All Of RR's Notes On Mushroom Cultivation

by

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compiled by dumbfounded1600

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THEY'RE SOME MISINFORMATION/OUTDATED INFO SO CHOOSE IT WISELY.

COLONIZATION

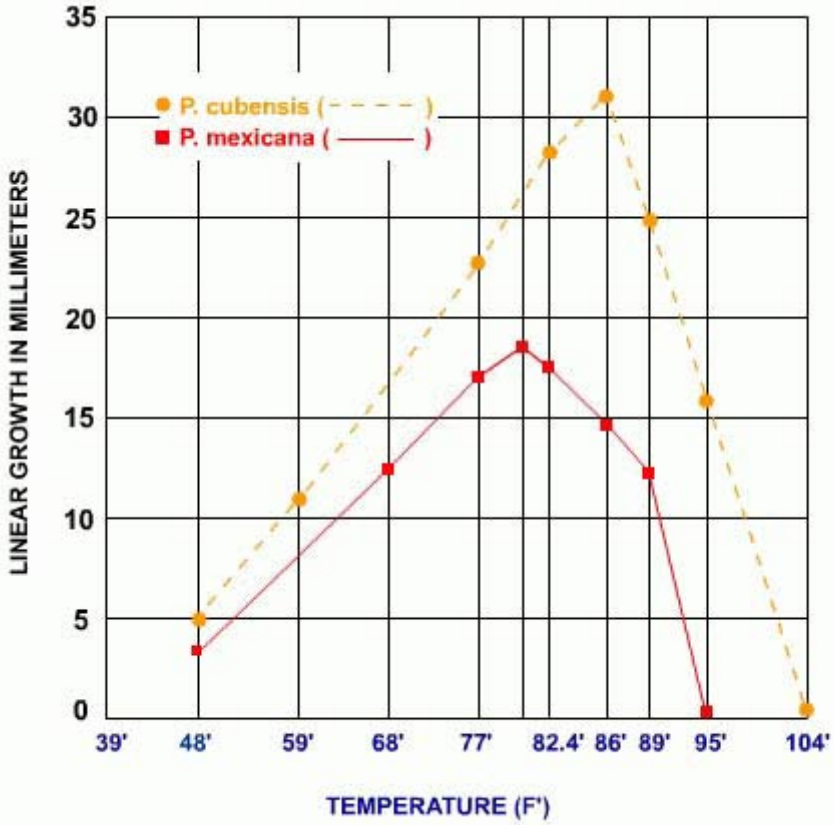
LIGHTING COLONIZATION - Incubating dark is another thing in Paul Stamets 'The Mushroom Cultivator' that needs to go away. The old advice of "incubate in total darkness" is bunk. Those words were written by Stamets in TMC 20 years ago, and he disavows that advice today. There is no harm or benefit from keeping jars in the dark. Expose them to normal room lighting from day one. There is no reason at all to ever have your mycelia in the dark. Darkness will only delay pinning. If you give light from day one, your yields will go up, and you won't face overlay problems. I've found no benefit or harm from allowing the grain jars to be exposed to light from day one. If a few pins form in the grains, it is actually a good thing. Contrary to popular belief, a few pins in the grains can be spawned right into the manure or straw (or used in grain to grain transfers) and they do not rot or otherwise cause contamination. There is evidence they actually help to give a faster, more uniform pinset in the eventual flushes. Stamets believes it's the hormones or other chemical triggers in the pins that do this. Exposing light from day one, one jar out of a hundred will make an early pin or two, but I simply spawn those pins right into bulk substrate along with the grains with zero ill effects. (In other words, small pins don't contaminate when spawned to bulk along with the grains). Twenty years ago, Stamets wrote in TMC to "incubate in total darkness" and people stick to that as if they were the words of god. However, Stamets no longer teaches incubation in darkness, and I agree. If you visit fungi perfect, you'll see 10,000 square feet of incubation area, with 8' fluorescent tubes lighting the entire area for ten to twelve hours per day. Of course myc will grow in the presents of light. IME myc grows faster in the absence of light also in nature myc colonizing substrate is most always not exposed to light so when we do not know for sure we will try to mimic nature which IMHO is the intelligent thing to do. Paul is a pioneer and is always learning as are we and things (ideas) will change again as we begin to really understand better what nature has given us.

COLONIZATION - And I've been trying to correct that disinformation for years. It's all based on a chart somebody mailed to Stamets many years ago showing 86F to be the peak temperature for growth of cubensis on a Petri dish, and everybody just accepts it as though Moses carried it down from the mountain on a tablet of stone. However, every single experiment I did to try to duplicate that with extremely accurate temperature monitoring was unable to verify that bogus 86F figure. What I have repeatedly found regardless of strain is that cubensis colonization remains rather flat from about 75F through 81F. Beginning at 83F, the rate of growth falls off sharply. By 86F, growth has slowed down nearly 50% what it was between 75f and 81F. These experiments were conducted on Petri dishes that produce little to no heat because of the very thin layer of

mycelium. In jars, up to several degrees of heat is produced by the colonizing mycelium; so definitely don't go over 80F to 81F if you're looking for maximum rate of growth. Furthermore, bacteria and thermophilic molds such as *Mucor*, the black pin mold are stimulated by higher temperatures. Therefore using an incubator set to 86F is certainly favoring bacteria and molds, while slowing down mushroom mycelium growth. Below is a picture of one of my colonization shelves.

It sits in my bedroom at normal room temperature and quart jars of rye berries colonize fully in ten days, and pf jars colonize fully in 14 to 21 days, but usually closer to 14. How often do we see posts where people have incubators set at 86F, and they're asking why their jars aren't colonized after four to five weeks, and they have large spots of yellow liquid forming? The liquid is metabolites that the mycelium secretes in response to stress, usually from competitor molds and/or bacteria. What has happened, is they've slowed down the mycelium while stimulating the competitors.

COLONIZATION - I have found little to no difference in colonization speeds between 75 and 81F. Growth falls off rapidly at 83F and above, not 87F. That chart above [see below] is bogus, period.



I have tried dozens of times to duplicate it and it can't be done. It was apparently made by someone who did ONE grow with sloppy note taking, and sent the results to Paul. Growth is much slower in cold temperatures until you hit 69F, where it speeds up quite a bit until about 75F, where it remains 'flat' until 81, then is flat again until 83, where it falls off fast beginning at 84. By 'flat' I mean there is no discernible increase or decrease in rate of growth within those ranges. Jars will colonize as fast at 75F as they will at 80F. I've proved this time and time again with every strain in my collection. Growth also falls off rapidly above 84, and this is why so many new folks have problems with incubators set at 86F, and jars that 'won't colonize'. The figures I give are substrate temperatures, not air temperatures. The temp inside the jar is 1 to 5 degrees higher than the surrounding air, depending on where in the colonization cycle the jar is. The heat produced falls off fast as the jar approaches full colonization. If you live in an igloo, (or near the waterfront) by all means build an incubator, but keep it in the normal room temperature ranges for best results. I see no reason to set one above 80F, and lots of reasons not to. Here's a picture of one of my shelves for colonizing jars. The substrate bags are there because I ran out of room on the other shelf. These are in a room at normal room temperature, and exposed to light nearly all day. I don't even put the pf jars on a top shelf where it's warmer. Of course, I had a good teacher on how to make them up, as everyone will soon know.

COLONIZATION - I've been saying that for years. My Petri dish studies a few years ago showed that cubensis reaches peak linear growth between 75F and 80F, then is flat until 83F, where it starts to slow down. Mycelium at 86F is growing at about 2/3 the speed of mycelium at 80F. In addition, the higher temps tend to stimulate thermophilic molds and bacteria. There's LOT'S of good information in TMC, but that 86F figure is one of the errors. When I did it there were ten Petri dishes colonizing at each temperature, in separate containers. I went through well over 200 Petri dishes of mycelium for no other reason than to determine the temperature that stimulates fastest growth, other factors being equal. That was a far more controlled study than the one reported over 20 years ago. If someone else wants to repeat the experiment, go for it. I consider the matter closed. Paul doesn't even repeat that 86F figure, which someone else sent him. Bottom line was the tubs that had Petri dishes between 75F and 81F showed no difference in growth. Below 75F, and above 81F growth slowed down, with a rapid drop in colonization speed below 70F and above 83F. At 86F, a Petri dish would be 2/3 colonized, while its sister at 75F would be fully colonized. Rate of growth at 86F was exactly the same as rate of growth at 72F, with fastest growth as said, occurring between 75F and 81F. Note that these tests were for linear growth in the two-dimensional plane of a Petri dish. In three-dimensional space such as in

grain jars or bulk substrates, the effects of thermogenesis need to be considered, so ambient temps should be lowered slightly to compensate.

TEMPERATURE COLONIZATION - 80-83F is optimal growth incubation temperature but anything past 81-83F increases the chances of thermophiles a.k.a contamination/bacteria. The 86F myth is based on a flawed agar study where heat isn't generated on Petri dishes. Mycelia growth declines rapidly at 86F and above. Paul Stamets later reviles that that is misinformation and should be lower. If it drops into the 60's however your speed of colonization will go slowly. 75-78F or at room temperature in the 70's is perfect for jars. If you're comfortable in a t-shirt in your house the jars are ok. Heating jars in incubator causes a lot of condensation, condensation is where the inside 'Temperature' differs from the outside. This has nothing to do with humidity. Condensation is the enemy of mushroom cultivation. It breeds bacteria and any moisture that is stuck to the walls is moisture that is NOT in the air any more, making your crop suffer. You should read up every week about how many noobs come in asking if they've cooked there jars because there temperature met all the way to the 100F +. This is why I disagree as well as speeding up a few days later, why? To run into more problems? For bulk substrates I wouldn't go higher then 80F as they already create enough heat by themselves.

COLONIZATION - 80F is fine for incubating, but don't exceed 81F or growth will slow. 86F is not optimal for cubensis. Stamets quoted somebody else who supposedly put out some Petri dishes in various temperatures and reported that to him, so he printed it. I've tried to duplicate that experiment, and after several times, I reached the positive conclusion that mycelium rate of growth is fairly flat from 75F to 83F, with it falling off sharply at 84F and above. It should also be noted that glass is an insulator, so the heat produced by the mycelium has no place to go and can easily spiral up into the range where growth falls off and thermophilic molds are encouraged. That's why I recommend normal room temperature for incubation, even if it is a tad slower. The benefits of a lower contamination rate far outweigh the extra day or two earlier they might colonize at a slightly warmer temperature. Besides, you should be waiting a week after full colonization anyway before birthing or spawning in order to allow the mycelium to consolidate its hold on the substrate.

COLONIZATION - I have not used an 'incubation chamber' in several years. If you maintain your house at normal indoor temperatures, your projects will do just fine. There is certainly no need to incubate jars over 80F, and to do so raises contaminant risks considerably. The inside of your jars will be 3 to 4 degrees warmer than the surrounding air. If you heat a chamber up to 86, your jars will be near 90, and much more likely to contaminate. I colonize on a bookshelf in a spare bedroom, and no attempt is taken to prevent the jars from receiving normal room lighting. I then fruit in a small greenhouse type enclosure with no heat applied during the growing process. If it's deep winter and your room is a bit cold, run a small space heater to heat the entire room to 75 or so. That temperature will work just fine for colonization, as well as fruiting. There's no need to make growing any harder than it already is. Keep it simple.

COLONIZATION - Do you know of one place in nature where cubes fruit naturally that does not have a difference between daytime and nighttime temperatures? I've read ever since 1985 that 86F is best, usually because of somebody simply repeating what they've read somewhere, then somebody repeats that, and so on and so on. Now, over 20 years later, they're still repeating it, and it's still wrong. In my grow room, the day and night temperatures fluctuate as much as 20F. When I say normal room temperature that means 72F to 78F. There is zero increase in rate of growth of cubensis above 80F, and mushroom mycelium often stalls out and bacteria is encouraged in warm anaerobic environments, such as is found in the bottom of non-vented tubs commonly used as 'incubators'.

COLONIZATION STORY - Let me tell you guys a story. My fellow moderator Roadkill and I were filming a video segment on pf jars over at my brother's house a month or two ago. Later that day, my non-mycologist brother moved everything we left behind out to his garage, jars included, just to get them out of the way. I told him it didn't really matter, as I just wanted to film the process of making/inoculating the jars. Three weeks later, I went over there and guess what? All of the jars were fully colonized. The temperature of his garage during this time varied from the mid 30's to the low 50's. (He lives about 50 miles from the Canadian border) So, if properly made pf jars can colonize in three weeks at those low temps, why bother with silly incubators?

INCUBATION - Mycelium will not colonize faster at 86F. That is flat out wrong. The state of growing mushrooms has progressed way past what was thought 25 years ago. Furthermore, the incorrect information presented 25 years ago said that 86F was an optimal SUBSTRATE temperature, not air temperature. Since

there is up to a ten-degree increase in substrate temp over air temp, based on those 25-year-old figures, you should colonize at no more than 76F ambient air temperature. However, maximum mycelium growth occurs at a substrate temperature of 80F to 82F, with a drop off in colonization speed above that. Anyway, this has all been covered to death already, so there's no need to repeat it all over again.

COLONIZATION - Incubators cause way more problems then they solve. I haven't used one in years. Glass is an insulator and holds heat very well. I've seen up to a ten-degree increase over ambient in the temperature inside the quart jars of grains, when a thermocouple is inserted into the center of the jar. The other problem with using a tub as an incubator is stale air. It does little good to have filters and holes in your lids if they all just vent into a sealed tub. Normal room temperature is fine for colonization of mycelium. Colonization speed peaks in the 75F to 81F range, and falls off dramatically above 83F. Stamets published a chart in one of his books that said 86F is the fastest for growth, and that is just plain wrong.

INCUBATING/COLONIZATION - Normal room temperature is the way to colonize jars. People who build incubators have a higher rate of contamination and other problems and those who succeed only have a minor decrease in colonization times. 75F to 80F is perfect for colonizing, and you should be able to find a nice place in your house that has that temperature, such as a top cupboard shelf in your kitchen or an upper bookshelf in the den. Colonizing jars need gas exchange that they don't get in a sealed tub.

COLONIZATION - A fan helps humans to cool off because it speeds up the evaporation of sweat from our skin. A fan will not make your jars any cooler at all because there are no sweat glands on glass. Find a cooler spot. That could be against the concrete floor in the garage or wherever. Placing your jars on a cookie sheet full of cold tap water should help bring the temp down as well. You could fill it just before you go to work and by the time the water heats to ambient, you'll be home to change it out with cool water again. Get creative. Just try to keep the temp in the low 80's or less.

COLONIZATION STORY - Last year, while visiting my brother, I inoculated a bunch of jars for him, thinking he was actually interested. This was in December. I went back in February, and found he didn't have time to bother with them, so put them out in the garage. Temps outside were in the teens and twenties, and in the unheated garage, 30's to low 40's. The jars were fully colonized. I took them home and they fruited like mad. Low temps slow things down, but that's all. I keep master culture slants in the refrigerator for years.

COLONIZATION - There is no need to keep them dark. I'd suggest tossing out that sweet looking incubation chamber and let them colonize on a bookshelf at 74F to 78F. Don't shake ANY jars at inoculation, and don't shake pf jars ever. I also don't buy into the turning them upside down thing either unless you made them too wet or they're water logged on the bottom. The CO_2 exchanges just fine out the top during colonization via the air currents that are created by the heating that is caused by thermogenesis.

COLONIZATION - The science of mycology is progressing very fast, and what was written 25 years ago isn't necessarily accurate today. Perhaps if you got one of stamets' later works, you'd see he no longer uses that 84F to 86F figure, nor does he recommend incubating in total darkness. I take it a step farther by recommending against 'incubating' at all, having found over my 35+ years of experience that room temperature is the best compromise between speed of colonization, and contamination prevention.

COLONIZATION - 81F should be considered the maximum 'good performance' ambient temperature in the colonization area for colonizing jars of mushroom mycelium. If your temp is higher than that, try finding a cooler place. Thermal death doesn't occur until much higher than that, but thermophilic molds and bacteria are encouraged at higher temperatures, and the 'rate of growth' of mushroom (cubensis) mycelium falls off sharply beginning at 83F. The oft-quoted figure of 86F is just plain wrong.

COLONIZATION - Wild swings in temperature cause air exchanges between the jars and the outside. If the changes are rapid, they can easily be too much for the filtering material, especially if only dry vermiculite is used. I don't recommend incubators, but find a nice room that holds at least to within five degrees or so. 75F to 81F is ideal. Above that, the returns are not worth the increased rate of contamination that will be experienced.

COLONIZATION - 80 to 84 is way too hot to incubate grains. Any temp over 80 will favor molds and bacteria and not mushroom mycelium. One must bear in mind the mycelium produces heat as it grows. If your jars are in an environment of 84F, the inside temp will be over 90F. That reduces the growth of the mushroom mycelium and encourages bacteria. Always incubate grain jars at room temperature. Good luck!

COLONIZATION - Actually, from my experiments, rate of growth falls off rapidly above 83F with cubes. I've found fastest colonization temps to be in the 78F to 81F range (ambient temp). Temperatures above that will stimulate molds and thermophilic bacteria, while actually slowing down mushroom mycelium. A lower colonization temp will give you reduced contamination percentages.

COLONIZATION - My quart sized grain jars from agar wedges or grain-to-grain transfers are fully colonized in ten days to two weeks at normal room temp of 72F to 77F, depending on time of day. If it takes longer than that, something else is wrong. Higher temps slow down mycelium growth while stimulating competitor molds and bacteria.

COLONIZATION - 86F is too hot. That figure comes from an error in Paul Stamets TMC, which was corrected in later books. However, many growers only have TMC, thus refer to it as the bible, as if everything we've learned about mushroom growing since 1985 when artificial cultivation at home was in its infancy is void.

COOLING COLONIZATION/FC - You can also freeze quart sized plastic bottles of water, and place them in your terrarium to absorb heat. If you can keep five or six in your freezer, you can rotate as necessary to keep one or two in the FC at all times during the hot months.

COLONIZATION - Light has little to no effect on colonizing mycelium. I colonize all of my substrates in an open room exposed to ambient room light the whole time. Pinning only begins when fruiting conditions are introduced, other than when something goes wrong.

COLONIZATION - Foil should be removed as soon as they're sterilized. It's important to have gas exchange during colonization, so I don't put them in a box of any kind. My jars colonize on an open bookshelf at normal room temperature.

COLONIZATION IS FOR NOOBS - Get rid of the incubator, and put the jars on a shelf where they can receive normal room light during colonization. This will speed up pinset once you case them. (or birth or whatever)

COLONIZATION - Thus, any ambient temp over 81 for jars or 78 for trays of manure, and you're slowing down mycelium growth while promoting bacteria and thermophilic fungi.

COLONIZATION - Darkness is irrelevant to colonizing mycelium. Don't go over 81F. Room temperature is just fine as long as you keep your house t-shirt warm in winter.

BULK SUBSTRATE COLONIZATION - 80F is too hot for colonization of bulk substrates. The interior of your substrate is well over 90F when ambient is 80F.

COLONIZATION - Mycelium growth slows down at 83F and above, so you're hindering growth with that incubator. Use room temperature

GRAINS/JARS/LIDS/SOAKING/SHAKING/G2G

JAR FILTERS - When you use type or polyfill or synthetic filter disks (best) you drill three or four 1/8" (1mm) holes for gas exchange and screw the lid down tight. I use the lids upside down, so the metal is against the glass, but that is just to make them easier to get off later. The rubber tends to stick, making it a chore to lift the lid when you need to open the jar. The jar will always be at the same pressure as the rest of the PC, so there is no problem there. When I sterilize water or test tube slants, I screw the lid down tight with no filter or vent holes. It's not a problem, provided you don't ever pop the weight off the PC at the end of the cycle before pressure has returned slowly to zero on its own.

FILTERS GRAINS - Tyvek is functional and cheap or free. However, synthetic filter disks last for many years and thousands of uses. Tyvek tends to get ripped at the edges of the lid, often resulting in only one use. It can also twist, making the lid very hard to get off later for G2G or other procedures. The time spent cutting tyvek to shape each time will easily outweigh any cost advantage. Even though I sell tyvek on my website, I still prefer filter disks.

FILTERS - Mycologists have used cotton filters at least since the 1930's. It's a proved filter material. The cotton must be kept totally dry, as must any filter material. Synthetic pillow stuffing is better, as are synthetic filter disks and/or tyvek. Coffee filters are for coffee. Using one as a contaminant barrier would be like trying to use a chain link fence as a mosquito barrier.

FILTERS - I think you should run an experiment and give us a report. It's so cheap, I toss it out after a use or two. One pair of XXXL coveralls will make over 200 filters. Synthetic filter disks, which are PFTE, can withstand bleach hundreds of times, which I know for a fact.

FILTER - We filter our colonizing jars because sterile, uncolonized substrates will grow whatever lands on them. There is no reason or need to filter a fruiting chamber. Aquarium pumps and air stones will not deliver nearly enough air exchange for good results.

COFFE FILTER GRAIN JARS - In addition, trying to stop contaminants with a coffee filter is like trying to stop a bird with a barbed wire fence. Look at a coffee filter under a microscope. The holes in it are ten times or more the size of contaminant spores.

COFFEE FILTER - First of all, trying to stop contaminants with a coffee filter is like trying to stop a mosquito with a barbed wire fence. Two coffee filters are like having two strands of barbed wire. Is that going to stop a mosquito???

COFFEE FILTERS AS BACTERIA PROTECTORS - Trying to use coffee filters to stop bacteria and trich is like trying to catch a mosquito with a fish net. Isn't going to work.

FILTER - If you're going to use micropore tape as a filter, use two layers.

TAPE - Actually, The tape is only for the sterilization cycle. After that, you can take it off because the dry vermiculite is the filter. Masking tape won't breath. The tape is simply to help keep water out of the holes. If you'll elevate the jars totally out of the water during sterilization, you don't need tape. Simply cover the lids with foil to prevent the condensation that drips off the lid of the kettle or pressure cooker from entering the holes. If you use medical tape such as micropore or other 'breathable' tape, you can leave it in place and inoculate right through it.

MICROPORE TAPE - Probably. The 'micropore' tape is a 3M product. I don't know if it's a trademarked name or not. I suspect breathable medical tape is going to be the same thing, whatever the brand.

MICRO PORE TAPE - The tape goes on BEFORE sterilization. It has no purpose afterwards. It's to prevent water that gets under the foil from penetrating your jars during the sterilization process.

POLYFILL - 'Synthetic cotton' = 'polyfill'

SYNTHETIC FILTER DISK - The bands are what hold the metal lid on. The lid itself isn't threaded with two-piece lid mason jars. You don't want the rye grains to come into contact with the filter disk. Be sure to put the metal lid on first with two 1/8" holes (1mm), then put the filter disk above that, then the metal ring goes on last. This way, when you shake the jars, the grain doesn't get the filter wet with grain juice. A wet filter is a vector for contaminants because they can colonize right through the interior of the filter. Be sure to keep your filter disks dry for best results. Use a glove box, and simply lift one side of the lid enough to squirt the solution in. Squirt it down the side of the glass. Do that in two or three places, then tighten lid. Be sure to use a glove box.

SYNTHETIC FILTER DISKS - I soak synthetic filter disks in a ten percent bleach solution for fifteen minutes before using. It's probably not necessary though since they'll be pc'd anyway on the next cycle. Bleach doesn't

hurt them. I have hundreds of synthetic filter disks that are well over ten years old and have yet to have a single one fail.

SYNTHETIC FILTER DISKS GRAIN JARS - They're the best filters you can get. Don't inoculate through them though. Use a glove box and simply lift the lid up and squirt under it. I have some that are six or seven years old and still being used after hundreds of times.

SYNTHETIC FILTER DISKS - Check a local chemical supply. The filter disks are made from PFTE and usually filter down to less than 1 micron. 90mm is a standard size. You might be able to find them from a local, non-mycology related source.

SYNTHETIC FILTER DISKS - You can't beat synthetic filter disks though. They're ten times thicker than tyvek and last a lifetime. I have some that have been through hundreds, perhaps thousands of cycles.

SYNTHETIC FILTER DISKS - Do NOT inject through a filter disk. If you use synthetic filter disks, you'll need to lift the filter up to squirt under it. Do this in a glove box, or in front of a flow hood.

SYNTHETIC FILTER DISKS - Synthetic filter disks are my favorite. I have some from the first batch I ever bought, ten years ago. I still use them after hundreds, if not thousands of times.

SYNTHETIC FILTER DISKS - They all work. My preference is synthetic filter disks because they can be used hundreds or even thousands of times.

SYNTHETIC FILTER DISKS - You need to use the lid under the disk. If you only use a filter disk, the grains will dry out before full colonization.

SYNTHETIC FILTER DISKS - Synthetic filter disks work great for LC, but as with all filters, be sure to keep it dry.

TYVEK - A single layer of good tyvek should be enough. Don't put cotton in the middle of a tyvek sandwich or it will get damp and ruin your day. Use kite tyvek or tyvek from a set of coveralls. Don't use three layers unless you have a lot of holes in the lid. You'll cut off the gas exchange. I drill four 1/8" holes, and use two layers of tyvek, both on the outside of the lid so they stay dry.

TYVEK GRAIN JARS - I've used tyvek coveralls for filter material many times. I doubt that's your problem. Tyvek is used for safety coveralls because it allows the person's sweat vapor to escape, while still providing protection from the toxins.

TYVEK - Don't use post office tyvek for anything but mailing. It's a violation of federal law. Go to your local home mega center, and in the paint department, they'll have tyvek coveralls for five or six bucks. Get a few of those to cut up.

TYVEK GRAIN JARS - Actually, the tyvek goes over the lid, not under it. You want the tyvek on the outside so it stays dry. Put down the lid with small holes in it first, the tyvek second, and lastly the ring to hold it all in place.

TYVEK LIDS - Not only will they dry out that way, they'll cause premature pinning by providing air exchange, as opposed to just gas exchange. You need to at least tape over 90% of the tyvek with duct or shipping tape.

TYVEK - Go to your local home mega center and get tyvek coveralls from the paint department to cut up and use as filters. Post office tyvek is not only illegal to use but subpar as far as performance goes.

TYVEK - Post office tyvek is thinner and not as effective at stopping contaminants as the multi-ply, much thicker tyvek used in wrist sleeves and coveralls.

TYVEK - The tyvek should be OUTside the lids. If you put the tyvek inside the jar, you'll have a much higher contamination ratio.

TYVEK - Tyvek coveralls, wrists leaves are washing machine safe.

KITE SUPPLY STORE. TYVEK - http://www.intothewind.com/search.

COLONIZING JARS/BAGS - I've scanned my crops and colonizing jars and substrate bags with an IR camera and noticed up to five degree F increase in quart jars of rye, and up to a 15F degree increase over ambient when shooting at large gusseted spawn bags, but that was 15F over ambient at the edge of the bag. I'm sure the center was hotter. I usually have up to 200 spawn bags colonizing at any given time on shelves in my grow room, and I never heat it, even in the coldest months of winter. The temperature in the room rarely drops below 75F, even when it's freezing outdoors. We use minimal heat in the rest of the condo as well, simply leaving the grow room door open is enough to supply most of the heat we use.

FLIPPING JARS PF/GRAINS - Don't flip jars. As prisoner said, it screws up the vermiculite filter. CO_2 doesn't need to 'drain' out by flipping the jar upside down. That's a bit of disinformation that once typed refuses to die. The reason is the heat produced by the mycelium causes circulation that takes care of the gas exchange.

FLIPPING JARS PF/GRAINS - When you examine them, don't turn them upside down. That can cause the vermiculite barrier to shift. You can expect there to be contaminant spores near the air/inoculation holes, and if you shift the jar around, those mold spores can be shifted down and into the substrate, contaminating it.

COLONIZING JARS - Bear in mind, a substrate on the dry side will colonize faster than an overly wet one, so if your jars didn't colonize, something else might be wrong. It's also a good idea in a dry climate to run a humidifier in the room your grow is located to raise the ambient humidity.

COLONIZATION/INCUBATING GRAIN JARS - The moisture comes from condensation on the lid of the pressure cooker that constantly rains down on the jars below. That's the reason for the foil. I'd start over and get it right. Don't waste spores getting off on the wrong foot.

PF CAKES - Cakes often pin on the bottom because that's where the moisture runs to by gravity and also it's closer to the perlite, thus the humidity is higher and stimulates pinning.

COLONIZATION - Grains colonize much faster when prepared on the dry side. I do it that way by design. If you see visible moisture on the surface of the grains, they're too wet.

GRAINS/SUBSTRATE - Most often, if a cased substrate smells of alcohol. Some fermentation has, or is taking place.

COLONIZING JARS - If the mycelium runs out of O_2, it will stall and die.

G2G TRANSFERS - One should never use a jar that isn't at least 100% colonized for a grain-to-grain transfer. The biggest reason is that since sterilization is a relative term, it's never complete. You have a window of opportunity to get your grains colonized before the contaminants that survived pressure-cooking come back to haunt you. If you grain to grain with uncolonized grains, you add their age to the age of all the grains in the receiving jar, possibly contaminating them all. The difference between 100% colonization and 80% colonization should be no more than two days, so don't risk failure for a measly 48 hours.

SPAWNING G2G - Bang the colonized jar against a tire or phone book to separate the kernels. Next, open each freshly sterilized rye jar one at a time, and pour and twist from the grain master to deliver a small amount into each receiving jar. Try to have the receiving jars open for no more than five seconds, so plan ahead and work fast. Clean all jars with alcohol before opening. Wear latex gloves and wash them with alcohol after putting them on. As said above, use a glove box, or even better of course is a laminar flow hood. Good luck.

G2G GENERATIONS - It was ANNO that pointed out - young vigorous mycelium does better than old. However, I have gone out 5 G2G transfer generations - without ill effect. Genetics plays a part in it. In nature - mycelium is designed to grow out & fruit in one season. You can FOOL with Mother Nature - but extending it to far out - usually brings on some mutation.

G2G TRANSFERS - When you do a g2g, unscrew the ring, then with your thumb and forefinger, squeeze the ring so you capture the lid and the filter and lift all three as one unit. Pour from the donor jar to the open

receiving jar, and then replace the lid as one unit. Have the receiving jar open for no more than a few seconds when doing this.

G2G TRANSFERS - I shake the master jar to loosen the kernels, and then do the g2g right away. After the transfer, gently shake the receiving jar, and then shake again at 20 to 30 percent colonization. I never wait for the grains to recover before shaking or g2g. They'll recover right into the fresh grains of the receiving jar. Good luck.

G2G TRANSFERS - Four grain-to-grain transfers should be considered the outside limit, but chances are you'll see growth slow before then anyway. Cloning from the third would make it the fourth, and wouldn't help. Go back to spores. A given cell line can only divide so many times before loss of vigor sets in.

G2G TRANSFERS - Never use a jar that pins early for grain-to-grain transfers. Usually, something is the trigger for early pinning, such as bacterial contamination. I know you don't g2g brf jars, but had it been a grain jar, you wouldn't want to use if for transfers.

G2G TRANSFERS - You can generally use a fully colonized grain jar to inoculate up to ten times that amount of sterilized grains. How many bags per jar simply depends on what size spawn bag you used, and what size jars your grains are in.

LC > G2G - Fastest colonization I ever had is with G2G.

SHAKING GRAIN JARS - I disagree with more than one shake during colonization. A shake at 20% to 40% will spread those kernels around, ensuring the rest is colonized within a few days. After shaking, there's a 24 to 48 hour period where the mycelium is merely trying to recover from damage, but isn't growing into the new grains. If you shake more than once, you force the mycelium to waste needless energy re-knitting, when it could be aggressively growing. The same applies at the end. Shake to loosen the grains, and then spawn them to your tray of manure or straw, etc. Let them recover directly into the manure or casing layer. If you shake, then allow to recover, they're damaged again by spawning, so must recover yet again. My point is that shaking is abusive, but a necessary abuse. Simply keep it to a minimum.

SHAKING GRAIN JARS - From my tests, it actually slows down colonization, by forcing monokaryons to reach out farther before finding a compatible mate. Dikaryons colonize and feed much faster than monokaryons. By shaking, you disperse the ungerminated spores over a larger area. I prefer to inject, and then let the jars or bags sit for several days until you see germination, or if you inoculate with an agar wedge, wait until the mycelium has moved off the wedge and into the grains before shaking. If you do the above, only one shake is required during the whole process.

SHAKING GRAIN JARS - When you shake a jar, it will 'look' uncolonized for a few days until it recovers. You only need to shake once at 20% to 30% colonization. Your second and fourth jar above look about done. Give them a few days past full colonization before spawning to bulk. The third jar needs a few days. They'll all look like the first jar after shaking. That's normal. Shake just before spawning by banging the jar against a tire, and then layer into your manure or whatever you're using as bulk. The mycelium on the grains will recover right into the substrate.

SHAKING GRAIN JARS - You need to break it up at 20% to spread the mycelium around so it can inoculate the rest of the rye. It will speed colonization up. If the mycelium fails to recover after breaking it up, it means the grains were contaminated anyway. Read up on 'shaking'. That's what we do with rye grain jars. I use a bicycle tire to bang the jar against to break it up. With bags, simply massage the bag between your fingers to break up the clumps and spread them around the bag.

SHAKING GRAIN JARS - If you shook right after inoculation, it will be fuzzy at first. I suggest inoculating and NOT shaking for at least a week. By shaking, you spread the spores around, forcing monokaryotic mycelium to hunt for a mate. If you let the spores germinate right next to each other, they form bonds and become dikaryotic in the first few days after germination, and then grow with the thicker, rhizomorphic mycelium.

SHAKING GRAIN JARS - Shaking right after inoculation is a mistake. You should allow the spores to germinate in close proximity to each other so they can pair up and become dikaryotic. Monokaryotic mycelium is thinner and much slower growing than dikaryotic mycelium. By shaking the jar, you required it to colonize with the slower growing monokaryons.

SHAKING GRAIN JARS - The best way to break up a grain jar is to beat the hell out of it against a fully inflated tire. I use a bicycle tire and air it up nice and hard before use. Half a dozen bangs usually separates every kernel from every other kernel. If not, it's a good sign your jar was contaminated with bacteria, which makes the kernels stick together like rubber.

SHAKING GRAIN JARS - Grains should NOT be shaked after inoculation with spores. Monokaryotic mycelium grows far slower than dikaryotic mycelium. It's best to inject the spores and leave them to pair up in close proximity to each other. Once they pair up and become dikaryotic, shake once to distribute the grains, which speeds up colonization.

SHAKING GRAINS - Grains should only be shaken once during colonization. More than that slows down progress. Shake at anywhere from 15% to 30%. The grains will begin to show recovery by 24 hours, and by 48 hours, things should be growing rapidly again. You'll have to shake again after full colonization to remove the grains.

SHAKING GRAIN JARS - If the grains don't break up easily when banged against a tire, it's a good sign that they're contaminated with bacteria. It is even more likely since you're using an incubator. Grain jars; especially quarts should never be placed in an incubator, but rather allowed to colonize at normal room temperature.

SHAKING COLONIZED GRAIN JARS - Colonized grain jars break apart very easily by banging against a fully inflated bike tire, and you NEVER want to scoop out grains. It damages the kernels, leaving them open for bacteria, and adds an additional vector of contamination to the process.

SHAKING - Never hold a jar in one hand while holding a camera in the other. That doubles the amount of shaking going on, screwing up the picture. Put the jar down. Rest the camera on a chair, book, or something else if you don't have a tripod.

SHAKING - Shaking always makes them look 'uncolonized' because it beats the mycelium on the surface of the grain. After a few days, as you found out, they recover. You should only shake a grain jar once at 25 to 35 percent colonized.

SHAKING GRAINS COLONIZING - There is no need to shake more than once. Three times is mycelium abuse. Please continue the same thread for ideas along the same lines. Don't start a new thread with each question.

SHAKING GRAIN JARS - Shake at about the 25% stage. Shaking prior to that only batters the myc & then it takes time to heal & start growing again. You ever hand a black eye? How long did it take to heal?

SHAKING GRAIN JARS - Grain jars shouldn't be filled more than 2/3 to 3/4 full to allow room for shaking. If you'll bang the jars against a fully inflated bicycle tire, the kernels will separate easily.

SHAKING - A quart jar of healthy mycelium on rye that is shaken at 25% will be completely colonized three to four days later. If not, something is wrong.

SHAKING GRAIN JARS - Shake jars well at 20% to 30% colonized to spread the grains around. They're usually fully colonized four to five days later.

SHAKING GRAINS - Remember, when things look fine until you shake, then don't recover, it's almost always bacteria.

SHAKING GRAIN JARS - Shake, and if it recovers it's fine. If not, it was contaminated.

SPAWN BAGS - I really hate to disagree, but it's best to not shake at all just after inoculation. Leave the spore solution all in one spot so the monokaryons can find compatible hyphae nearby and do the sex thing. Once you have solid white mycelium growing, those are the dikaryons and they grow much faster than the wispy, grayish monokaryons that emerge from the spores. Many new growers mistake these for cobweb mold and toss out perfectly good projects because they shake at inoculation. If you shake the bag or jar early, you force the slow growing monokaryons to colonize much more of the substrate before finding a mate, thus slowing down the progress. I'd recommend giving the first and only shake at 30% colonization.

STORING GRAINS/PETRIS - Actually, grains have been found better for mycelium storage than agar slants, but unfortunately take way too much room in the refrigerator. However, I've used jars that have been stored fully colonized in the refrigerator for several years. Put them in the refrigerator at full colonization, and then when you remove from the refrigerator, allow three to five days at room temperature before spawning.

STALLED GRAIN JARS - In the overwhelming majority of cases when a jar stalls, it's due to lack of gas exchange. Make sure the holes are open on the lids. If you have a vermiculite barrier, you can loosen the lids or even remove them for a time. Jars rarely dry out.

GRAINS STORING - You can store colonized grains in the refrigerator, or use them for grain-to-grain transfers to expand your mycelium. Correct, removing jars from the refrigerator requires a couple of days of warm up before they start growing again.

SPAWNING - Make thin layers so they fill in the gaps quickly. I've found this has less of a chance of breaking kernels of grain spawn, which can allow contaminants to get a foothold in the uncolonized part in the middle.

STALLING JARS - They don't 'stall' without a reason. Either it ran out of air due to no holes for gas exchange, or it's contaminated with bacteria. You can't spawn uncolonized grains or the bulk is sure to contaminate.

SPAWN BAGS - Unless it's a HUGE bag, don't use over three to five ml of spore solution or liquid. More than that will be too much and throw off your moisture content.

STORING GRAIN JARS - They can sit for a couple of weeks at normal room temperature after full colonization without harm.

RYE GRASS SEED - Use twice as much grass seed by volume as water. For a 1-quart jar, use 1 1/4-cup rye grass seed, and 5/8-cup water. Add a pinch of gypsum between your thumb and forefinger per jar. Put a solid lid on the jar and shake well. Allow to sit for an hour or two, and then shake again. Replace the solid lid with a filtered lid, and PC for an hour at 15 psi. Rye grass seed makes an excellent grain master, because you can easily do a grain-to-grain transfer into 20 jars. I won't go over ten jars with rye berries. It's also a great spawn to bulk substrates, because of all the inoculation points. It also seems less susceptible to trichoderma then the larger rye berries. We usually don't recommend it to new growers because it often takes quite a few tries to get the moisture right. If it's too wet, the mycelium can't colonize. Ditto if it's too dry. The above plan should work out for you though.

RYE GRASS SEED - Rye grass seed needs to be mixed with half as much water by volume as you have grass seed. For a quart jar, I use 1 1/4 cup of grass seed, and 5/8 cup of water. Add a pinch of gypsum between your thumb and forefinger per jar. Half the amount of water can be substituted with brewed coffee. I put a solid lid on the jar after mixing and shake well. Allow to sit over night, and then shake again. Replace the solid lid with a filtered lid and PC for an hour at 15psi.

PREARING RYE - It's irrelevant. I bring rye to a raging boil after the 24-hour soak, with the stove on 'high', and have ZERO busted kernels. As shown in the video, rinse grains very well with hot tap water before the soak. Fill the kettle with hot tap water to begin the soak. Add gypsum. After 24 hours, bring to a raging boil for five to ten minutes, then drain and shake. I've never seen more than one kernel in a thousand busted when following the above.

RYE GRAIN - After a 24-hour soak, I once accidentally left the water in a rapid boil for nearly an hour. There were no burst kernels and they weren't any fatter than they'd have been after a ten-minute boil. I used them and they were fine. The secret against cracked kernels is to soak the grains first, and then to heat the water

and grains together slowly.

RYE GRASS SEED - Rye grass seed is also excellent for spawning to bulk, and very cheap too. It's a bit trickier to prepare, but goes a long way when used for grain to grain transfers or for spawning to bulk substrates.

RYE GRASS SEED VS RYE BERRIES - I doubt you can get grass seed to fruit, although it makes excellent spawn. You want rye grain. Copes need the grains to be spawned into manure.

WBS - I gave up on wbs due to the inconsistent types of seed in it. It works, but rye is much better and only costs about 5 cents per quart jar if you buy it in 25 pound bags.

RYE GRASS SEED - If you simmer rye grass seed, you will ruin it. Soak only.

FLIPPING JARS - If the bottoms didn't colonize due to bacterial contamination, it will have no effect. If the jars didn't colonize due to excessive moisture that ran to the bottom, it will help, by draining it to the other end of the jar. Some growers think flipping upside down is to release CO_2, but this is incorrect. The heat produced by the mycelium produces circulation that does that job. I've never yet had a jar that wouldn't colonize the bottom, provided it was made correctly to begin with, using the proper amount of water AND the correct jars, which you don't have. BRF cakes do best in short fat jars, such as wide mouth half-pints.

PF TEK JARS - The biggest cause of failure with pf tek is not following proper sterile procedure. You the cultivator are the biggest single source of contamination, so be very careful. Thousands of bacteria are exhaled from your mouth with every breath, so wear a surgical mask. Millions of bacteria reside under your fingernails, so wear gloves, and wash them with alcohol before use. Use a glove box, and flame the needle of your syringe red hot before use. Alcohol might clean the outside of the needle, but contaminants can enter into the center of the needle and not be touched by the alcohol.

LIDS GRAINS - In addition, your order of assembling the lids is incorrect. You want the metal lid with holes first (make the holes no more than 1/8"), followed by the filter material, then the ring. This keeps your filter on the outside of the jar where condensation doesn't get it wet. Remember, if your filter gets wet, you're screwed. Bacteria in the air will colonize right through the material as if it wasn't even there. The reason for making the holes in the lid small is so that when you shake, the wet grains don't contact your filter material. A wet, nutrient saturated filter is sure to contaminate.

GRAIN JARS - Actually, half a teaspoon of bleach in a gallon of water will kill bacteria, but it throws the pH way off, so I don't recommend it at all, especially in grain jars, which prefer an acidic pH. I wouldn't inject water into a grain jar. If they're drying out, chances are, your gas exchange holes are too big. You don't want more than four 1/8" (3mm) holes. You could even get by with smaller holes. I use four 3/32" (2.4mm) holes for both 1/2-pint pf cakes and full quart grain jars. Larger holes can dry out the material and encourage invitro pinning.

GRAIN JAR SIZES - Quart jars are best suited for grains in my experience. Anything less, and there just isn't enough spawn for your bulk substrate. Due to the requirement to leave shaking room, a pint jar can hold more grains than two 1/2 pint jars, and a quart jar can hold more grains than two pint jars. Half-gallon jars are nice, but they really should be colonized at a 45-degree angle to help with gas exchange. I've had a lot of trouble with CO_2 concentrations when leaving 1/2-gallon jars standing upright.

GRAIN JAR LID - If you'll drill two or three small, 1/16" holes in the metal lid, the grains will never touch the filter when you shake. A fully inflated bicycle tire works great for banging jars against to break them up. Just make sure you have the tire pumped up nice and hard.

GRAIN JAR LIDS - I recommend using four 1/8" holes for gas exchange. If you use more than that, you run a risk of drying out your grains and/or stimulating pinning inside the jar due to having too much air exchange, as opposed to a small amount of gas exchange.

GRAIN JARS - As said, you soak for bacteria, not molds. If it turned green without opening, then plain and simple, your filter is not doing its job. Look for tears. Is it post office tyvek? If so, that could be the problem. I

don't consider it suitable for mycology.

GRAIN JARS - A 1/2" hole in the lid is way too much for a small jar. In fact, with quart jars, I only use three to four 1/16" holes for gas exchange. A large hole will not only dry out your grains, but can lead to pinning before full colonization.

HALF-GALLON MASON JARS - My experience with half gallon and larger jars is they need to be incubated at an angle of 45 degrees to allow for gas exchange. They get stagnant standing upright with the lid/filter only on top.

RUSTY LIDS - Rusty Lids: It's harmless to the mushrooms and to you if eaten. Just don't cut your finger on the rusty lid. Lockjaw sucks.

PF CAKE JAR - Use 1 ml total for a 1/2-pint cake.

SIMMER OR NOT TO SIMMER - The above posts prove there are many ways to skin the proverbial cat. The important thing is to have the grains at twice their original dry size, with no burst kernels and no excess moisture in the jars.
After a 24-hour soak, the grains are fully hydrated, but personally, I boil for a few minutes after the soak for one reason-It allows the grains to steam off the excess moisture from the surface as the rest of the water drains in the colander. By shaking the colander, the grains release the excess moisture as steam.
Experienced growers are all successful and most have evolved their own tek for preparing the grains. As long as your grains seem dry on the outside, and are twice the original size without burst kernels, they are ready for the pressure cooker, regardless of how one goes about reaching that point. Some growers even dry the grains off with a towel.
I would say to any new grower to read the way the experienced cultivators do things and try a few ways. After you pressure cook your product, don't hesitate to toss it out without inoculating if things don't look right, and start over. Try, and then try again until you get it right. Once you find a method that works for you, stick with it.
Good luck.

JARS PRESSURE COOKER - It's really not about jars breaking, although sometimes they will. Here is the reason: At 15psi, the temperature in your PC and inside the jars is 250F. If you quick cool the PC, the substrate or whatever is in your jars is still at 250F, but now the pressure is gone. As we all know, water boils at 212f at sea level pressure. That means that the moisture in your jars will boil off. It will continue to boil off until the temperature of the substrate cools below 212F. There's an excellent chance that you will have destroyed the moisture content you worked hard to get right before sterilization. If you quick cool with bags, the filter won't expel the steam fast enough, so the bags inflate and burst, spilling whatever is in them. When the instructions say you can quick cool, you must bear in mind they don't build PC's for mushroom growers. They build them for kitchen food use.

PCING GRAIN JARS - Lids tight. If they're loose, there's a chance that contaminants will be drawn into the jar as the PC cools at the end of the cycle. Air in the jar won't expand and need to escape because the air in the pressure cooker is under the same pressure, thus it's equalized. It's best to let steam escape for a few minutes before placing the weight on or closing the toggle if it's a sterilizer, but don't let it go too long. Anytime steam is escaping from the PC, it's also letting moisture escape from your jars. If the PC is blowing steam wildly, it's also blowing steam wildly from your jars, possibly blowing the filter material and/or drying out your grains. This is the reason you never want to pop the weight off at the end of the cycle to let the steam out.

RELEASING PRESSURE PC GRAINS - One should never release pressure immediately after the cycle. The very rapid cool down from 250F to 212F while the grains or other substrate inside of the jars is still 250F will cause many jars to break. Furthermore, water at 250F must be under pressure to exist in the liquid state. Therefore, when you release pressure, you also release moisture from the substrate. That is a fact of physics. It can be made up for by adding more water to begin with, but now you're forced to figure out how much is going to be lost. That is beyond the reach of the new folks trying to learn so many other facets of the hobby. It's far better to tell them to NOT release pressure early to remove one more variable from the equation.

PRESSURE COOKING JARS - Jars should be inoculated as soon as possible after sterilization. I wish people would quit saying the jars need to cool past the point when they're cool to the touch. They do NOT stay warm on the inside of the jar longer than the outside by more than a few minutes at most. The water permeates every part of a grain or brf jar, and water is an excellent heat transferrer. If the jar itself is cool to the touch, then the insides will be also, and that includes the middle. Think about it. If you have a cup of coffee get cold from sitting out too long, it isn't still hot in the center.

NO NEED TO SIMMER - LOL the soak / simmer thing is something we all go through. My experience with "simmering" grains almost always led to mushy - sticky grains & on occasion - wet spot contamination - in jars. I prefer WBS because of its low cost & availability - everywhere. No simmer is necessary with WBS. Just experimenting around, I have supplemented WBS spawn with rye (5 % per batch), rape seed (5%) & cracked corn (5%) & had great results.

PCING GRAINS - PC'ing does not remove water from the grains unless you screw up and pop the weight off at the end of the cycle to let steam out. In addition, grains prepared on the dry side will colonize much faster than wet grains.

BURSTED KERNALS - Attempting to make your mycelium colonize busted kernels is like trying to get your car to drive cross-country on two flat tires-possible, but not recommended for good performance and speed.

STERILIZING GRAINS - I recommend 120 minutes for quart jars of grains to take care of bacteria.

SOAKING GRAINS - If you soak overnight, with the soak beginning in hot tap water, you can boil the grains for an hour or two and the kernels won't bust. They also won't take on any more water. Once the kernel is saturated, it doesn't absorb any more, no matter how long you boil. After the soak, add hot tap water to the soak water if necessary to fill the kettle as full as you can before placing on the stove. Heat to boiling, and then after several minutes, pour the water off. Shake the colanders so the steam can evaporate off the kernels, drying them. That's the main purpose of the boil, besides killing the germinated bacteria before pouring it down the drain. It also gives the grains sort of a pre-sterilization prior to the PC cycle. Don't skip the gypsum. It's worth a trip to the nursery.

SOAKING GRAINS - I soak anywhere from 4 to 24 hours. It really doesn't make much difference. The grains are only going to absorb so much, so you'll never over-hydrate by boiling. After a few hours to overnight soak, I let the pot boil for five to ten minutes, then drain into the colander. The steam that evaporates off the grains will dry the outside while the water runs down the drain. If you'll toss the colander around with the grains a few times to make them steam off, they're ready to load in twenty minutes. Gypsum serves two purposes. It adds calcium and sulfur, both essential mushroom nutrients, and helps prevent the grains from sticking and clumping up.

SOAKING GRAINS - 18 / 24 hour soak is a must do thing. Long a soak as possible, so long as WBS doesn't ferment (smell very badly), sprout, or rot is best. No simmer needed. If you have some aged / leached / steer / horse manure around, either brew some into tea, or add softball size handful into a nylon stocking (doubled up - several times) & add cup of strained tea, or use nylon stocking bag - like tea bag & leave it in the soak & stir halfway through soak. Adds significant N to soak water, which WBS absorbs & myc loves. You will get bigger better - everything.

GRAINS COFFEE SOAK - Use weak liquid coffee to soak your grains AFTER rinsing them in hot tap water. Rinse before the soak, not after. Once you've soaked in water or weak coffee, bring the soak water to a boil with the rye in it. It's all described in the tek posted above, and also on the video. I've used coffee grinds in grains, but there's little benefit. It's better as a substrate ingredient.

GRAIN SOAK PEROXIDE - It would be a waste to use peroxide in the soak water for two reasons. One, you want the bacterial endospores to germinate and grow during the soak, so the pressure cooker can kill them. Two, peroxide breaks down very fast in the presence of organic materials, so it would likely do nothing at all anyway. It would be long gone by the time you boil.

GRAINS SOAKING - I suggest a bit of hydrated lime if you're soaking in weak coffee, due to the acidity of the coffee. Use no more than a teaspoon for 2 gallons of soak water. If you're soaking in plain water, skip the lime.

Use one tablespoon of gypsum per gallon of soak water, regardless of how much grains are in it.

COFFEE SOAKING GRAINS - Yes. Mix it weak. About half or less the normal drinking strength. Add it hot. Use hot water for the rinse and add hot coffee later. The heat prevents the grains from germinating during the soak.

GRAINS SOAKING - As I said above, it isn't necessary to use long soak times with rye or wbs. If rye is used/PC'd before it starts to ferment, I actually like the scent.

COFFEE SOAK - Yes. I add coffee to grains, partly to lower the pH. Mushroom mycelium grows fastest at pH about 5.5 to 6.5.

COFFEE SOAK - If you use too much coffee, it will actually slow down growth.

FUNGICIDES FOR GRAINS/CASINGS - I found no problems when using banrot, and the fruits came out normal. It seems I used 1 tablespoon of Banrot 40WP per five gallons of soak water, but that could probably be reduced. Banrot will prevent fungi spores from germinating, but doesn't affect mycelium. It also seems to prevent bacteria. I once left a freshly sterilized jar of rye berries exposed to the open air for half an hour or so, then closed it up and a month later, it was still contaminant free. However, good sterile procedure renders it unnecessary for grains, and while soaking casing material in it will prevent trich and cobweb, proper pasteurization and good air exchange will also prevent mold on casing layers. I prefer growing without chemicals and am generally an organic gardener. The Banrot experiments were simply experiments. Dried and crushed Rhododendron leaves will also help prevent trichoderma and cobweb in casing layers.

GRAINS - You boiled the rye, but not the millet? Then mixed the two? That gives you two different grains with different levels of hydration. Draining for an hour does nothing. All the water that will drain out from a batch of rye does so within 1 minute. The water that is stuck to the surface of the grains, will make them too wet later. You need to drain after the simmer while the grains are still boiling hot, so you can let the steam dry on the surface. Avoid busted kernels at all costs. None is best. If you have more than just a few, do the batch over. If you've soaked, beginning in HOT tap water, there should be no busted kernels after boiling because they will have softened up. Did you leave the stove on high during the process? If so, your jars probably puked out all the moisture that was in the grains. You're supposed to turn down the stove as soon as the weight rattles. Turn it down so the weight either doesn't rattle at all, or rattles once every few minutes at most. Every time the weight rattles, moisture leaves the PC, and a corresponding amount of moisture leaves each jar of grains. That is basic physics.

GRAINS PREPARATION - One of the secrets of grain preparation, regardless of which grain, is to rinse the kernels very well before continuing with whatever preparation tek you're going to use. All grains get packaged with a lot of chaff and grain dust that if not rinsed out will cause the grains to stick together later and cause that sticky goo. Put your dry grains in a large kettle and fill with water as you stir it around. You'll see all the dust and other crap come floating up. Slowly dump out the water to get rid of the junk and repeat two more times or until the water pours off clear. Adding gypsum is also a great idea. It will take anyone a few tries to get the moisture content right, regardless of which grain or which tek you follow. If it's too wet this time, make adjustments next time, and so on until you work out your system.

GRAINS - The biggest reason for clumped up grains is the failure to rinse properly BEFORE soaking/simmering/sterilization. Rinse the dry grains so the dry chaff and dust and other debris can rise to the top and be poured off. Give two or three rinses and your grains will be clean and free of the dust that behaves like glue later. The second biggest reason for clumping is failure to use gypsum. If the grains are properly rinsed, and gypsum is added, they will NOT stick together later, even if you let them sit in the pc until they reach room temperature.

GRAINS - I strongly disagree with mixing vermiculite in grain jars. If you have excess moisture, it will soak it up. If you have the correct moisture, it will screw it up by making the grains too dry. The trick is to learn to get the right moisture content. Grains should be totally dry on the surface before loading jars. That's all. It's simple. The moisture inside the grains is what you want. Either use a towel to dry after draining, or drain the grains after a simmer, and toss them around in the strainer so the steam can dry the surface.

GRAINS - Make sure if you get rye from a feed store that it hasn't been treated with fungicides if you plan direct inoculation with spores. Many times, feed grain is treated with fungicides to prolong storage life in damp barns. If you inoculate with agar wedges or LC, the fungicides won't hurt because they only stop spores from germinating. Personally, I only use certified organic rye berries, obtained from a health food bulk supplier. It costs me $8.75 for a 25-pound bag, but it's worth the extra cost, imo.

GRAINS PREPERATION - As said above, prepare you rye properly and don't dilute it with vermiculite. That's a bogus tek to help beginners get away with being sloppy. In addition, because the vermiculite soaks up the excess water, you never learn to prepare grains properly. It's sort of like never taking the training wheels off your bike. They'd look pretty silly on a Harley someday.

GRAINS - 99% is not 100%, and you have no idea if the center of the jars was colonized or not. Uncolonized grains exposed to air = contamination. They should not smell earthy; they should smell like fresh mushrooms. The earthy smell in grains indicates trichoderma or other molds, so there's always the possibility they were already contaminated.

GRAIN WATER CONTENT - It's because fungus grows better on damp things than on wet things. The grains aren't really dry when properly prepared, they just 'look' dry. That allows the most amount of air in the spaces around the grains, thus favoring the mushroom mycelium over bacteria, which prefer a wetter, more anaerobic environment.

GRAINS - It's normal to see what appears to be uncolonized grains where they are pushed up tight against the glass. If that's all it is, they're good to go. Also, sometimes there's foreign material in the grains, so you might even be looking at a small rock or something.

PREPARING GRAIN - I boil in the water they soak in. The main reason for that is to kill off the live bacteria in the soak water before you pour it down your drain. The soak water can make for a pretty stinky kitchen sink drain if you don't boil it before pouring off.

GRAINS - Also, dumping grains into already boiling water as shown there is a mistake that often leads to burst kernels. Grains should be placed in cold water and slowly brought to a boil, or preferably soaked 24 hours to hydrate.

GRAINS - What causes spores to clump up is all that grit, dirt, and dust in their if you don't soak.

CASING/FC/CO2/HUMIDITY/CAKES/OUTDOOR/SOAKING/MISTING

CASING - A casing should be a non-nutritious top layer that is placed over a colonized substrate to help induce pinning and to supply moisture to the substrate and the developing fruits. You can use others with nutrition but it's best not to as this will cause overlay if your not careful. A casing of 50% Peat Moss, 40% Vermiculite, 10% Coco Coir is something called CAC' which some commercial growers use. This is fine but once again you have to watch it or it can colonize the casing for being nutrition and what's the point of a casing if it fully colonizes? With uncased substrate, wait for full colonization, and then place in the fruiting chamber. Try to keep humidity at 99%, since uncased substrates should be treated as cakes. Remember, when using a casing layer, we keep the humidity a bit lower to allow some evaporation from the casing, which is replaced by daily misting. A piece of wax paper layed loosely over the uncased substrate will help produce a micro-climate conducive to fruiting, but remember that even though it helps, wax paper is no substitute for a genuine casing layer. Incubate until you see mycelium coming up through about 20 to 30 percent of the casing layer. Sprinkle fresh casing material over that mycelium which is showing (That's what we call patching) and place in the FC. The best casing mix is 50% Peat, 50% Vermiculite, 10% gypsum, Teaspoon per cup of peat of Hydrated Lime. Mix the dry ingredients very well, then slowly bring to field moisture level and pasteurize. Also you can use jiffy mix as all it is Peat/Vermiculite/Lime treated but I see it less valuable as just making your own buying a block of peat moss/vermiculite/hydrated lime/gypsum and not having to deal with other shit or pasteurize. Sunshine Mix #3 also works though. The reason we use lime is to raise the pH and to make the casing layer inhospitable to competitor fungi, which are less tolerant of a high pH than established mushroom mycelium. Gypsum is not used to change pH. Gypsum contains both calcium carbonate and sulfur, thus it tends to keep the pH near neutral, preventing swings as the metabolites try to push the pH down. Calcium

carbonate or hydrated lime is not used to counter the effect of the metabolites. As said above, that's what the gypsum does. Use gypsum on substrates such as compost or horse manure, but don't use lime. Save the lime for the casing mix, where you should use gypsum and lime together. Gypsum is added to help keep the kernels separated after sterilization and to provide calcium and sulfur, basic elements promoting mushroom metabolism. Using both these will keep contaminants at bay. What you want is a short term (Hydrated Lime) because the life of a casing is measured in weeks instead of months or years. Use hydrated lime to get the ph right at the start, and use gypsum at a rate of ten percent to the peat in your casing to prevent ph swings later. Pickling lime is hydrated lime. It's my favorite, and many commercial grow operations DO use it. Don't use limestone; limestone is for long-term use, such as in a garden. Casings, which flush for a month or so, do not need long-term ph adjustment. They need short term, therefore hydrated lime is what you would want to use. The most critical time for contaminants to enter a casing is during the initial colonization and first flush stages. Once the layer is fully colonized, it's very contaminant resistant. This is why we use Lime/Gypsum. A common contaminant that occurs in casings is the 'Cobweb Mold' which isn't toxic just very annoying that thrives in old stale air. You can melt this using 3% peroxide over the casing. It will not hurt the casing one bit; it's just annoying because you have to keep on it. Don't go easy spray as much as you can. Not in the one spot! Spray the entire casing. Bacteria in a bulk substrate are not a contaminant. Commercial mushroom farms toss out any fruits that have bacterial blotch growing on the fruits themselves. However, having bacteria present in the substrate is not a cause for concern, and in fact many agaricus species won't fruit at all from sterilized substrates. Casing layers are not pasteurized in commercial mushroom production in order for the casing to have a high microbe count. NEVER keep a terrarium or other grow tub sitting on the floor. Get a table or shelf to put it on. Over 90% of the contaminants in a room are within a foot (1/3 meter) of the floor. You can tell when your casing needs a mist by looking carefully at the cakes or casing layer. Allow them to dry slightly, then mist lightly. After a few grows, you'll be able to instantly tell when a project needs to be misted. You don't want them to dry completely out, or get waterlogged. Rhizos on top are a good sign. Let them grow. Knots form later. We using 'Perlite' in our casings because perlite works not by holding water, but by preventing clumping and providing lots of air pockets in the layer itself, which stimulates primordia. By mixing perlite with vermiculite, you get the best of both worlds... moisture retention in the vermiculite, and air retention in the perlite. Ph balancing isn't necessary unless you add peat, which isn't absolutely required for cubes. Just don't try to grow agaricus or other edibles without peat in the mix, because they won't pin. If you're going to case substrates, you want the humidity no more than 90%, with 80% being ideal. Too high a humidity is a major cause of weak or no pinsets on cased substrates.

CASING - You don't need alcohol, peroxide, heat treatment, bleach or anything else on the perlite. Just rinse, and then drain well. Leave no standing water. There is nothing sterile about a fruiting chamber. FC
Having a slightly acidic casing layer PH will not cause side pinning. Sure, you can mist with a bit of baking soda or hydrated lime in the water if you failed to balance the casing layer PH first, but as I said, that isn't the problem. An acidic casing layer will favor trichoderma and other molds, while mushroom mycelium is more tolerant of basic PH. This is the reason we use lime. As the mycelium colonizes the substrate, the metabolic byproducts produced begin to swing the PH lower. By the time pinning starts, you have a near neutral substrate, which is what you want.
Casing layers pin on the sides for several reasons, but most important to remember, they pin there when that's the best environment for them to form primordia. The crease between substrate and tray is a perfect microclimate. It's nice and humid down there and there is plenty of moisture for the substrate to work with. It's also protected from the spray from the mister, which will damage developing primordia if they get sprayed and are allowed to remain wet. When the mycelium is actively reaching/colonizing the top of the casing layer, back off on misting. A sheet of wax paper can be layed on top to hold in the microclimate you're looking for. It helps to wrinkle it up into a ball, and then spread it out again before laying on top of the casing. These wrinkles will ensure there is plenty of air circulating under the wax paper, while at the same time holding a high humidity level in your mini-environment under the wax paper.
It's normal for the substrate to shrink. It's more than loss of water because the mycelium is actually eating the substrate; therefore it naturally gets smaller over time.
At this point, I do not recommend liming the casing layer. You're trying to make it pin, not suppress trichoderma or other molds. If it only pins on the sides, you can be assured they'll grow into monsters. I doubt your total yield will be very much less, although it doesn't look as cool as a wild flush that hides the entire casing layer beneath a forest of mushrooms.

CASING - Exactly. Peat based casing layers should be pasteurized, not sterilized. It does no good to say something doesn't perform well if you don't follow proper procedure in making it. As I've said many times, the commercial growers have invested millions of dollars into research on ways to maximize crops. We can learn a great deal from them, and then expand on that knowledge. Edible and medicinal mushrooms with few exceptions are exponentially harder to grow then cubensis, so learn from those who are already at the next level. Growing cubes can be looked at as a way to learn mycology and then move on, or it can be looked at as a way to get some cheap drugs. Those who follow the latter are here today, freaked out by a trip and gone tomorrow. That's why there is such a huge turnover on this and other boards. Look at growing cubes as a way to 'learn the ropes' and then move to harder and more rewarding species. When you do that, the small things such as casing layer composition become much more important to get just right. Many species won't even fruit at all on a sterilized casing layer. Cubes will fruit, but poorly compared to how they fruit on a properly balanced, pasteurized casing layer, applied over a properly balanced, pasteurized bulk substrate.

FUNGICIDES FOR GRAINS/CASINGS - I found no problems when using banrot, and the fruits came out normal. It seems I used 1 tablespoon of Banrot 40WP per five gallons of soak water, but that could probably be reduced. Banrot will prevent fungi spores from germinating, but doesn't affect mycelium. It also seems to prevent bacteria. I once left a freshly sterilized jar of rye berries exposed to the open air for half an hour or so, then closed it up and a month later, it was still contaminant free. However, good sterile procedure renders it unnecessary for grains, and while soaking casing material in it will prevent trich and cobweb, proper pasteurization and good air exchange will also prevent mold on casing layers. I prefer growing without chemicals and am generally an organic gardener. The Banrot experiments were simply experiments. Dried and crushed Rhododendron leaves will also help prevent trichoderma and cobweb in casing layers.

PEAT MOSS CASING - You seriously need to read and study and not start a thread for every single question that pops into your head. The members can help answer what you don't understand AFTER study, but this isn't a place to learn everything. Commercial growers use buffered peat and NO vermiculite as casing. Their income depends on growing as many mushrooms as they can for the money they spend to grow them. Do you really think a multi-billion dollar industry is just throwing money away? Read, search and study. ALL the questions you're starting these threads lately for are already answered in detail, and available by a simple search, which is faster than typing a question. Those who know these answers are sick and tired of typing the same stuff hundreds of times, over and over again, and aren't going to do it anymore. Those who don't know the answer will make something up just to take a wild guess, and the disinformation continues...

BULK SUBSTRATES CASING - Thicker substrates cause a lot of problems. Layering will give faster colonization with less damage to your spawn than mixing. You'll have more success with thinner substrate layers. Don't even attempt a six or seven inch thick horse manure substrate. They will heat up, and also have the tendency to go anaerobic in the core, leading to contamination. You'll get far more bang for the buck with two trays of 3 inch substrate layers than one tray with 6 inches. Horse manure fruits very well uncased. A properly made peat/vermiculite casing layer will increase yields, but is by no means necessary.

UNCASED/CASED FC - With uncased substrate, wait for full colonization, and then place in the fruiting chamber. Try to keep humidity at 99%, since uncased substrates should be treated as cakes. Remember, when using a casing layer, we keep the humidity a bit lower to allow some evaporation from the casing, which is replaced by daily mistings. A piece of wax paper layed loosely over the uncased substrate will help produce a micro-climate conducive to fruiting, but remember that even though it helps, wax paper is no substitute for a genuine casing layer.

CASINGS - Primordia form in 99% humidity, and rarely in less. A casing layer can help to keep humidity at the surface of the substrate at 99%, even though the air in the fruiting chamber might be lower, therefore they allow for more sloppy technique. However, with less than upper 90's percent humidity, the casing layer dries out fast at the recommended level of air exchanges, defeating the purpose unless you mist heavily a few times daily. That's why I recommend 99% humidity for all growing, regardless of whether one cases his substrate or not.

LYSOL MUTATIONS - I want to scream every time I hear that. It's wrong. Lysol doesn't cause mutations. I can only catch it so many times, and this Lysol/mutant myth is spreading like a damn virus. Your new homework assignment is to spray Lysol near (not on) one of your fruiting cakes and report the results. Lysol is

mostly alcohol and isn't good for mushrooms, but using it in the room isn't going to cause mutations. I spray the face of my flow hood with Lysol prior to transfers, so it's always blowing on something.

CASING - Mycelium needs light for much more than for the mushrooms to 'know which way is up'. Upon full colonization and a reduction in CO_2 levels brought about by increased FAE, light becomes an important pinning trigger, and must be bright enough to penetrate the casing layer so that hyphal knots can form from deep within the casing instead of just on top. Dim light will produce 'some' pins, but if you want one of those wall-to-wall flushes, use bright light. I hope this helps clear up any confusion.

CASING - Agaricus farmers use peat without the vermiculite, while people growing cubes tend to mix peat and vermiculite. There's a reason for this. Agaricus fruits at ten to twenty degrees cooler than cubensis in very low light. There is far less evaporation of moisture from the casing layer at lower temperatures, thus the reservoir effect of vermiculite is not as necessary. For a given volume, vermiculite holds more moisture than peat, thus combining the two results in a compromise that favors fruiting in warmer conditions.

CASING/CAKES - You pick the fruits that are ready to pick and leave the pins. The easiest way to re-hydrate a bulk substrate that is dry is to pour water around the edges of the tray so that the substrate floats a bit. Leave it overnight and pour off the excess water. Mist the casing layer well. Never pick the pins because it's common with many species to set pins for the first few flushes at the time of first flush. These pins remain dormant until their turn comes. If you pick them, you ruin future harvests.

CASING PERLITE - Perlite works not by holding water, but by preventing clumping and providing lots of air pockets in the layer itself, which stimulates primordia. By mixing perlite with vermiculite, you get the best of both worlds …moisture retention in the vermiculite, and air retention in the perlite. Ph balancing isn't necessary unless you add peat, which isn't absolutely required for cubes. Just don't try to grow agaricus or other edibles without peat in the mix, because they won't pin.

CASING LAYER - A casing layer allows us to be a bit sloppier on conditions. For example, if you have to leave for work every day for 10 hours or more, a casing layer will protect your substrate while you can't be there to mist. If you can hang around and babysit your crop, it makes little to no difference. Note this applies to cubes only. Other species fruit poorly or not at all without a casing layer, and many edibles won't even fruit on a pasteurized casing, it must be untreated.

SPORE DEPOSITS ON CASING - Heavy spore deposits do tend to hinder future flushes to some extent, but not to the point they describe. You don't need to leave them attached to the casing until you have a black mess everywhere in order to make prints. Pick them as the caps flatten out, but before they go crazy dropping spores. I have several totally sporeless strains. They're the way to go. Culture slants last for years in the refrigerator, making prints unnecessary.

LAYERING VS MIXING CASING - It seems to make sense that mixing would give faster colonization, but my experience is the opposite. By layering, the mycelium on the grains recovers and knits together, and then rapidly takes off and colonizes the rest of the substrate. In addition, since mixing 'can' damage the kernels, and a broken kernel is a prime site for contaminant spores to germinate, layering has the added benefit of less trauma to the spawn medium.

CASING - Bacteria in a bulk substrate is not a contaminant. Commercial mushroom farms toss out any fruits that have bacterial blotch growing on the fruits themselves. However, having bacteria present in the substrate is not a cause for concern, and in fact many agaricus species won't fruit at all from sterilized substrates. Casing layers are not pasteurized in commercial mushroom production in order for the casing to have a high microbe count.

CASING CONTAMINANT COBWEB - The most common contaminant during the fruiting stage is cobweb mold, but it's caused by lack of air circulation and exchange. The more you lift that lid and fan the better. There should be no dust. Wipe it off the top first, and of course, NEVER keep a terrarium or other grow tub sitting on the floor. Get a table or shelf to put it on. Over 90% of the contaminants in a room are within a foot (1/3 meter) of the floor.

MUTANTS - Mutants are pretty common. It wouldn't be from mixing B+ and TC. The mycelium only cares about A and B mating types, not the name somebody wrote on the syringe or print. You may end up with separate zones of each 'strain' or you may end up with a cross, or somewhere in between, but it won't be a hybrid since they're the same species anyway. Either way, it looks like not a half bad pinset you have started there...

CASING - A 'casing' is simply a non-nutritious top layer that is applied over a substrate in order to supply moisture and an environment that is conducive to primordia formation. It should not be used as a synonym for a tray, substrate, or total project. The purpose of a casing soil is to provide moisture and also to provide lots of little air pockets with high humidity to stimulate primordia formation.

FLUSHES BULK SUBSTRATES - True, but in that same time you could have replaced that with a fresh one and got started on another 80% of either 100 or 250, increasing your total yield considerably. It really doesn't matter with hobby grows anyway, but in the commercial field where yield per square foot makes the difference between profit and going out of business, it counts.

LAYERING CASING - I strongly recommend against leaving any grains on top of a substrate, exposed to air. If the grains dry out and the mushroom mycelium weakens, they become the perfect place for molds to start. Many growers get away with it, but the contamination rate will be higher over time. Grains should be covered with at least a very light layer of substrate, imo.

PERLITE CASING - Actually, perlite works very well in casing layers. It can't be used well in pf cakes, but in casing layers it helps to break up the peat and provide lots of O_2 in casing layer, which stimulates pins. Of course, peat moss can be used without any vermiculite or perlite at all. Just lime to balance Ph, and use gypsum at ten percent by volume of the amount of peat.

CASINGS FC - A layer of vermiculite under the substrate is counterproductive. I recommend against it. Some beginning growers do it so that if they over mist, the vermiculite soaks it up. However, if you fail to overwater, the vermiculite draws moisture from your substrate. The vermiculite on bottom can also cause the mycelium to pin there instead of on the top where you want it to.

CASING - It's very common for the mycelium to try to colonize the sides of the tray above the substrate line, especially if condensation is present, which I'm sure it is with your heater. Your fruiting chamber should be kept at normal room temperature, not heated. If it's too cold in your house, run a small space heater in the room, not the terrarium itself.

OVERLAY CASING - Overlay is matted, nearly dead mycelium. Full colonization, even if 100%. Overlay is matted, overgrown mycelium that makes the casing layer impervious to water absorption. A bit of rhizomorphic mycelium on the surface is ok. It's what produces primordia. Patch if you want to, but if you have primordia showing, don't.

OVERLAY CASING - Overlay is the condition that results when mycelium has been allowed to completely cover the casing surface. It is caused by prolonged vegetative growth temperatures, high CO_2 levels, and excessive humidity. If overwatered, the overlay will become matted, or, will form a dense, dead layer of cells on the casing surface.

CASING - I've been saying unpasteurized casing material works better for years, but it's heresy around the OMC where half the growers PC their casing material. Chances of Dactylium mold contamination are higher with an untreated casing layer, but if one can manage proper air exchange, results are superior, ESPECIALLY with cubensis.

CASING - Use gypsum at up to ten percent of the peat. Don't count the perlite and/or vermiculite. Test it with pH strips, and adjust with hydrated lime as necessary to get a starting pH of 8. When they say it has lime added, it means to make it right for plants, which generally like about 6.5 pH, which also happens to favor trichoderma.

CASING - You apply it to your fully colonized substrate and cover it up. You then place it on a shelf out of the way, at normal room temperature for a few days. When the mycelium pokes through a few days later,

introduce to fruiting conditions. Read up on patching. It's optional, but does increase yield and pinset.

COLONIZING HIGH CO_2 - One benefit of a high CO_2 level during colonization is that less of the actual carbon in the substrate is converted to CO_2 gas. In other words, if you allowed too much fresh air during colonization, more of the substrate would be 'consumed' by the time the mycelium got to the fruiting stage.

CASING - I would look for a mix without fertilizer if possible. It really won't hurt your fungus, but it could stimulate algae. The chemical plant food won't feed the mushroom mycelium or contaminant molds, but for my grows, I'd prefer to keep it away. I don't even use that stuff on plants.

CASING/JARS - Bear in mind, a substrate on the dry side will colonize faster than an overly wet one, so if your jars didn't colonize, something else might be wrong. It's also a good idea in a dry climate to run a humidifier in the room your grow is located to raise the ambient humidity.

VERMICULITE CASING - Actually, vermiculite can provide moisture to support a flush, but it doesn't fit the definition of 'casing', a term which is tossed around and abused fairly loosely. Furthermore, cobweb mold LOVES plain vermiculite, which lacks the beneficial organisms to fight it off.

COLONIZING MANURE - Leave the substrate loose and airy. I like to add a touch of vermiculite to manure for that purpose as well. A slightly dry substrate will actually colonize faster, so I don't think that's the problem. I make mine dry on purpose, and then dunk before first flush.

COLONIZATION SPEED - Nobody can answer that. There are too many factors besides strain that go into pinning. Also, there's no 'strains' that just colonize slower. Colonization speed is related to substrate moisture level, preparation, gas exchange, amount of inoculants, etc.

CASING - What you want is a short term (Hydrated Lime) because the life of a casing is measured in weeks instead of months or years. Use hydrated lime to get the ph right at the start, and use gypsum at a rate of ten percent to the peat in your casing to prevent ph swings later.

CASING - You don't finely grind up casing layer ingredients. The courser it is the better. It's important for air to be able to penetrate the entire casing layer. A few small pieces of debris in the peat doesn't hurt a thing. I never remove them. That's the reason we pasteurize.

CASING - You want upper ninety to near 100% humidity with lots of air exchange. Misting is required. Even at 99% humidity, the proper amount of air exchange will dry your casing layer (which is a pinning trigger), thus you need to mist to replenish the moisture.

COLONIZING - In addition, colonizing mycelium as agar pointed out, generates its own heat. The process is called thermogenesis. I've seen up to a fifteen degree F increase in substrate temperature over ambient air temperature with manure-based substrates.

CASING - It sounds like the substrate and/or casing layer might be too wet. After awhile, you can get a feel for when a bulk sub needs water by picking it up and judging the weight. You can actually develop a very accurate feel for moisture content this way.

CASING - It looks fine to me. The substrate is supposed to shrink. It's being eaten. It will pin in a few more days, and it's ok to keep the humidity up. You don't need to reduce it until after the pins turn into small mushrooms. Until then, 99% won't hurt a thing.

SLOW COLONIZATION - The biggest causes of slow mycelium growth are a too wet substrate, and not enough gas exchange. Make sure the holes on your jars are open. If your substrate is too wet, there's not much you can do except fix it on the next batch.

WHY CO_2 LOW AND HIGH FC AND COLONIZING - If the CO_2 levels are too low during colonization, the mycelium will consume more of the substrate. By keeping the CO_2 levels high during colonization, we save the mass of our substrate to support the flush.

CASING VERMICULITE - Contaminants will easily germinate on damp vermiculite, and then spread their mycelium to your substrate below. The vermiculite barrier works in pf jars because it's dry. In addition, nothing 'wicks' contaminants, vermiculite or no vermiculite.

CASING - A 'casing' is a non-nutritious top layer that is applied over the fully colonized horse manure in order to supply moisture to the substrate below and to provide an environment suitable for pinning. A casing layer is optional with cubes.

MIXING - Often, they'll combine into one strain, but you'll never know, because there's very little difference between the various strains anyway, PE and the albinos excepted. It would be a 'cross' not a hybrid, which is an interspecies mating.

SUBSTRATE DEPTH FC - Two feet of substrate would go anaerobic in the core due to no air getting in, and rot. 8" seems to be about the maximum you can go with consistent success, but it better be loose and airy if you're going that deep.

FC. CASING FC - Incubate until you see mycelium coming up through about 20 to 30 percent of the casing layer. Sprinkle fresh casing material over that mycelium which is showing (That's what we call patching) and place in the

CLUSTERS - Clusters vs. single fruits are strain related. Often when multispore inoculation was used, you'll see one on first flush, and the other(s) on second and later flushes. The reason is that different strains are flushing.

CASINGS - Mycelium on the caps is not an indication of too much humidity. It's a combination of two types of mycelium on the fruiting body. It's more genetic in nature, occurring in some substrains more than others.

CASING/CAKES - However, it's normal for the substrate to shrink. It's not just from drying, but from the mycelium actually eating the substrate, so it naturally gets smaller over time even if you dunk it.

CASING WHAT IT'S USED FOR - The CASING is the non-nutritious top layer that is placed over a substrate to help induce pinning and to supply moisture to the substrate and the developing fruits.

CASINGS - They do shrink, but not typically on first flush. If this is first, they could be dry. Pour some water around the edges, then after a few hours, dump out any water that hasn't been absorbed.

CASING - However, it's normal for the substrate to shrink. It's not just from drying, but from the mycelium actually eating the substrate, so it naturally gets smaller over time even if you dunk it.

LATE CASING - Never add a casing layer after pinning starts. It leads to contamination under the casing layer, and also causes the pins that have formed to abort in many cases.

BETTER LAYERING BULK - If you spawn in layers, the spawn layer recovers very fast which then makes it resistant to contaminants as it colonizes the layers of manure.

CASING/SPAWNING - Contamination prior to first flush indicates your spawn was contaminated. Mold mycelium is white, thus you didn't notice it until sporulation.

CASING - It works great. It's just a bit spendier than buying a block of peat and a big bag of vermiculite. Sunshine mix #3 also works well. Don't forget to pasteurize.

CASING - Flush - It can either pin at will or once you see that the flushes are giving off continual harvests and the mushrooms look more haggard, it's done.

CASING RATIO - You can leave it uncased. I wouldn't go 1:4 with that. Stick to 1:2 or 1:3. Horse manure does fine at 1:4 and straw can be done at 1:10.

FREEZING CASING - No. Freezing will squeeze the moisture content out. Pasteurize tonight, then use tomorrow without freezing or nuking.

SPORES/CASING - Spores won't germinate on a fully colonized substrate. Harvest just before spore drop for best quality fruits though.

CASING - If it's waterlogged, the fruits will be small and rotten. If it's too dry, the fruits will be dry, cracked, and hard, plus small.

CASING - Vermiculite by itself is the poorest choice of a casing material. It's barely better than no casing at all.

CASING - If you wait until the mycelium is all over the top of the casing, then what is the use of the casing?

COBWEB ATTACK - 3% peroxide straight from the bottle in your mister will melt cobweb mold on contact.

CASING - Add 10% coir to your casing mix. That is somewhat like CAC'ing that some edible growers do.

CASING - Most often, if a cased substrate smells of alcohol. Some fermentation has, or is taking place.

CASING - Casing layer moisture content is critical; so don't leave it to a machine to figure out.

SUBSTRATE CASING - Substrate = Layer in which mushroom MYC feeds from.

CASING - Rhizos on top are a good sign. Let them grow. Knots form later.

WHY OVERLAY CASING - A dry casing layer causes overlay.

CASING - Casing layer = Layer on top, holds moisture.

PF TEK FC - Fine vermiculite holds more moisture per volume of measurement than course vermiculite; due to they're being more of it. The basic formula of 2-1-1 works great with fine or medium vermiculite, but if you're using course vermiculite, you might want to cut down a bit on the water. I've found that cakes as well as grains, and even bulk substrates colonize a bit better and faster if made up on the dry side. With cakes, it's easy to adjust the water down, and then simply do a dunk and roll at birthing to put the moisture in for the flush at that time. If the first batch comes out a bit too wet, simply reduce moisture by 10% to 20% on the next batch until you find the sweet spot. I'd still recommend the occasional fanning. You simply can't have too much air exchange, and the turbulence from fanning helps prevent trich from getting a foothold on your projects. Good luck!

PF CAKES - It's up to you if you want to roll in vermiculite after the second flush. If there's still vermiculite stuck to the cake, then it can do its job of absorbing water and supplying it slowly to the mycelium over time. If the mycelium has fully colonized the first batch of vermiculite you rolled in, then go ahead and roll after the second dunk. The idea is to have some uncolonized vermiculite on the sides and top of the cake to absorb water and act as a reservoir for the mycelium. 24 to 36 hours if fine for dunking depending on how much moisture the cake needs to absorb. If they're really lightweight, meaning they've dried out, then dunk longer. If they feel heavy, then they don't need to dunk as long. You don't have to worry about drowning them. They could survive weeks under water if they're in the refrigerator.

HYDRATING A CAKE - There's lots of ways to hydrate a cake. Dunk and roll is my favorite method. You're actually hydrating the individual mycelium cells, so it's a good idea to push the cakes a few inches under water so there's a bit of water pressure on them. Remove after 24 to 36 hours and roll in dry vermiculite, which is then heavily misted after being placed into the FC. Another method is to pile up vermiculite as deep as you can on top of the cake and keep that saturated. Another is to set the cake in a saucer of water. The straw method also works. These last methods are fine during a flush. Between flushes or prior to the first, I'd still suggest a dunk and roll. Mushroom farmers have been soaking substrates in water to rehydrate them for at least a thousand years. It's the time-proven method.

REHYDRATING A CAKE - You can also simply use your finger or a sharpie and make a small hole in the cake when you originally mix it and fill that with vermiculite. Then, simply pour water into the reservoir when the cake starts to dry out. Either way, don't keep the cake wet all the time or it will waterlog. Hydrate it, and then

allow it to dry out a bit before wetting it again. If you dunk and roll prior to first flush, and then dunk between flushes, the straw tek isn't necessary.

SOAKING CAKES - I've seen pf type cakes survive two-week dunks in the refrigerator. I've also seen master slants under water survive two or three years in the refrigerator. You shouldn't dunk in the jars. It takes pressure to hydrate the mycelium. Dunking isn't hydrating the substrate, which is fully colonized. Dunking is to hydrate the individual mycelium cells, which takes time and a higher pressure outside the cell wall than inside (osmosis) for hydration to occur. Dunk in a large kettle or bucket, etc., so the cake can be pushed completely under water, thus providing the pressure required. Soak the cakes in this manner for 24 hours.

CASING/CAKES - Allowing a substrate to consolidate its hold on the substrate before introducing to fruiting conditions is good practice. By digesting more food before fruiting, better quality fruits are produced. Other than that, there are no known ways to readily increase potency in substrates. There's lots of talk about tryptamines, etc., but the claims of increased potency can't be independently repeated. I believe from my many experiments with hundreds of substrates and additives that potency is genetic. If your mycelium has enough food to produce mushrooms, it has enough food to produce the active ingredients as well.

PF CAKE FC - Place the cakes in the terrarium so that what was the top of the jar is now the bottom. The reason is the bottom of the jar is concave, thus it leaves an indentation on the bottom of the cake. This makes a nice 'bowl' to hold moisture later when it becomes the top and is filled with vermiculite. You can actually pour water directly on top of the cake, saturating the vermiculite in this 'bowl' and it will slowly hydrate the cake, supplying moisture for the flush. It's OK if mushrooms grow from the bottom of the cake. Just let them grow. They pick their own favorite place to pin, so don't mess with them.

PF CAKES - Stamets also explains the idea of consolidation in his books. It's not necessary with grains if you're going to be spawning to bulk or using for grain-to-grain transfers, but you do need to wait for full colonization. However, with pf cakes and other bulk substrates, it helps to wait some time after full colonization before initiating fruiting conditions. Doing so results in more prolific flushes. Failure to do so with some of the harder to grow edibles such as P. nameko and Shiitake sometimes results in no flush at all.

CONSOLIDATION PF CAKES - It isn't really necessary to wait for primordia to birth, but the idea is to give about a week after full colonization for the mycelium to digest some of the food it has just colonized. We call this process 'consolidation' and it makes for a much better pinset. Consolidation allows the mycelium to perform this process while still in the jars so they don't dry out before the flush. Those who birth right at full colonization often ends up with dry cakes by the time they flush, which reduces yields.

CASING/CAKES - You pick the fruits that are ready to pick and leave the pins. The easiest way to re-hydrate a bulk substrate that is dry is to pour water around the edges of the tray so that the substrate floats a bit. Leave it overnight and pour off the excess water. Mist the casing layer well. Never pick the pins because it's common with many species to set pins for the first few flushes at the time of first flush. These pins remain dormant until their turn comes. If you pick them, you ruin future harvests.

FC PF - The reason for waiting a week after full colonization is to allow the mycelium to consolidate its hold on the substrate. Until the mycelium digests some of the substrate it has colonized, it will not fruit. If you birth the day of full colonization, the week spent consolidating the hold, will be a week spent drying out the cake, thus making pinning harder and yields weak. If you wait a week after full colonization, pins often form within 48 hours of birthing/dunk and roll.

CAKES - Don't use distilled water for cakes, for all the same reasons you shouldn't drink it. Google it if you don't know what I mean. They contaminate much easier. Tap water is fine. For crying out loud, we've had lots of threads where people have dunked cakes in ten percent bleach, so the very small amount in tap water isn't going to hurt anything. Use tap, river, lake, spring, etc., but not distilled. Save your distilled water for making agar.

CAKES - A cake can only support a few mushrooms at a time, due to the size of the cake (substrate). If you get an awesome pinset on a cake, expect 80% of them to abort. Pick off the aborts when you pick the flush, but don't pick any pins that aren't black. Often, pins for the first two or three flushes set at the same time as pins

set for the first flush. Once you pick the first flush off and dunk, they'll take off and grow.

HUMIDITY CAKES - My terrariums have a dozen or more holes drilled into the bottom. The natural air currents, since air is drawn from cold to warm, cause air to enter the bottom of the terrarium, work up through the perlite while being humidified along the way, then into the terrarium and back out the holes above the substrate. This provides FAE without fanning, and 95% to 100% humidity.

PF CAKES FRUITING FROM BOTTOM - I'd leave them. They'll push out from the bottom. Often, water drains by gravity to the bottom of a cake. They pin there because that's the best environment, thus they took advantage. If you flip the cake, it might work or they might abort. If you do decide to flip the cake, place it in a saucer of water overnight and allow the cake to soak up some moisture.

PF CAKES - Any cake that hasn't pinned after two weeks should be dunked and rolled again. Keep them at 99% humidity and normal room temperature. Inoculate a few cakes with oysters and cook them up for the family in an omelet. Then you won't have to worry about kids. In my opinion, mom and dads bedroom should be off limits to kids anyway. At least, that's how I raised mine.

PF CAKES - I'd recommend removing the trays, and then raking your fingers through the perlite to fluff it back up. Set small blocks or pieces of pvc on the perlite to hold the trays elevated. You could also build a wire rack for the trays to sit on. However, keep up plenty of air exchange even with the holes, as normally the substrate trays evaporate enough to maintain pretty good humidity.

PF CAKES - I didn't notice that the first time. You should wait one full week after full colonization before birthing. This allows the mycelium to consolidate its hold on the mycelium. They will rarely pin during that first week anyway, so keeping them in the jars keeps them in the high CO_2 environment, where they also lose less moisture to evaporation.

FC PF TEK - Most jars are concave on the bottom so there's a small well in the bottom of the cake. Put it into the fc where what was once at the bottom of the jar is now the top of the cake. This little divot can be filled up with vermiculite, and then you can pour water onto it every day to keep the cake fully hydrated. That's the key to good performance.

PF CAKES - We wait one week after full colonization to allow the mycelium to digest a bit more of the food it has colonized, thus allowing it to consolidate its hold on the substrate. It won't fruit before this week passes anyway, so it's best to leave in the jars. After a week, birth the jars, dunk and roll, and then place into fruiting conditions.

HUMIDITY - Condensation on the sides is in no way an indication of high humidity. In fact, it's an indication that you have low humidity because your humidity has been stolen from the air to be deposited on the surface of the terrarium. What it indicates is a temperature differential between inside and outside the terrarium. Nothing else.

PF CAKES - After rolling in dry vermiculite, I hope you misted several times over the next few hours to fully hydrate the vermiculite. Don't mist the sides of the terrarium, as it does no good. Aim the mist up into the air and let it fall directly on the cakes. In fact, after the dunk and roll, aim the mister right at the cakes and soak them well.

FLOODING CAKES FC - What WILL flood your cakes is pumping from a humidifier AFTER the air is already at 100%. That's why I recommend three to five inches of well-drained perlite for a terrarium, and no mechanical humidifier. This way, if your humidity reads less than 95%, it means you need to calibrate your hygrometer.

FC PF - There should be ZERO standing water in the perlite. Having standing water relegates that perlite that is underwater useless. Rinse the perlite; drain well, and then place into the terrarium. Three to five inches of well-drained perlite will deliver 95% humidity, provided you've drilled those small holes into all six sides.

CAKES FC PERLITE - You're not supposed to let them sit on the perlite. It causes them to wick up water from below, and also to attempt to grow into the perlite. Put down a jar lid or something to separate them from

sitting right on the perlite so they won't become waterlogged. If they do, they won't fruit.

PF - You should NOT see condensation on the sides of the terrarium, especially with holes in the sides for air exchange. Condensation indicates one thing and one thing only: A temperature differential between inside and outside the FC. It does not indicate humidity in any way, shape, or form.

CAKES - This gives you a place to fill with vermiculite, which you can then pour water into in order to keep the cake hydrated during the flush. They'll fruit either way, but divot side up gives a nice moisture reservoir, to counter the small size of the cakes which often limits fruit size.

PF CAKES - If you used the dry vermiculite filter per the pf tek, you can loosen the lids with no problem. Don't move the jars around or turn them upside down or anything silly like that because it can cause the vermiculite filter to shift, allowing contaminants to reach the rice flour below.

PF CAKES - Moisture in a pf cake often drains to the bottom of the cake from gravity, thus pinning starts there. In addition, right against the perlite is the most humid microclimate, thus it encourages pinning. It's also the area that any perlite will stick to the cake simply by geography.

CAKES - Often, the mycelium will set way more pins than it can support. Since there's no way a pf cake can support 48 mature mushrooms, expect the majority to abort. Start really giving it a lot of water. You can put a pile of vermiculite on top of the cake and then keep it wet.

SOAKING CAKE - A member recently dunked his cakes for two weeks, thinking that putting them in water and then refrigerating was the best way to store them. Guess what? They survived and did just fine. I'd still recommend 24 to 36 hours max though.

CASING CAKES - Mushrooms depend on a LOSS of moisture from the substrate to fruit. If you saturate them, or keep a steady moisture level, they fruit poorly if at all. Mushrooms are not plants, which benefit from steady moisture levels.

CAKES/FC/HUMIDITY/PINNING - It should rise and fall. FAE will lower the humidity, and then you mist to replenish it. That's what you want. Evaporation of moisture from the casing layer or substrate is a major pinning trigger.

CAKES - Try to keep normal room temperature, and near 100% humidity. Mist as required keeping the vermiculite on the outside of the cake moist. Three or four light mistings per day are superior to one soaking.

CASING - Scratching seems to have benefits with button mushrooms, but in my experience, it does little to no good with cubensis. I tried it many times, and it seemed to set back progress every time.

PF CAKE - That slime is the reason I recommend to rinse the cakes well both before and after the dunk. Rinsing before the dunk helps prevent it, and rinsing after the dunk removes any that has formed.

CAKES DUNK AND ROLL - You're supposed to mist after the roll in dry vermiculite to get the vermiculite that stuck to the cake moist. Otherwise, the vermiculite will suck moisture from your cake. Yes, mist it now.

PF CAKES - Cakes often pin on the bottom because that's where the moisture runs to by gravity and also it's closer to the perlite, thus the humidity is higher and stimulates pinning.

CASINGS/CAKES - Since hyphal knots to primordia to pins takes at least two to three days, those pins formed because of what you were doing before you made the changes.

PF CAKES - I always add a tablespoon of gypsum to each multiple of the basic recipe of 2 cups vermiculite, 1 cup each of brf and water.

CAKES - People need to realize that a greenhouse isn't appropriate for pf style cakes because they require a very high humidity.

BRF CAKES - No water should squeeze out of BRF mix, no matter how hard you squeeze. Follow the recipe

next time.

CAKES - After each flush, allow the cakes to sit for a few days to rest, and then dunk for 24 to 36 hours again.

CAKE FC - With lots of pins without the correct moisture the excessive pins can drain a cake in no time.

GYPSUM PF TEK - In fact, I add a tablespoon of gypsum to the basic 1,1,2 pf recipe.

CO_2 - CO_2 will build up in a terrarium, whether or not holes are drilled into all six sides. The levels will be lower than they would be without holes drilled and/or fanning regularly, but will still be above normal ambient. With oyster mushrooms and lion's mane to name two species that are very CO_2 intolerant, you need to fan a few times per day, even when using my terrarium design. The point above is that even with 100 holes in the floor of the fruiting chamber/terrarium, CO_2 levels will still be elevated. The holes help, but don't make for maintenance free fruiting. In other words, gravity won't 'drain' the CO_2. I hope this clears up any lingering confusion. In addition, CO_2 is not the only reason we provide air exchange. The other important reason is that contaminants prefer stale air, while mushroom mycelium prefers fresh, moving air.

CO_2 - CO_2 doesn't 'sink to the bottom' or 'pour out like water'. It mixes with the air and raises the CO_2 content. CO_2 can be measured in the upper reaches of the atmosphere. If it all settled to the bottom (ground) it would snuff out life on earth. Therefore, you can't drain CO_2 out of your terrarium by holes on the bottom. Fans in a small terrarium will dry out the air. That's why your current cakes are blue. They're dry and stressing. You want natural circulation in your FC, near 100% humidity, and enough holes or fanning by hand to get the CO_2 out.

CO_2 - If CO_2 was heavier enough than air that it settled to the bottom, we'd all be dead from CO_2 poisoning on the surface of the planet. CO_2 mixes with the air. To get rid of it, you exchange the air in the terrarium. You can't simply drill a hole in the bottom and expect it to run out like water. CO_2 is found high in the atmosphere, not just at the surface. It's the same in your terrarium. In a completely airtight container, the CO_2 would sink to the bottom. Such is not the case with our growing containers.

CO_2 - CO_2 won't run out of holes in the bottom. It's widely misunderstood that CO_2 is heavier than air, and many growers think it will run out like water if only there's holes in the bottom. The fact is, the CO_2 mixes with the air inside the tub and raises its CO_2 content. You have to exchange ALL the air in the tub to get rid of it. I simply drill lots of holes in the fruiting chamber, and let nature take care of it.

COLONIZING CASING CO_2 - The 5K to 10K ppm levels of CO_2 are during colonization. The fungus naturally produces the CO_2 just as humans also produce it. The 300 ppm levels are what is optimum for fruiting, and you'll have to ventilate to get it that low. We don't supplement with CO_2, but rather have different strategies for getting rid of it, depending on the part of the cycle we're in.

CO_2 CASING - You want holes all around to create circulation. It's a myth that CO_2 settles to the bottom and needs to be 'drained' out. If that were the case, we'd all be dead from the CO_2 from the power plants, car exhaust, etc. sinking to the surface of the earth, but the fact is, CO_2 can be measured in the highest reaches of the upper atmosphere. It simply mixes in with the air and goes where the air goes.

CASING CO_2 - High CO_2 levels are beneficial during colonization. It prevents most of your substrate from being turned into CO_2. Without proper covering, up to 50% or more of the carbon in your substrate will be released as CO_2 gas by the mycelium. In addition, many competitor fungi can't thrive in the high CO_2 environment, thus it helps favor for mushroom mycelium.

CO_2 FRUITING - High CO_2 levels are another thing that causes pins to abort. Mycelium can form primordia in conditions that can't sustain a flush, so lots of air exchange is very important throughout the fruiting process.

CO_2 FC - 'Drainage' holes drain the CO_2, and you want the CO_2 high in the substrate and low on top of the casing layer because that stimulates pinning where you want it to happen.

CO_2 - Drill holes as described. CO_2 isn't enough heavier that it will 'drain' out holes in the bottom. You want

lots of holes so there can be constant fresh air.

HIGH CO_2 - High CO_2 will give long stems, but not huge caps. However, if you don't give any air exchanges, you'll grow nothing but green molds.

MUSHROOMS CO_2 - Tall, skinny mushrooms are indeed a sign of insufficient air exchange. Lack of light will also cause that.

HIGH CO_2 - Long, spindly stems are a sign of too high a CO_2 level, and green molds are a sign of insufficient air exchange.

HIGH CO_2 - Increase air exchange. High CO_2 levels cause stem elongation and small caps.

HOLES IN FC AND WHY - The holes in the bottom increase humidity. How? It's a development from something I learned working on the Alaska Pipeline project in the 1970's, helping to engineer the supports that are actually self contained refrigeration units that keep the tundra frozen even in summer so they don't shift, thus preventing the pipeline from rupturing. The supports require no electricity to operate.
The methodology is this: Air currents travel from high pressure to low. Heat expands the air, thus causing low pressure. Cold compresses the air, thus causing high pressure. The damp perlite is cold, so the air surrounding the perlite is our 'high' pressure. The substrates within a terrarium produce heat, as does the lights shining through the sides or top, thus the air in upper terrarium becomes 'low' pressure. This causes air to want to flow through the perlite and into the terrarium, but only if there is an entry point at the bottom for the air to be drawn in. The air, by natural convection passes through the perlite, absorbing moisture as it does. It then enters the terrarium, and is expelled through the holes above. This natural circulation provides FAE without fanning, while keeping the humidity higher than it would otherwise be.
I developed this over the last year, but am just now releasing it after a full year of testing; so don't look for anyone else beside myself to have used this system yet. It works. Oyster mushrooms still should be fanned a time or two per day, but every other species has done very well with this system with no fanning, and humidity maintains between 95% and 98% provided four to five inches of damp perlite are used. Smaller depths may work with smaller terrariums, but with the 106-liter terrarium I've posted pictures of, four to five inches is best.

DIFFERENCE BETWEEN AIR EXCHANGE AND GAS EXCHANGE - Gas exchange is when the gasses must percolate up through a vermiculite barrier or other filter to three or four small holes in the lid. The small filter on spawn bags allows for gas exchange. The very limited exchange that takes place allows the excess CO_2 to get out of the jars and be replaced by very small amounts of filtered room air. Air exchange is when we remove the lid on a fruiting chamber or run a fan in a greenhouse to forcefully fan the contents in order to blow out the stale air and replace it with large amounts of unfiltered room air.

FC/HUMIDITY/HOLES - I drill dozens of holes all over my terrariums, including the very bottom. The holes on the bottom actually increase humidity, while letting the CO_2 drain. The reason the holes on bottom increase humidity is because air currents travel from cold to warm, due to the pressure difference caused by the molecules being farther apart in warm air. The warm air in the terrarium causes air to percolate up through the perlite, wicking moisture as it passes through.

AIR EXCHANGE FC - Sure looks like too much substrate and mycelium for such a small container. I'd imagine the gasses build up in no time in something that small. You need three to five air exchanges per HOUR, not two per day. That's why I recommend drilling holes into all six sides of the terrarium. If you mist, and then close that thing up with the fruits wet, it's just one more example of the proof that doing so causes aborts.

FAE CONTAMINATES - The fact of the matter is, green molds can't survive in a fresh, turbulent air environment. They require stale, still air. That makes green molds fairly easy to control. All the sterile procedure in the world won't help once your project is in fruiting conditions. At that point, give fresh air and keep it moving. Green molds will still pop up from time to time, but they won't be devastating.

FAE - I have a couple dozen holes drilled into the floor of the FC as well, so any excess water from misting can drain out. The holes in the floor of the Rubbermaid also help to let the CO_2 seep out. Water doesn't evaporate well into CO_2, so getting rid of it helps the perlite work better, as well as stimulate pinsets.

FFAE IS THE WAY TO GO - In nature there is no fanning, there is constant, full air exchange which is what starts the chain reaction to pinning, so the more air you're providing via open air exchange, the better, farms don't use fruiting chambers they use huge trays in open rooms, as that's how they grow best.

FILTERED AIR - Best way for filtered air exchange in a TIGHT clean room, or grow room is POSITIVE PRESSURE. Meaning, pump in hepa filtered air in a volume much larger than the outlet. Which creates mild positive pressure. Enough that nothing wisps in, except what you carry on you.

FAE. KEEPING COBWEB MOLD AT BAY - You should have just hit it with a mild H202 mist - spurt. Then, or NOW increase your FAE. For Cobweb. Give it another spurt of H202, and then about triple your FAE. Plenty of FAE is the trick to holding cobweb at bay. It thrives, when there is little or no

FILTERING AIR NO REASON TO FC - Actually, polyfill is a filter, but there's absolutely no reason to use it on a fruiting chamber. If you have gnat problems, you can use window screen, which will allow much more air to circulate, thus lowering the risk of contamination.

FAE/FC - Just remember with small holes, it takes four times as many holes to equal twice the area. In other words, two 1/4-inch holes are not the same as one 1/2-inch hole. It would take four of them. It helps to bear that in mind. Good luck.

FAE - Four air exchanges per HOUR are recommended. I'd suggest fanning three times per day, and drilling a hundred or more holes in your terrarium to get you by between fannings so you can leave for work, play, etc.

FAE - Stamets recommends 4 to 5 air exchanges per hour. I try to give a bit more than that because in addition to getting rid of the CO_2, we're also trying to make an environment that is inhospitable for contaminants.

FAE - Correct. Nothing covers the holes. It's near my balcony where we keep the sliding glass door open all the time. The breeze from the open door helps with the FAE too, and the natural sunlight is a plus.

AIR EXCHANGE FC - We filter uncolonized grain spawn, but once it's fully colonized, there is no reason to filter. Air exchange is the key to contamination prevention in the fruiting environment.

FAE FC - Mushrooms like 3-6 COMPLETE FAE's an hour, which can't even hope to get near most of the time and if they do, it typically will cause a problem with over-Drying of the substrate.

FC AIR - There is no reason to worry about contaminants in your fresh air supply, because your cakes are already colonized. Stale air is much more of a threat than contaminated air.

CONTAMINANTS WITH FAE - All the FAE. The constantly circulating air outdoors gives contams little room to take hold of the patch. Unlimited FAE is the key factor.

FAE. FAE FC - You want about 4 air exchanges per hour if it's in fruiting mode, so watch your humidity as agar said and be sure to replace the moisture you lose to

MUSHROOMS WITHOUT FAE - Insufficient fresh air exchange leads to the long twisted stems, and poor lighting leads to very small caps.

PROBLEMS WITHOUT FFAE - The sign of high CO_2 is baseball bat fruits with fat stems and little tiny caps or long skinny ones.

FC - Air exchange in the fruiting environment will do way more for contaminant control than filtering.

FAE FANS - Fans are unnecessary, and tend to dry out the air too much.

FC FILTERING AIR NO NEED - You don't filter air to fruiting chambers!!!

FFAE - FFAE = Frequent Fresh Air Exchange.

FC - It all depends on the size of the FC. If you can maintain upper 90's humidity, then the more holes the better. Air exchange is the key to contaminant avoidance and good pinsets. However, if you over do it on the holes, performance will suffer if you can't keep up with good humidity. If you're unable to maintain humidity with all your holes, begin taping them up until you can maintain 95%. That will be the sweet spot. Many people also don't realize that if you double the diameter of a hole, you increase its area by four times. That means a 1/4" hole is four times as large as a 1/8" hole, and a 1/2" hole is four times as large as a 1/4" hole. You can dry out your terrarium in a hurry if you have too much. With this system, it also helps to run a humidifier in the room your terrarium is located, if you live in a dry or air conditioned climate. If your ambient humidity is in the 50% range, your terrarium will do much better than if it's in the 10% range.

FC - The fruiting chamber I designed has holes in all six sides. This results in convection and circulation. It is NOT a still air environment! The mushroom substrates produce heat, and also the lighting that shines through the fruiting chamber produces heat. These two produce convection. Perhaps if you'd read posts before jumping into shit you know nothing of, you'd have seen that. Sorry, but this pisses me off. Don't attack my work because you don't understand the science behind it. Now, in a so-called 'shotgun' fruiting chamber with holes on all six sides, would you suppose the CO_2 drains out the bottom? It doesn't. It mixes with the air. I see absolutely NO change in CO_2 concentration from the top to the bottom of the fruiting chamber. CO_2 levels are higher than ambient in the room, but lower than they would be in a 'still air' terrarium, as if anyone who has knowledge of the life cycle of fungi would ever make such a thing.

PERLITE FC - The perlite should stay fully hydrated and provide humidity for four to six weeks. This is plenty for a crop cycle. I simply take the perlite from the tub, place in strainer and run water through it again to re-hydrate it. You should be able to use the same perlite for years. When I filmed this part for my dvd, I bought a new bag of perlite so it would be nice and pretty white. My old perlite, which is still perfectly fine, is several years old and has been used for dozens of cycles, and is stained various colors from different substrates and spores getting spilled onto it over the years. If you have a bad trichoderma outbreak, It can't hurt to boil the perlite in a large kettle before re-use.

SPAWN BAGS FC - I seal after sterilization and inoculation. You'll have to make provisions to allow the pressure to escape from the bag as the PC cools down or the bag will burst. I use a tyvek sleeve placed the entire length of the flap from the substrate to the end of the bag. This allows the pressure to escape, but also filters any air that tries to seep back into the bags. Using this method, I've left them to sit on a countertop in open air for several days prior to inoculation. The tyvek prevents contaminants from entering. I use steel tie-wire to seal the bags. I don't even own an impulse sealer.

CONDENSATION/FAE/PINNING FC - Correct. The temperature differential causes the condensation, and the holes help to keep the temperature equalized, thus no condensation. If you've dunked and rolled your cakes, you still want to mist to keep the vermiculite damp. If you have cased substrates, you also want to mist. All those holes provide for constant FAE, which is a major pinning trigger, but the constant FAE also causes evaporation from your substrate (another pinning trigger), which needs to be replaced by misting.

TEMPERATURE PROBLEM FC - If you have a freezer, freeze water in several plastic containers. You can then rotate the jugs from your freezer to your FC and back as needed. No, I meant to put the ice inside the DT. Get imaginative. The jug can hang from a wire if the whole tub is covered with substrate. Don't put the ice on the outside or you'll stunt the mycelium in that location. You can open fruiting chambers whenever you want. The more the better in fact as long as you maintain humidity.

FC - Massive air exchange is what you want for a fruiting chamber. By the time fruiting comes, CO_2 production has fallen off dramatically. You want large amounts of air exchange in order to prevent contaminants such as cobweb, which thrive in stale, still air. Have several vents both top and bottom in a FC, so you can get circulation as well as intake and exhaust. Positive pressure is not necessary. A FC by nature isn't sterile, nor does it need to be. Just keep the humidity up.

FRUITING CHAMBER - Perlite will remain hydrated for months, so you don't need to wet it every weekend. Your mushrooms won't abort because of going two days without misting, provided you've built a proper terrarium and have 3 to 5 inches of well-drained perlite inside. Something else is wrong. You can mist mushrooms. They thrive in the rain. What's your air exchange provisions?

CONDENSATION HUMIDITY FC - Condensation does not begin on all surfaces at about 95%. Condensation is a function of the temperature differential on either side of a surface. Condensation forms on the warm side. Condensation won't even form on your mushrooms at 100% humidity. If they get wet, it's because liquid water droplets were thrown on them, not humidity in the air.

PERLITE IN FC - Also, make sure your perlite isn't packed down tight. If it is, it can't work. Rake your fingers through it from top to bottom to fluff it up. You want your perlite very loose and airy so it can evaporate the moisture it holds into the air. The more surface area of perlite, the better it works. Make little mountains and valleys for best results.

FC - Drill as many as you can drill until the humidity begins to fall. Then, cover up the last hole you drilled. The more air exchange during fruiting, the better. Just keep your substrate thin, and also keep the casing layer thin. Pans don't like thick substrates. 1 1/2" deep works for the manure, and 1/4" is plenty for a casing layer.

FC/HUMIDITY/CONDENSATION - You need high humidity in a fruiting chamber, and heating one will cause excessive condensation. The humidity you want for the mushrooms will be wasted sticking to the sides as condensation if there's a temperature difference between the fruiting chamber and the room it's located in.

CONTAINER FC - Use black plastic glad ware baking dishes. I've seen aluminum containers with holes in the bottom before the first flush comes in. Even if the metals are not transferred to the fruits (which nobody has the equipment to test to know for sure), the holes in the bottom cause unwanted pinning down there.

FC - A humidifier inside the greenhouse works great, and mine last several times as long inside the greenhouse as outside. Have it on a timer so it runs no more than two minutes at a time. One minute on, six minutes off works great for me. Just leave lots of gaps in the plastic so you have continuous air exchange.

CONDENSATION FC - Condensation on the walls only indicates that the temperature of the walls is equal to or less than the dew-point of the terrarium, and is not an indication of humidity. In other words, condensation indicates a temperature differential and not moisture content.

PULLING AWAY FROM THE SIDES CASING/FC - With a good pinset, they'll need lots of water. Be sure to give it to them. As said, it's normal for the substrate to pull away from the sides. The mycelium is munching down its food, so the substrate naturally is going to get smaller.

FC - Elevate the terrarium off your table on blocks so the holes in the bottom are open. Built as directed, it will maintain humidity fine if your ambient humidity is 50% or more. If necessary, run a cool mist humidifier in the room your terrarium will be located in.

FC MOISTURE - Droplets on your pins will not cause aborts. It's recommended to mist mushrooms. Air exchange must be provided because stagnant water sitting on a mushroom in stagnant air for an extended period WILL cause aborts.

CONDENSATION FC - Condensation has nothing to do with humidity. Condensation is caused by a temperature differential between inside and outside your tub. Use plastic or a drip shield to prevent drops from falling on the fruits.

HEAT A FC - NEVER heat a terrarium. It causes condensation, which robs the humidity from the air within, and turns it into condensation on the sides. You're supposed to heat the room the terrarium is located in.

FC - Warmer air has the molecules farther apart, thus humidity is lower, even in a sealed chamber. A 20F rise in temperature doubles the capacity of the air to hold moisture, thus it cuts the humidity in half.

USING PERLITE FC - Be sure your perlite is well drained, and you'll have 98% humidity for three weeks or

more, at which time you can remove, wash, drain and replace the perlite for the next cycle.

CONDENSATION FC - Condensation in a FC is actually stealing moisture from your air, lowering the humidity inside. Avoid it. As said above, the water droplets falling on your mushrooms is bad as well.

FC - It's normal for the substrate to pull away from the sides of the tray. It's not just from drying though. As the mycelium consumes the substrate, it actually gets smaller because it's being 'eaten'.

FRUITING CHAMBER - Depending on what you're growing, you need a bit more air exchange than that. I like to see three to four air exchanges per hour, with a co2 level around 1,000 or less.

CONDENSATION FC - Condensation is not caused by humidity. It's caused by a temperature differential between inside the box and outside. Don't use heat.

CONDENSATION FC - True, but condensation can only form if the humidity is 100% OR there is a temperature differential between inside and outside.

FC - You don't heat fruiting chambers. You heat the room they're in to avoid condensation. If you desire 80, you'll want to heat the room that warm.

COLONIZING PERLITE PF TEK / FC - Don't force the mycelium to colonize the perlite that has no food for it anyway. It will waste needless energy.

SUBSTRATE FC - They break in half all the time when I'm dunking. They do just fine. Try to avoid breaking them, but if they do, don't worry.

CONDENSATION FC - You don't heat fruiting chambers or they get condensation on the walls, which sucks moisture out of the air inside.

FC - Standing water lowers humidity. Drain fully, then put the perlite in your terrarium. That will deliver the highest possible humidity.

FC - FYI placing in the FC slows vegetative growth and covering your knots with casing would destroy your initial pinset.

SUCCESS FC - High humidity and massive amounts of air exchange is the key to success with mushroom growing.

HEATING FC - Don't heat the terrarium. You'll only make condensation that will suck the humidity out of the air.

FC - How to incubate Monotub...Drill a bunch of holes...put Micropore tape over holes for colonization.

FC - You really need to get your humidity as close to 100% as possible for hyphal knot formation.

FC - On the next grow; provide more air exchange for shorter, fatter stems and larger caps.

CONDENSATION FC - Condensation is caused by excessive temperature inside the jars.

FC - High humidity, plus high air exchange will give the best results.

CONDITIONS TO INDUCE FRUITING - The major pinning triggers are in order of importance, full colonization, a decrease in CO_2 levels due to increased air exchange (not gas exchange which is minimal), a steady rate of evaporation from the substrate or casing layer, and lastly, light.
Hyphal knots form best in 100% humidity, but I didn't list that because it's not a pinning trigger, but rather an environmental condition that is necessary. That's why we use casing layers. The casing helps to provide the 100% humidity right at the surface of the substrate where the hyphal knots form.
I have seen no correlation with temperature drop whatsoever. In the summer, my growing chambers are 10 or more degrees warmer than the open shelves I incubate on due to the heating effects of the lights. Even with a

temperature increase, I still get wall-to-wall pinsets, so I don't consider temp drop relevant at all to tropical species. Other growers disagree of course, but that's just my observation after many years.
Full colonization of the substrate is the number 1 pinning trigger. Full colonization can be when the mycelium reaches the physical border of the container they are in, or when they run up against a biological border, such as a contaminant species. Either way, they see they have colonized all of what is available to them, so they then enter the next phase, which is reproduction.
There must be evaporation of moisture from the substrate for pins to form. A waterlogged substrate will just sit there forever without pinning. Even in 99% humidity, as long as you provide fresh air, moisture will be evaporating away from the substrate, and this is necessary for pinning. We mist to replenish the lost moisture, and then allow it to dry slightly before misting again. This keeps the moisture content high, and keeps the humidity at the casing surface near 100%, but at the same time provides the evaporation of moisture that is a very important pinning trigger.
During colonization, we provide very small holes in the jars or tubs for gas exchange. We want a high CO_2 environment during colonization, because this prevents the mycelium from consuming all of the substrate. The mycelium colonizes the substrate, but doesn't 'eat it all up' due to the high CO_2 levels. During fruiting, we remove the covers to provide air exchange, which is at a much higher level then the minimal gas exchange provided during colonization. This increase in air exchange lowers the CO_2 levels, and is a major pinning trigger. At this time, the mycelium begins to consume the substrate it has previously colonized, and we notice during fruiting that our substrates pull away from the sides of the container. This is not due to moisture loss, but rather due to the mycelium 'eating' the substrate and turning it into CO_2, a waste product. It is easily proved that this shrinking isn't related to moisture loss, because even when we dunk a bulk substrate, it doesn't return to its pre-flush size.
Last, but not by any means least is exposure to light. Light does much more than just tell the mushrooms which way to grow. There are mechanisms in the light that stimulate the formation of hyphal knots as well, and light at the higher end of the spectrum (blue) definitely, absolutely stimulate more hyphal knots (which grow into primordia, which then morph into pins) than light at the lower end of the spectrum (red) This does not mean to get a 'mood light' with a blue lens, but rather to select lights such as metal halide, or much more economical is 'natural daylight' fluorescent that emit light at around 6,000 Kelvin to 7,500 Kelvin depending on the brand. Cool white fluorescent emit light at around 5,000 Kelvin and the 'red' incandescent emit light at around 3,000 Kelvin. The higher the light temperature in Kelvin, the more stimulatory it is to hyphal knot formation. I hope this helps.

PINSET INITIATION FACTORS - I rarely start new threads anymore, but the same questions and misunderstandings seem to keep popping up regarding what makes our fungi enter the pinning stage. The reply below is one I posted in another thread earlier, so I'll take the liberty of cutting and pasting it here for those who would otherwise miss it. Hopefully it will stimulate some more research and discussion on everyone's part and clear up a few things. Here it is:
LIGHT IS NOT THE MAJOR PINNING TRIGGER FOR MUSHROOMS!
In fact, light isn't even the major factor in which direction mushrooms grow. Wind or other air currents is the first. Light is the second, and then finally gravity is the third.
As for pinning, full colonization of the substrate is the most important pinning trigger. If there are contaminants present in a substrate, the mushroom mycelium generally stops growing when it contacts them. This represents full colonization because the mycelium has hit a natural barrier, and often pins begin to develop, whether light is present or not.
The second most important pinning trigger is an increase in air exchange, with the corresponding drop in CO_2 levels that occurs simultaneously. When you uncover a tray to look at it, you allow the CO_2 to escape and be replaced by fresh air. THIS is a pinning trigger, even if you do it in the dark.
Third, which goes along with second, is a steady rate of evaporation of moisture from the substrate or casing layer. In the artificial environment of a small tray, we must mist to keep the substrate or casing from drying out, but we also must allow that moisture to evaporate off between mistings.
Fourth, when the above three triggers are active, light becomes a pinning/growth initiation factor.
If one waits too long to apply the casing layer, or the other factors listed above are in effect prior to light OR the casing layer being applied, primordia will begin to form, which will then push up through to the surface, whether or not it has been fully or even partially colonized. By the same token, if light is applied and the other, more important factors have not been met, primordia will NOT form.
This is why experienced growers, such as commercial spawn producers who make their entire living

incubating mushroom mycelium, make absolutely NO effort to incubate in the dark. It isn't necessary. People will have much more success in the hobby when they understand that.

PINNING STRATEGY - Here are the facts. It DOES matter if you sterilize your casing layer. It will perform poorly. It's a well-known fact that the beneficial organisms in a casing layer stimulate pinning. This was very well known in 1985 when Paul Stamets wrote 'The Mushroom Cultivator' and it's still known today. Casing layers should be pasteurized, not sterilized.
In addition, coir is a substrate material, not a casing material. If you wish to use it for casing, it should be mixed at the 60/40 ratio (60% vermiculite, 40% coir) in the tek, or better yet, 70/30. However, peat mixed 50/50 with vermiculite is a far superior casing. The reason peats works better is the beneficial microorganisms that are not present in as high a concentration in coir.
Furthermore, sterilizing a casing makes it MORE prone to contaminants, not less. A sterile substrate is a prime breeding ground for the first organism to land on it, or the fastest growing. Mold mycelium, being imperfect fungi grows and sporulates much faster than mushroom mycelium because they get to skip the fruiting body stage.
Field capacity for casing layers says when you pick up a handful of material no water should drip out. If you squeeze gently a few drops will fall, and if you squeeze hard, a small stream will fall. It sounds like your casing might be getting prepared too dry as well.
Fanning 4 to 5 times per day is not sufficient unless you have another method of providing fresh air exchange. It is recommended to have 4 air exchanges per hour, not day.
My suggestion is to use a peat/vermiculite casing with gypsum added (very important) at a rate of one part to each ten parts of peat, and limed to an initial pH of 7.5 to 8. Pasteurize, don't sterilize and increase air exchange. Good luck.

FRUITING CHAMBER - You want three things in a Fruiting Chamber. FAE to keep contaminants at bay and to get a nice pinset. Humidity to get a nice pinset. Moisture for yield and pinsets. Mushrooms ideally want 4-6 FFAE every hour so it's best to put 1/4th inch holes everywhere around the terrarium. As much as so humidity doesn't escape and the CO_2 levels are low. Massive air exchange is what you want for a fruiting chamber. By the time fruiting comes, CO_2 production has fallen off dramatically. You want large amounts of air exchange in order to prevent contaminants such as cobweb, which thrive in stale, still air. Have several vents both top and bottom in a FC, so you can get circulation as well as intake and exhaust. Positive pressure is not necessary. A FC by nature isn't sterile, nor does it need to be. Just keep the humidity up.

FRUITING - As for fruiting temperatures, the lower 70's seem to produce the best fruit quality. For years, I didn't AC my house in the summer because I live in a generally mild climate, and they still fruited fine into the 90's, which my grow area would often reach on summer afternoons. I found that temperatures which would fry the mycelium during colonization, would hardly be a factor during fruiting, but the fruits grew very fast, were not very meaty, and the 'other' quality we look for was often lacking. When I switched over to all edible and medicinal mushrooms, I installed a refrigeration unit on my mini-greenhouse, because mushrooms such as shiitake would refuse to fruit at all in those hot temperatures.

PINNING - I doubt it was the light. Light is horribly over rated as a pinning trigger. It was most likely the air exchange that was allowed through the landscape fabric.
If you want an awesome pinset, it's important to only allow gas exchange and not air exchange as the mycelium colonizes the substrate. There's a big difference. During colonization, you actually want CO_2 levels to be extremely high, which prevents fruiting. Upon full colonization, you increase FAE (air exchange) and expose to light at the same time. This results in a sudden and massive pinset.

SPAWNING WITH PINS IN JARS - You can spawn a cake with pins right into manure/straw, or even use it for grain-to-grain transfers. It's a myth that pins will rot. I've proved that hundreds of times. Here's what happens when you put pins on a Petri dish. The two pictures below were taken five days apart. The same thing happens regardless of substrate. Just be sure they're small, growing pins and not large fruits. You should pick the mature fruits.

PINNING - Mycelium will pin best at or near saturation humidity and plenty of fresh air, whether the substrate is cased or not. A casing layer simply helps to hold humidity high right at the surface, under less than ideal ambient conditions. Of course, once pins form, the casing layer also helps to supply the substrate below with moisture, so you want to keep the humidity high to prevent the casing layer from drying out too much between mistings.

ABORTS - Grey or black heads indicate aborts. Pins that have simply stopped growing but have normal color are NOT aborts and should not be picked. It's common for many species including cubensis to set all the primordia for the first few flushes when primordia for first flush is set. They stop growing until their time comes, at which time they kick into gear again. If you pick them, you ruin future flushes.

PINNING EARLY CASING - What I meant above about pinning early in the presence of contaminants is when you see pinning in a jar prior to full colonization. It's because the mycelium ran up against the contaminant and said, "Oh heck, this stuff might kick my butt. I better reproduce by dropping some spores so I'll survive". That's why they pin. It's not because you had the light on when you checked the jars.

CRACKED/SPLIT CAPS - There is a difference between cracked caps and split caps. Cracked caps are caused by low humidity, which cracks the caps to give them a reptile type appearance. What you see above is split caps. It's part genetic and part just from very rapid growth where the cap simply rips apart. Split caps are not environment related.

PINNING - Many things. I've found the brightest light stimulates more pins. You need to look at pinning triggers like the instruments in a band. One instrument can be slightly off, and the band still plays the song. Often one instrument can be taken away and the music still sounds ok. However, if all are working together, it's awesome.

PINNING TRIGGERS - The pinning triggers are: Full colonization, 100% humidity, increased air exchange, and light. If all that happened within 24 hours of what you did, the primordia were already formed, so it was going to happen anyway. The rooster may crow at sunrise, but he isn't responsible for the sun coming up.

COLONIZING HIGH CO_2 - One benefit of a high CO_2 level during colonization is that less of the actual carbon in the substrate is converted to CO_2 gas. In other words, if you allowed too much fresh air during colonization, more of the substrate would be 'consumed' by the time the mycelium got to the fruiting stage.

CRACKED CAPS - Cracked caps are from low humidity and also really don't hurt anything. In fact, many Shiitake growers deliberately lower humidity a day or two before harvest to crack the caps. They feel it leads to a better product and in Japan; cracked cap Shiitake brings a higher price.

SPLIT/CRACKED CAPS - Usually, spit caps are caused by rapid growth. Contrast that with cracked caps, which is a sign of too low a humidity. Either is usually harmless. Vertically can also cause caps and stems to split, but it's a fungal disease so the fruits would also look unhealthy.

PREMATURE PINNING - Too much air exchange during colonization leads to early pinning too. If the holes in your jar lid are too big, your grains or whatever is exposed to air exchange rather than just gas exchange, which would keep CO_2 levels high and prevent pinning.

SMALL MUSHROOMS FC - Small mushrooms are caused by one or more of the following: Too small a substrate or too thin a casing layer, improper substrate or ph level for the species, or too little moisture in the substrate or casing layer. The latter is most often the cause.

SPLIT CAPS - There are two phenomena that are often called 'split caps'. One is from growing fast and is normal. The other is more correctly called 'cracked' caps and is related to low humidity. Either is usually fine to eat. Post a picture if you want a better diagnosis.

SMALL MUSHROOMS - The only reason they're small is that there is only so much water in the cake. More mushies mean smaller ones. One tip for next time ...you can inject a bit of water into the cake during the flush with a syringe. Don't overdo it, just 3 or 4 cc.

PINNING ON EDGES - Your substrate is pinning on the edges because that's the only place where there is near 100% humidity to stimulate primordia formation. You can get more pins in the middle by laying a sheet of wax paper over the top of the tray.

FRUITING LOW CO_2 - A rapid and sudden decrease in the ambient CO_2 levels is a pinning trigger in cultivation, so adding fresh air at the same time as full colonization and the other pinning triggers helps ensure a full, even flush.

UNCASED SUBSTRATES - Uncased substrates should be treated as cakes. Primordia form best in near 100% humidity. Yes, lay wax paper right over the substrate. Replace every second day with a fresh sheet. Lift it to fan for air exchange.

FRUITING SUBSTRATE - However, you can mix it in with horse or cow manure, or compost at 5% by volume. In other words, for each 20 cups of compost or manure, you can add one cup of chicken manure. Don't forget to lime for ph.

FC SIDE PINNING - Black plastic glad ware fruiting trays. I've never had one single side pin when using those until second flush when the substrate is pulling away from the sides a bit due to shrinkage, which is normal.

SMALL MUSHROOMS - Small mushrooms are caused by a shortage of water. After this flush, dunk. It's not strain related. All strains we see are of the same species and I've seen huge amazons.

FRUITING TEMPERATURE CASING - Mushrooms grow more quickly at higher temps, but there is no doubt that they are denser and more potent when fruited at a lower temperature.

ABORTS - Misting doesn't cause aborts. Leaving pins wet after misting with no air exchange causes aborts. When misting pins, be sure to increase air exchange afterwards.

FRUITING TEMPS - Cubes will actually fruit well in temps that would fry the mycelium in the colonizing stages. However, quality is better when they fruit at lower temps.

CASING FRUITING SIDES - If the fruits are only forming on the edges, it could be because the casing layer Ph is too far off, or it could mean the casing layer is too dry.

MYCELIUM ON CAPS - It's a combination of two types of mycelium on the fruiting body. It's more genetic in nature, occurring in some sustains more than others.

PINNING TRIGGERS CRITICAL - The other pinning triggers of full colonization, steady evaporation of moisture, and air exchange are much more critical than light.

FRUITING TEMPS AND WHY - Benefits from fruiting at 68-72F. 1. Better Fruit Quality, 2. Easier To Control Harvest Time, 3. Easier To Control Evaporation!

SMALL MUSHROOMS - Fruit size is mostly determined by substrate moisture level. Small fruits mean your substrate is too dry.

MYCELIUM FC - Pins are live, growing mycelium. Live, growing mycelium does not rot. Aborts rot. The above are not shiitake.

FRUITING - Better food quality and slower growth occurs in the high 60's low 70's, that's why it's the true preferred range.

PINNING TRIGGERS - It's air exchange, full colonization, or contaminant presence which is what makes them pin.

HYPHAE TRIGGER - Aerial hyphae, attracted to the fresh air/humidity, no digital can actually read that high.

COOLER TEMPS, LIGHT!! LOWER RELATIVE HUMIDITY - PINNING TRIGGER: FAE (3 PER HOUR),

PINNING - One of the biggest pinning triggers is the sudden reduction in CO_2 buildup.

SKINNY MUSHROOMS - Poor air exchange causes long skinny stems, not fat Asses.

ABORTS FC - If the head is black, it has already aborted. Aborts don't recover.

LATE PINNING - Late pinning is caused by poor air exchange 90% of the time.

SPLIT CAPS - Split caps, not related to humidity or moisture content.

CRACKED CAPS - No. Lack of humidity causes cracked caps.

PIN - Hyphal knots are tiny. Perhaps 1mm in diameter.

HUMIDITY FC - Hang on a second. 100% humidity means the air is saturated. Having the air saturated in no way is going to flood your cakes. What WILL flood your cakes is pumping from a humidifier AFTER the air is already at 100%. That's why I recommend three to five inches of well-drained perlite for a terrarium, and no mechanical humidifier. This way, if your humidity reads less than 95%, it means you need to calibrate your hygrometer. Mycelium will pin best at or near saturation humidity and plenty of fresh air, whether the substrate is cased or not. A casing layer simply helps to hold humidity high right at the surface, under less than ideal ambient conditions. Of course, once pins form, the casing layer also helps to supply the substrate below with moisture, so you want to keep the humidity high to prevent the casing layer from drying out too much between mistings.

HUMIDITY - I recently cleaned out one of my terrariums after 8 weeks. The perlite was still damp, and at least half of this time, the lid was off. I think you're mistaken. You can judge moisture content of the perlite by lifting the tub. Dry perlite is almost weightless. My huge 3 cubic foot bag probably weighs a pound or less. The terrarium I lifted up weighed at least ten pounds. However, if your house is extremely dry, you'd be well advised to run a humidifier in the room your grow is located in. It will make it better for your plants, and it will be easier on your own skin and lungs as well. Shoot for an indoor humidity of 50% or better for comfort. It will also make it much easier to heat your house in winter because the humidity will hold heat much better than dry air.

WAX PAPER HUMIDITY - What I have said is not to wait a week before using wax paper or it could stimulate the germination of contaminant spores that have landed. If you use it from the start, those contaminant spores will have mostly landed on the surface of the wax paper, which is discarded every two to three days. After four or five days, you can simply wash the surface of your substrate very well under the water faucet to rinse off most of the contaminant spores that have landed. Wax paper simply helps to hold a high humidity at the pinning surface. It's even more effective with uncased substrates than with cased.

FC HUMIDITY - I'm now convinced the closer to 100% humidity we can get, provided we have proper air exchange, the better. This applies to cakes, substrate blocks and cased substrates. Perlite in a terrarium with a cased substrate tray allows us to leave the lid or door propped open to allow for constant air exchange, which promotes pinning and suppresses contaminant molds. Without the perlite, we need to keep the terrarium closed up tighter, which promotes contaminant molds. I think the 90% humidity suggestion when casing comes from stamets' books, but I respectfully disagree.

FC/HUMIDITY/HOLES - I drill dozens of holes all over my terrariums, including the very bottom. The holes on the bottom actually increase humidity, while letting the CO_2 drain. The reason the holes on bottom increase humidity is because air currents travel from cold to warm, due to the pressure difference caused by the molecules being farther apart in warm air. The warm air in the terrarium causes air to percolate up through the perlite, wicking moisture as it passes through.

CASING HUMIDITY - Why would one want to avoid getting moisture on the mushrooms? Mushrooms are 90% water and benefit greatly from misting. The other benefit to misting is to replenish moisture in the casing layer or on the surface of the cake. You can't do that with humidity, even at 100%. It must be done by misting. Opening the lid of a fruiting chamber a few times per day is a great idea. A total influx of fresh air is always good for the pinning/fruiting mushrooms.

WAX PAPER HUMIDITY - Wax paper will work better if you'll wrinkle it up into a ball first, then flatten it back out and lay over your uncased (or cased) substrate. By wrinkling, you open up lots of little air passageways while still keeping the humidity tent. It also helps cut down on the surface area of the caps touching the wax paper as they push it out of the way. Be sure to lift it up a couple of times a day to let all the built up CO_2 from around the substrate escape.

HUMIDITY - Mushrooms grow best in upper 90's to 100% humidity. It makes no difference if the substrate is cased or uncased. A cased substrate can still get some pinning at a lower humidity than cakes, but performance is always better when high humidity is maintained. The old adage of 85% for cased substrates, 100% for cakes is just plain wrong. None of the experienced, successful growers fruit casings at lower humidifies.

HUMIDITY FC - If you have three to five inches of well-drained perlite, with holes cut in all six sides of the terrarium, humidity will be in the upper 90% range. A 20F rise in temperature cuts the humidity in half until more moisture evaporates from the perlite. That is just a fact of physics. Warm air can hold more moisture, so if you heat it, more moisture is required to have the same relative humidity.

HUMIDITY - If your ambient room humidity is very low, I'd suggest running a coolmist humidifier to bring your room humidity up to fifty percent or so, and then you'll be fine in your terrarium. As said, get an analog hygrometer and properly calibrate it at the high end of the scale. I'd also get rid of the aquarium light and get a fluorescent in the range suggested above.

HUMIDITY CASING - Perlite is best of course. If you don't have it, paper or cloth towels work fine. I've used them in pinches for years. Wring them out of excess moisture, and make sure they're fluffed up in the terrarium. You can even paste them to the sides. They won't contaminate for weeks, so if you change them for fresh every few days, you'll be fine.

WAX PAPER HUMIDITY - Wax paper in a monotub type grow is generally of little benefit. If you're using tray culture in a mini greenhouse where humidity is often less than optimal, wax paper can help keep humidity in the correct range for pinning. In a tub, humidity is usually close to 100% anyway, negating the need for wax paper.

CASING/HUMIDITY - Hyphal knots and primordia form best in 100% humidity. They don't care one whit whether the substrate is cased or uncased. You should maintain humidity in the upper 90% range for best results when growing mushrooms. The oft-repeated advice that 'casings only require 80% humidity' is wrong.

HUMIDITY - Raise humidity to near one hundred percent during primordia formation. Once pins are set, humidity can be reduced a bit, but don't get out of the 90's. The 'old' advice of keeping humidity lower for cased substrates is incorrect. As hyphae said, keep humidity high, and air exchange high.

CASING HUMIDITY/FAE - Never. I fruit cased substrates in the high 90% range too. The key is air exchange. Even at 99% humidity, moisture will be evaporating from your casing layer, provided you have enough air exchange, giving you two of the three major pinning triggers.

HUMIDITY/FC - A fact of physics is that a 20F(11C) rise in temperature cuts humidity in half, and a 20F(11C) drop in temperature doubles humidity, providing the amount of moisture stays the same. You're better off fruiting at 22-24C than at 27C anyway. Fruit quality will be better.

HUMIDITY FC - Recent experiments (over the last 23 years) have shown100% humidity means the air is saturated. Having the air saturated in no way is going to flood your cakes.

HUMIDITY FC 92% - Humidity will be fine with a good casing layer. I prefer higher, but lower will also still work, only requiring more frequent misting.

HUMIDITY/CASING - It's hard to get total saturation humidity with lots of air exchange. At 99% humidity with five to six air exchanges per hour as recommended, a casing layer will dry out daily and this moisture needs to be replaced by misting.

CASED SUBSTRATES - If you're going to case substrates, you want the humidity no more than 90%, with 80% being ideal. Too high a humidity is a major cause of weak or no pinsets on cased substrates.

HUMIDITY % CASING/FC - The maximum amount of air exchange possible while still maintaining humidity is what you want in a growing chamber. Fully colonized substrates are very resistant to contaminants.

HUMIDITY FC PRIMORDIA - During primordia formation, the higher the better. Once pins have formed, humidity can be reduced, but don't go less than 80% or you'll see a lot of cracked caps.

HUMIDITY/FC - You'll never get a good pinset at humidity below 90%. 95% and above is recommended, even with a casing layer. It's easy to get 99% humidity with perlite in a terrarium.

HUMIDITY - Contrary to popular belief and constant repetition, fuzzy stems are not an indication of too high humidity.

FC HUMIDITY - One cool mist is plenty for your terrarium for both air exchange and humidity.

HUMIDITY FC - There is no such thing as too much humidity when growing mushrooms.

SOAKING - Simply put the tray under a gently running faucet for a few hours. Allow the water to fill the tray and run over and down the drain. The running water prevents contaminants during the soaking process. Place a jar, rock or something similar on top of the substrate if necessary to prevent floating. After the soak, fill in the divots caused by picking with fresh casing material. You don't need to apply a whole new layer because it won't colonize anyway. Never pick pins that aren't aborts. Primordia for the first two or three flushes commonly forms at the same time, and then remain dormant until their time comes. If you pick the substrate clean, you ruin the next flush. Just be sure to drain out any excess water before returning to the FC. Don't get anal about draining; just get what pours off easily. The rest will continue to be absorbed by the substrate over the next 24 hours or so. You can throttle down the faucet too. You don't need a lot of water overflowing, just a trickle.

SOAKING/CASING/UNCASED - Dunk first. Personally, I've seen little benefit to adding a casing layer over bulk substrates with cubensis. Very experienced growers can definitely get a boost with a well-managed casing, but for the majority of new growers, I feel you'd be better off getting your feet wet by fruiting uncased. Of course, straight rye or wbs requires a casing to perform well, but bulk substrates such as coir or manure do not. You can dunk the coir/coffee substrate, and then introduce directly to fruiting conditions. This way, you get your harvest a bit sooner, and don't have the other problems to deal with that casing causes. As you gain experience, add casing layers to future crops. You can lay a sheet of wax paper over the uncased substrate to hold a high humidity right at the substrate surface, which will stimulate pinning. Lift it up to fan several times per day, and replace with a fresh sheet every two to three days, or if/when it gets damp.

MISTING - Droplets on your pins will not cause aborts. It's recommended to mist mushrooms. Air exchange must be provided because stagnant water sitting on a mushroom in stagnant air for an extended period WILL cause aborts. Condensation does not begin on all surfaces at about 95%. My can of cold beer gets condensation in Arizona in the summer. I know it's not 95% there. Condensation forms on my windows in winter, even when humidity in the house is less than 50%. Condensation is a function of the temperature differential on either side of a surface. Condensation forms on the warm side. Condensation won't even form on your mushrooms at 100% humidity. If they get wet, it's because liquid water droplets were thrown on them, not humidity in the air. 92% humidity will be fine with a good casing layer. I prefer higher, but lower will also still work, only requiring more frequent misting.

COLD SHOCKING - You dunk in the refrigerator to prevent bacteria buildup that would otherwise contaminate your brf if you dunked at room temperature. Don't confuse that with cold shocking, although it does cold shock them...lol. As for cased bulk substrates, I ran several experiments a few years ago where half the trays were placed in the refrigerator for 24 hours, while the second half were left at room temperature. Both sets of trays went to the fruiting chamber at the same time. Every single tray that had been 'cold shocked' pinned two or more days later than trays that had not been cold shocked. That is not to say a temperature change can't be a pinning trigger. However, along with light, a fully colonized substrate, and an increase in air exchange, it is only one of the triggers. However, cold shock being beneficial or not, you need

to dunk your cakes in the refrigerator.

CASING SOAKING - The casing layer will never re-colonize after first flush. Simply dunk to rehydrate the substrate and return to fruiting conditions. I used to recommend dunking in the refrigerator, because in part, that was the conventional wisdom. I no longer believe that's the best course of action, so dunk at normal room temperature, beginning the dunk with cold tap water, but no ice. Larger trays can be easily soaked by placing under the kitchen or bathtub faucet, allowing the tray to fill up and gently run over the edge for a few hours. Put something on top of the substrate if it tries to float. The running water will help to wash away contaminant spores that may have landed, while preventing excess bacterial blooms that may occur under still water.

REHYDRATING SPAWN BAGS - Your mistake was injecting into the middle instead of along the edges. It's best to squirt solution in the area between the bag and the grains. This lets you see right away after germination what you have. Five to seven days is about normal for first growth to be seen if you inject the edges. Since you injected the middle, double that at least. I'd suggest waiting two weeks, then kneading the bag between your fingers to mix it up. Doing so should reveal some mycelium from the center of the bag, and the kneading will spread it around the bag. Only do this once, ten days from now.

FANNING/MISTING FC - Fanning is when you take the lid of the tote and wave it back and forth over the terrarium to blow out the stale air and replace it with fresh. Fan for fifteen seconds or so each time. I'd suggest drilling a hundred or more 1/4" holes into all six sides of the terrarium, elevate it an inch or two off the shelf, and then fan a couple of times per day also. Mist each time you fan, just before fanning. There is no maintenance free terrariums, so keep it simple and give your mushrooms lots of humidity, lots of fresh air, and lots of bright fluorescent light.

SOAKING - No, just use tap water unless you live in an area with contaminated drinking water. It's best to refrigerate or otherwise keep the water cool during the soak period to prevent the growth of unwanted organisms in the anaerobic conditions underwater. Put the cakes in a pot of water, and then use a heavy glass dinner plate or something similar to hold them submerged, as they'll try to float. Rinse well under the faucet both before and after the soak period. It's a good idea to roll the cakes in dry vermiculite after the soak. Read up on 'dunk and roll'.

SMALL MUSHROOOM HYDRATING - Small fruit size is related to substrate moisture content. It's easy to hydrate a substrate block during fruiting by simply pouring water around the edges so it slides down and under the substrate. If you pour a few tablespoons of water around the edges a couple of times a day, the substrate will readily absorb it and transfer the moisture to your fruits. Cubes will benefit from a casing layer, but by no means is one necessary to get a nice flush of large fruits.

MISTING - You can mist pins, but they must be left open to fresh air after misting. If you mist small pins, and then put the lid on the fc, they'll usually abort. They also must be misted with a very fine mist sprayed up into the air, so that it settles down gently on the casing layer. A direct spray will abort pins. Never mist when they're in the primordia stage. Simply lay a sheet of wax paper over the top of the tray to hold humidity at that time. Pick off any moldy pins from the substrate.

REASON FOR COLD DUNKING CUBIES - Cold water is recommended for dunking for only one reason-it helps to keep bacteria from growing during the time the mycelium is underwater. Tap water is fine, unless your local water supply is polluted. Many people add 1/2 teaspoon of bleach per gallon of water to the dunk water. I recommend rinsing the cake under the faucet with running water after the dunk to remove any bacteria or slime that develops during the dunk.

MISTING - Your substrate is dry. You can mist pins, so mist away. It will take several mistings an hour apart over a day or two to get your moisture back. I'd also pour, yes pour water around the edges. Wait two hours, and then pour any excess back out. Once pins are the size of yours they won't abort from misting as long as you up the FAE to let them dry off. Misting, then closing a container up tight will cause them to abort. Don't allow them to sit wet is the idea.

SOAKING CASING - Just give it an hour or two under gently running water. The kitchen sink works fine. Just put a rock or something else heavy to keep the substrate down in the pan, and let it fill up and gently run over

the edges. After a couple of hours, drain off the excess water and place back in fruiting conditions. You can patch the divots from picking, but don't recase. It won't colonize anyway and will just serve as a place for contaminants to get a start.

PEROXIDE/NO TO SOAKING - Peroxide breaks down within minutes in the presence of organic material such as a substrate, so is ineffective for an overnight soak. Peroxide is toxic to fungi so don't use it except to control a cobweb outbreak. It's ineffective as I said in dunk water because it breaks down so fast. Besides, it's not necessary. Yes, the only reason for using the refrigerator during the soak is to prevent bacteria from growing unabated.

REHYDRATING FC - I like to dunk cased substrates under running water. Just let the faucet fill up the tub and run over the edges. Use whatever you need to keep the substrate block from floating. Allow the water to run for an hour, then drain and return to fruiting conditions. The running water prevents contaminants building up during the dunk and also helps to wash contaminant spores that may have landed on your project down the drain.

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DUNKING IN BLEACH - If you still have problems with contaminants after using peroxide, you can also dip tissue into a ten percent bleach solution for a couple of minutes. Believe it or not, the mycelium can withstand this, but molds and bacteria can't. The bleach works really well when cloning dry tissue. Live tissue needs a week or two to recover from the bleach, but dry tissue is dormant so hardly even gets smacked.

SOAKING WITHOUT A FRIDGE - You can pad your bet by changing the water every few hours, or using very gently running water from the sink. Just hold the cakes underwater, and allow the faucet to drip slowly into the pan until it overflows and runs down the drain. The moving water will prevent growths as well. It's also a good idea to rinse the cakes very well under running water both before and after the soak.

DUNKING - You can dunk right in the tray it grows in. Just leave it under the gently running kitchen faucet for a few hours. Let the water overflow the tray and run down the drain. The running water will prevent bacteria buildup during the dunk and might even wash a few contaminant spores off in the process. Put a couple of rocks or whatever you have on top of the substrate to hold it submerged.

MISTING - You can mist mushrooms. You can mist the casing layer directly to moisturize it. In fact, you can put your thumb over a garden hose and blast your mushrooms and they'll do fine (slight exaggeration) as long as you don't seal them up in a closed terrarium while wet. Mist, and then increase air exchange until the visible moisture on the fruits themselves has dried or been absorbed.

MISTING CASING - You want your casing layer to dry a bit between mistings. This is one of the major secondary pinning triggers. Replace that lost moisture with misting. An ultrasonic can easily saturate the casing layer, taking away this major pinning trigger. I'd go from misting once a day to three or four times, and keep the air exchange up, provided you have mid to upper 90's humidity.

HYDRATING - You should be misting several times per day to keep it nice and moist. You can also pour water right from a bottle between the pins to super-hydrate the casing. If the substrate is also dry, as I suspect, you can inject water directly into it with a syringe, and/or pour water around the edges of the tray, filling it up. Pour off the excess a few hours later.

REHYDRATING - If the substrate dries out, you can always inject some water with a syringe. I tried all sorts of hoses, pipes with holes, and straws in the middle of substrates for hydration and had an increased rate of contamination every time. It seems that trich spores migrate into the well you cut, and then grow there in the stale, still air until they ruin the project.

MISTINGS - Mist cakes a couple of times per day, especially if they've been dunked and rolled. Keep that

vermiculite damp. What you need is a higher priced mister. It should spray a very fine mist and not puke out large droplets that will damage your mushrooms. Aim it up so the mist gently falls onto your cakes. This won't damage the fruits.

HYDRATING - You can do it either way. However, since it isn't the 'soil' or 'substrate' we're hydrating, but rather the individual cells of mycelium, soaking overnight has become the preferred method. Cells take on water by osmosis; therefore the water pressure helps to hydrate them faster than simply misting.

SOAKING/DUNKING - In addition, dunking causes the cakes to expand, so in jars they stop expanding when they hit the glass, thus they stop in taking moisture. In addition, it pushes the cake tightly against the glass, making birthing harder. It's best to birth before the dunk so the cakes slide right out of the jars.

HYDRATING/CASING - You can pour water directly on the casing layer between pins to fully hydrate it. We use high humidity to slow down the rate of evaporation, but you still need to mist directly to replace what is used by the growing fruits, as well as to replace what moisture naturally evaporates.

MISTING CASINGS - You can tell when to mist by looking carefully at the cakes or casing layer. Allow them to dry slightly, then mist lightly. After a few grows, you'll be able to instantly tell when a project needs to be misted. You don't want them to dry completely out, or get waterlogged.

MISTING/SOAKING - Misting lightly or even heavily does not abort mushrooms. Soaking wet mushrooms in stale air causes aborts. Always provide plenty of fresh air and you can mist like crazy. That's the reason for building a terrarium with holes in all six sides.

DUNKING - Dunking before first flush is optional, but it's best to dunk between flushes for sure. There is no reason to use mineral water. I use plain tap water, but if your local water supply sucks, it's probably best to filter it or use spring water.

DUNKING WITH PINS - Leave them. Dunking won't hurt healthy pins. I've actually seen them double in size during the dunk. Also, pins for the second flush often form during the first flush. Just leave them and after the dunk, they'll begin to grow.

MISTING - You don't want the cake to dry out. Mist as needed until hyphal knots form. Then back off until the pins are well established. Always fan after misting. Don't allow a pin to sit there soaking wet after you close up the terrarium.

MISTING - If the casing layer is saturated, it means you've over misted, or possibly made it too wet to begin with, but high humidity will not get your casing layer wet, but rather will only slow down the evaporation of moisture from it.

HYDRATE - Yes, that's a very small substrate to have to support all those pins. I'm sure it's dry. Put about 1/2" of water in the pan and let it soak for a day, and then dump out the excess. Repeat every 48 hours until the flush is done.

MISTING - Misting is fine, but be sure to increase air exchange afterward until all the misted water either evaporates or is absorbed into the fruits by osmosis. If you leave pins wet in a still-air environment, many will abort.

MISTING - You should not stop misting. Mushrooms are 90% water and the purpose of a casing layer is to supply moisture to the flush. Daily, or several times daily misting is required for large fruits and good performance.

SOAKING - Tap water is best for soaking/dunking in my opinion. I use it right out of the tap. The small amount of chlorine will actually help to prevent bacteria buildup during the soak. I use spring or distilled for misting.

DUNKING - After the dunk, replace the casing that is missing from the divots or from washing off during the dunk. You can also dump extra casing material around the edges to fill in the gap.

COLD SHOCKING - Cubensis benefit NONE from cold shocking, as they are a hot tropical species; Cold Shocking is used for cold climate edible mushrooms.

SOAKING - You don't need to pick them off before dunking. If they abort later, pick them, but it's rare for fruits to abort from an overnight soak.

DUNKING - I've never found that dunking damages these pins. Just be careful not to scrape or otherwise physically damage them.

COLD SHOCKING - You should soak in the refrigerator to avoid bacteria buildup in the anaerobic environment under water.

CASING MISTING - You're supposed to mist your casing layer several times per day to replace moisture that is evaporating.

DUNK IN CHLORINE - I never have. If anything, the chlorine will help kill bacteria. It sure doesn't hinder the mycelium.

MISTING - You're supposed to mist your casing layer several times per day to replace moisture that is evaporating.

MISTING - Use filtered, spring, or distilled for misting though.

OUTDOORS GROW - For an outdoor grow, all you need to do is gather up some of your field-aged manure and make a bed of it in a nice shady spot. Make the bed no more than about six inches deep. Dig a hole and put the manure in that, so the ground can help keep it from drying out. Wet the manure down well, but no pasteurization is required for outdoor grows. Obtain some spores and inoculate some pf cakes, made from brown rice flour and vermiculite. You can find the pf tek on here in the FAQ link at the top of the page. When 8 or 10 jars are fully colonized, you can spawn them into your manure outdoors, and the mycelium will jump off from the brown rice flour cakes into your manure. Lay a sheet of cardboard, or a few inches of straw over the top to shade and hold in moisture while the mycelium colonizes your manure. It will fruit later in the summer after heavy rains.

OUTDOORS GROW - If you're going to grow outdoors using bagged cow manure unpasteurized, put it in the ground, not in a Tupperware. It needs the organisms in the soil to prevent contamination. I'd also suspect your cake was contaminated prior to spawning to the manure if it was green within a week. I've stored bagged cow manure outdoors for months without it growing trich. If you spread the bagged cow manure out on a tarp in the hot sun, the ammonia is gone within hours. If it's cool weather, it might take a few days.

OUTDOOR - Wait until June to plant them outdoors. If you put grains in the ground, the damn squirrels will dig up every single kernel to eat, and destroy your patch. Mix the grains with manure indoors, and then in June or July, bury them into a shallow hole with horse or cow manure spread all around the substrates you're planting. If you want to spawn directly to manure outdoors, use pf cakes, not grain.

OUTDOORS - Cakes can be grown outdoors, but those temperatures are at the extreme end of the scale. I would suggest to partially burying the cakes after full colonization, in the shade under some thick bushes. By burying the cakes half way, they can draw moisture from the soil, preventing them from drying out. It will help to run a lawn sprinkler in the area for several minutes, a few times per day.

OUTDOORS BED - You can pick up the cow pies and break them up into a compost pile or shallow manure bed in your yard. Mulch over the top with straw. This is how I originally started out in the early 70's; when there was no Internet, no grow guides, nothing.

OUTDOORS GROW - Chop up the fruit into manure or compost. It should clone right into the new substrate, provided temperatures are still in the right range.

STERILIZING CASING - Do not sterilize A Casing! EVER! In fact, most of the casings I use these days are simply peat/vermiculite with lime and gypsum, and zero heat-treating of any kind, because many edibles won't

fruit on sterile or pasteurized casing layers. You can pasteurize casing material and it works well with cubes. However, sterilization will give a higher rate of contamination then doing nothing. You have to assume that mold spores are going to land on your casing layer. If it's been sterilized, they will germinate and grow because nothing else is there to stop them. The beneficial bacteria that are in peat moss will help protect against molds such as trichoderma, and some of these will survive the pasteurization process, which should kill all the mold spores that are present at the time. Once the casing layer is in place, the key to preventing molds is proper air exchange. Lime raises the ph, and gypsum keeps it stable. They both provide calcium, but gypsum also helps with texture.

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STERILIZING CASING - My main point about sterilizing casing layers is that one; it makes them more prone to contamination, not less. A sterilized substrate is prime food for whatever organism is the first to land on it. Second, many gourmet species will not fruit on a pasteurized or sterilized substrate/casing. Eventually, most growers either move from cubes to more difficult species to grow, or they lose interest in the hobby and quit growing. I just feel it's important to learn procedures that you can use later. I hope this clears it up.

STERILIZING CASING - The reason you don't sterilize casing layers is because a sterilized media is a prime target for contamination to grow on because there's no competitors.

MARTHA NEEDS REDUE... I THOUGHT I CAN JUST COPY AND PASTE A BUNCH OF SENTENCES TOGETHER BUT IT DIDN'T WORK SO

MARTHA/GREENHOUSE (REDO)

Once you've fixed up your mini greenhouse it's time to go over some guidelines. You want 100% humidity regardless if it's cased or not. You do not want your cool mist/humidifier/ultrasonic on the ground. It will pick up the contaminants from that air and bring them inside your growing chamber. Put your cool mist inside the greenhouse for optimally so it humidifies the entire thing and doesn't come in from just one spot. You want to cut slits in your greenhouse for FAE or open vents or doors are for air exchange, you also can use a fan if it's not moving at all. Using a cool mist, as a fae will only last a very short time due to the static pressure produced, which ruins the motor and bushings. For best results, use a humidifier for humidity, and vents for air exchange. I have openings cut all over my greenhouse so air can circulate in and out top, bottom, and sides. Constant air exchange, with the humidifier inside the greenhouse gives excellent performance. I can actually maintain 99% humidity, just like a terrarium. Place the humidifier(s) on a bottom shelf or floor of the greenhouse. Humidity in mini-greenhouses seems to stratify into layers with higher humidity near the top and lower at the bottom. By placing the humidifiers on the bottom of the unit, the air drawn into the humidifier will cause circulation from the top back down, thus equalizing the humidity.
You need a floor. Easiest is to use plastic sheeting and duct tape it to the sides. To catch drips, use trays of damp perlite. These will return the drips to the air as humidity.
I spent years modifying humidifiers before I worked out this method. A humidifier that has been modified has a life span in weeks, sometimes months, but not years the way an unmodified unit has. My two cool mists on the floor of my greenhouse are now over two years old without failing. Also, when it fails, you can't return a drilled out humidifier to the store.
Using the above system, I can easily keep my greenhouse at 95% to 99% humidity, which is what's required for cakes or substrate blocks of sawdust during fruiting. You'll need a good cycle timer for the humidifiers. Don't let them run more than a few minutes at a time, followed by another few minutes of 'off' time.

When you're first filling up the greenhouse, place trays of damp perlite on any empty shelf space. A greenhouse full of substrate is much easier to keep moist than an empty one, so the trays of perlite make up the difference. Supply air to the bottom, and return air out the top if you're circulating. This helps to counter the natural tendency of the humidity to stratify in layers.
You don't need to worry about removing CO_2 in a mini greenhouse. Just have a few openings top and bottom and that will take care of itself. You want air circulation and turbulence to help prevent molds. For best results, have constant air exchange during fruiting. It's counterproductive to use a humidifier for air exchange. You will never get the humidity high enough for cakes if you're pumping in fresh air with a humidifier. Rather, leave the door unzipped or cut slits in the sides of the plastic both top and bottom to allow for constant air exchange and circulation. Cool mist humidifiers have no problem keeping the humidity right around 85% to 90%, which is perfect for cased substrates. Wax paper works great to put over cased substrates from the time you first expose to fruiting conditions. It will keep the humidity near 100% right on the surface where primordia form, then as the pins grow, they will push the wax paper out of the way, opening the edges to allow for less humidity. It's sort of a self-regulating system. Just be sure to change the wax paper out for a clean sheet every second day. Also, you must use this tek right from the start. If your casing has already been open and exposed, placing wax paper over it will help the contaminant spores to germinate and grow. If used from the start, most contaminant spores falling from gravity will land on the wax paper, which you carefully remove and replace every 48 hours. Just lay the wax paper over the top. Don't try to tuck it under the cake or other substrate or you'll do more damage than good. You can fold it if necessary to fit, but don't try to make a tight seal. Tiny drops won't hurt, but if they build up, you're in for problems. This is a very common problem when running cool mists 24/7 because the air can't absorb all the moisture you're pumping into the greenhouse. If your casing layer becomes waterlogged, it won't pin. If you'll put trays of damp perlite on the empty shelf space and floor, you can easily get 99% humidity in a martha with a cool mist. I place mine inside the greenhouse, which raises humidity even more because it recirculates already humid air through the cool mist. I only use cool mists, with trays of perlite on the floor to catch drips. As you can see, it's steady at 95%. Put the cool mist inside the greenhouse and run it no more than 25% of the time. You want a Vicks 400 humidifier. I'd put two cool mists on timers or a humidistat inside the greenhouse for humidity, then simply cut about ten to twenty holes big enough to stick your arm through at various points in the sides. Put half the holes you cut high, and the other half of the holes down low. If you open windows while doing sterile work, it hurts. If you open windows near your greenhouse or terrarium, it won't hurt at all. In fact, I have a 4" clothes dryer hose connecting my mini greenhouse to the outside. Just make sure you shut everything before you do any sterile work. You want totally still air for that, plus a glove box. You still want the greenhouse open though. The more openings the better as long as you can maintain humidity. I know from experience if I allow the cool mists to run for more than two minutes, they begin to drip because the air can't absorb the moisture as fast as one of those can put it out. However, you can run them one minute on, then two to ten minutes off and get 80 to 90 percent humidity with no drips. It takes a good cycle timer to do it, but the results are worth it. I agree. Short cycles are the key. I'm running mine about a minute on, then about six minutes off. The link below will get you a good prewired timer for $120. Scroll to the bottom of the page and look at the Cycle stat 4 timer. It's what I've used for two years now and it's still working great.
http://www.littlegreenhouse.com/accessory/controls2.shtml. If you're going to run a cool mist into a terrarium for air exchange, run it no more than one or two minutes per hour. That is enough to fully exchange the air without drying anything out. I run the humidifier for two minutes every fifteen.

GREENHOUSE - I think you said you're growing cakes. A mini-greenhouse is really not suitable for cakes unless you put the cool mist directly INSIDE the greenhouse so it can recirculate your moist air, adding additional humidity to it. CO_2 should not be allowed to build up, then vented. For best results, have constant air exchange during fruiting. It's counterproductive to use a humidifier for air exchange. You will never get the humidity high enough for cakes if you're pumping in fresh air with a humidifier. Rather, leave the door unzipped or cut slits in the sides of the plastic both top and bottom to allow for constant air exchange and circulation. Place the humidifier(s) on a bottom shelf or floor of the greenhouse. Humidity in mini-greenhouses seems to stratify into layers with higher humidity near the top and lower at the bottom. By placing the humidifiers on the bottom of the unit, the air drawn into the humidifier will cause circulation from the top back down, thus equalizing the humidity. You need a floor. Easiest is to use plastic sheeting and duct tape it to the sides. To catch drips, use trays of damp perlite. These will return the drips to the air as humidity. I spent years modifying humidifiers before I worked out this method. A humidifier that has been modified has a life span in weeks, sometimes months, but not years the way an unmodified unit has. My two coolmists on the floor of my

greenhouse are now over two years old without failing. Also, when it fails, you can't return a drilled out humidifier to the store. Using the above system, I can easily keep my greenhouse at 95% to 99% humidity, which is what's required for cakes or substrate blocks of sawdust during fruiting. You'll need a good cycle timer for the humidifiers. Don't let them run more than a few minutes at a time, followed by another few minutes of 'off' time. When you're first filling up the greenhouse, place trays of damp perlite on any empty shelf space. A greenhouse full of substrate is much easier to keep moist than an empty one, so the trays of perlite make up the difference. Supply air to the bottom, and return air out the top if you're circulating. This helps to counter the natural tendency of the humidity to stratify in layers. You don't need to worry about removing CO_2 in a mini greenhouse. Just have a few openings top and bottom and that will take care of itself. You want air circulation and turbulence to help prevent molds.

GREENHOUSE FC - Greenhouse: Air exchange is provided by the very loose fitting door. My greenhouse is framed with PVC pipe and covered with plastic sheeting. I got all the parts at the hardware store for less than $35. I'd say it's twice to three times the size of the Martha closet. I didn't put zippers or anything else to seal the door, so it's open on both sides from floor to ceiling. This provides for plenty of air exchange, and the cool mist humidifiers have no problem keeping the humidity right around 85% to 90%, which is perfect for cased substrates. When I use it for cakes or straw logs, etc., that require higher humidity, I simply cover them with wax paper which holds in the humidity in that specific area while still fitting loose enough to allow gas/air exchange. Wax paper works great to put over cased substrates from the time you first expose to fruiting conditions. It will keep the humidity near 100% right on the surface where primordia form, then as the pins grow, they will push the wax paper out of the way, opening the edges to allow for less humidity. It's sort of a self-regulating system. Just be sure to change the wax paper out for a clean sheet every second day. Also, you must use this tek right from the start. If your casing has already been open and exposed, placing wax paper over it will help the contaminant spores to germinate and grow. If used from the start, most contaminant spores falling from gravity will land on the wax paper, which you carefully remove and replace every 48 hours. Just lay the wax paper over the top. Don't try to tuck it under the cake or other substrate or you'll do more damage than good. You can fold it if necessary to fit, but don't try to make a tight seal.

GREENHOUSE - I get 90% to 95% with cool mists alone. I have never used an ultrasonic because I've found them not necessary. Never seal a fruiting chamber or greenhouse up tight. You want massive amounts of air exchange to stimulate pinning and to prevent contaminants, which thrive in stale, still, moist air. I have several 4" holes cut in the sides of my greenhouse, and the door is a simple piece of plastic sheeting that hangs from the ceiling all the way to the floor and is not attached at all except at the top. This leaves two slits the full vertical length of the greenhouse. All of the above provides plenty of air exchange, and an impeller type cool mist inside the greenhouse provides the humidity by only running one to two minutes on, five to seven minutes off. I tweak the cycle timer depending on how full of substrate trays it is at any given time. It also helps to get a bunch of plastic trays and fill each one with damp perlite. Use these to line the floor to catch drips, and also to fill up any empty shelf space within the greenhouse. Doing the above will provide you with 90% to 95% humidity along with ample air exchange. You can also do a search, and you'll find all of this has been covered many, many times before with experienced growers using all sorts of methods. This is my method, but by no means is it the only one that will work. Other growers prefer to put the cool mist outside the greenhouse, and then modify it to pipe the humidity in, but that isn't my personal choice for reasons I've previously posted, but it certainly works and they have the pictures to prove it.

GREENHOUSE - I have two 4" holes near the bottom on each side. Two more 4" holes are at the top on each side. The door is an opening that covers the entire front, nearly 5 feet across. It's a sheet of plastic that hangs down from the top; with a piece of PVC pipe at the bottom to hold it shut by gravity. The side slits are not attached to anything, thus air exchanges the full length from top to bottom on each side of the door, and the other 4 holes also pass air. There are also a few smaller holes I've cut for taking pictures and never sealed up. The idea is to have as much air exchange as you can possibly have and still keep mid 90's percent humidity. I use 2 vicks kaz cool mists sitting inside the greenhouse, set to run 1 minute on, 4 to 6 minutes off depending on ambient humidity. I'll tweak it daily due to local conditions. When things get really dry weather-wise, I'll often run a third cool mist in the room the greenhouse is located to raise the ambient humidity. Good luck. The weight of the PVC pipe is whatever a 2" X 5' length of it weighs. Perhaps two or three pounds. Yes, I built a place for it to hang. To open it, I simply roll up the PVC and 'door' from the bottom. It makes a nice little roll to hang on the hooks at the top. My entire greenhouse is framed with PVC pipe and covered with plastic sheeting. I also have a self-contained air conditioning system to use when fruiting cold weather loving

mushrooms such as oyster and shiitake. I can keep the greenhouse at 58F, while the room outside is 70F.

GREENHOUSE - There is absolutely no need or reason to even attempt to keep a greenhouse sterile. We use sterile procedure to colonize grains, but once they're colonized, everything else is done in normal air. You don't need a fan to provide air exchange in a greenhouse. Simply take a knife and slice the plastic from top to bottom in a few places. This will allow normal room air to circulate into and out of the mini greenhouse. Use a cool mist humidifier (or two) depending on size to provide humidity, not air exchange. Trays of damp, well-drained perlite placed on empty shelf spaces and the floor will help to catch drips and return them to the air as humidity. To repeat, a mini-greenhouse should have high humidity and high air exchange, with very bright high frequency lights such as natural daylight fluorescent on a 12/12 cycle for best results. Don't waste time stressing over filters or other means of scrubbing the air. It isn't necessary.

HUMIDIFIER/GREENHOUSE - You don't need distilled water for your humidifier. I've used tap water for many years in different parts of the world. It's fine. You also don't need to clean it with bleach once a week. When it starts to get nasty, clean it in the sink with soap and water. Impeller type humidifiers DO move air, but not much. They are the type to use for mycology. You don't need one for a monotub or terrarium, but when you move up to a mini-greenhouse, you'll want one. Wicking type humidifiers will work fine in the room your grow is located in, as a way to boost the ambient humidity, but they can't produce enough humidity for mushrooms. After about 60% to 70%, they won't evaporate any more moisture into the air.

GREENHOUSE FC - http://www.littlegreenhouse.com/accessory/controls2.shtml
I also have the humidistat they sell on that same page, but if you order it, be very careful to always harvest before a major spore drop occurs, because the spores will jam up the mechanism, causing the humidistat to fail. The cycle timer mounts outside the greenhouse so it's safe. Also, the humidistat won't provide over 80%, which is fine for cased substrates as long as you put a sheet of wax paper over the casing layer during pinning initiation.

GREENHOUSE/COOLMIST - With mine inside the greenhouse, it only needs to run one or two minutes, followed by five to seven minutes off. I tweak the cycle timer depending on season and ambient humidity in the room. If you run it longer than fifteen minutes, you'll have water everywhere. I burned up at least 20 cool mists before I stopped modding them and placed them inside. The same two cool mists have now been in the mini-greenhouse for over two years. Using hoses creates static pressure that ruins the bushings, thus burning out the motor in a very short time. Cool mists are designed to provide humidity, not move air.

HUMIDIFIER - I've always recommended people in dry climates run a humidifier in the general area or room their grow is located. If you can bring the ambient humidity up to 50%, you'll have no problems. While it's true that Seattle has a damp climate in the fall, winter and spring, summers are very dry here. I always run a cool mist 24/7 in the room my terrariums are located. This becomes especially important if using a terrarium with many holes drilled into it. Air exchange is a major pinning trigger as well as preventer of contamination, so make sure your ambient humidity is up to the task.

HUMIDIFICATION CASING/CAKES/GREENHOUSE/FC - Get rid of standing water. If you can't find perlite, you can use paper or cloth towels in the terrarium. Replace paper towels or wash cloth ones every three days to prevent molds and/or bacteria from growing on them. I've ran terrariums with a large bath towel soaked, then well rung out and folded loosely, then laid into the bottom of the tub. Humidity stays as high as several inches of perlite. People with humidity problems in mini-greenhouses can also hang a damp bath towel or two inside the greenhouse for a great boost.

GREENHOUSE, HUMIDITY - Simply run an additional humidifier or two 24/7 in the room your greenhouse is located. Get your ambient room humidity up to 50%, and you'll not have trouble maintaining humidity in the martha. This will also make your house more comfortable and much more economical to heat. In fact, you should run several humidifiers in your house during the winter. The wax paper tek works great. Lift it to mist, and change it with a fresh sheet every two days. Wrinkle it up, and then flatten it back out so plenty of air can still circulate under it.

GREENHOUSE FC AIR EXCHANGE - I have several large slits, and even a few holes cut in the plastic for air exchange. In fact, the door is simply a large sheet of plastic sheeting hanging from the top, with a weight on

the bottom to hold it down. The full length of both sides is not connected, so two large slits run from the ceiling to the floor of the greenhouse. The more air exchange you can give the better, as long as you can maintain humidity. That is the reason I moved the cool mist into the inside, rather than on the outside.

GREENHOUSE COOLMIST - Put it at the bottom. A cool mist needs to shoot a mist straight up about 5 feet to work properly. Mine sit on the floor of the mini-greenhouse, one on each side of the shelves. Cut a hole in the plastic right next to where the humidifier sits, and it will draw in some fresh air and also mix with the air inside to give you a nice 95% humidity easily. Giving lots of fresh air in a greenhouse is easy. Simply use a knife to cut slits and holes in several places.

GREENHOUSE - For years, I've been running a self-contained AC unit in my mini-greenhouse during the summer months. It will seriously dry out the air, so you'll have to provide for increased humidification. Get a stand-alone unit so you can circulate the same air. Don't use the central AC unit from your house. The house AC will push the humidity out. A good humidifier might be able to keep up, but it will take some tweaking, so you'll just have to experiment.

MARTHA HUMIDIFIER - One hour is too long to run the humidifier. More than a few minutes at a time will cause drips to form. I run mine less than five minutes on followed by five to ten minutes off. This maintains a high humidity without excessive dripping. You need to seal the bottom and put several trays of perlite down there to catch whatever drips do form. At the very least, get a timer with 15-minute intervals. They're cheap. Try running 15 on, 30 off.

HUMIDIFIER/GREENHOUSE - The inside of a cool mist type humidifier is always at 100% humidity because of all the mist flying around in there. You can run a cool mist, such as the vicks kaz models inside the greenhouse without problems. I've done so for years and wouldn't recommend something that wasn't safe. I'm an electrical engineer, as well as licensed journeyman electrician, so am qualified to make that determination.

HUMIDIFIER/COOLMIST - They don't crap out because of humidity. They crap out due to backpressure in the hose, which forces moisture into the motor bearings, ruining them, which then burns up the motor due to the extra load. That's why they're best used inside a greenhouse. They will also raise the humidity more because they're recycling already humid air, rather than dry air from outside.

MARTHA - FAE is 'Fresh Air Exchange' and is provided by ventilation holes cut into the mini-greenhouse. Cool mist humidifiers are designed to raise humidity, not move air. If you try to use one to move air, it will only last a very short time due to the static pressure produced, which ruins the motor and bushings. For best results, use a humidifier for humidity, and vents for air exchange.

MARTHA FC HUMIDITY - I know from experience if I allow the cool mists to run for more than two minutes, they begin to drip because the air can't absorb the moisture as fast as one of those can put it out. However, you can run them one minute on, then two to ten minutes off and get 80 to 90 percent humidity with no drips. It takes a good cycle timer to do it, but the results are worth it.

GREENHOUSE AIR EXCHANGE - Humidifiers are for humidity. Fans, fanning, open vents or doors are for air exchange. I have openings cut all over my greenhouse so air can circulate in and out top, bottom, and sides. Constant air exchange, with the humidifier inside the greenhouse gives excellent performance. I can actually maintain 99% humidity, just like a terrarium.

MARTHA TIMER FC - I agree. Short cycles are the key. I'm running mine about a minute on, then about six minutes off. The link below will get you a good prewired timer for $120. Scroll to the bottom of the page and look at the Cyclestat 4 timer. It's what I've used for two years now and it's still working great. http://www.littlegreenhouse.com/accessory/controls2.shtml

FAE GREENHOUSE - If you open windows while doing sterile work, it hurts. If you open windows near your greenhouse or terrarium, it won't hurt at all. In fact, I have a 4" clothes dryer hose connecting my mini greenhouse to the outside. Just make sure you shut everything before you do any sterile work. You want totally still air for that, plus a glove box.

GREENHOUSE - Toss out the ultrasonic and get a spinning impeller type cool mist, and set it inside the

greenhouse. Adjust the timer so you get the desired level. I use one minute on, six minutes off. In the winter when ambient humidity is lower, I use one minute on, four minutes off. You'll have to tweak your own setup depending on your ambient conditions.

HUMIDIFIERS - Cool mist humidifiers cost from $15 to $35 brand new, and a fraction of that at thrift shops. If necessary, run one in the room your fruiting chamber is located in. Right now, the ambient humidity in my house is 11% and my FC is at 98%, using only perlite and 1/4" holes drilled into all six sides. I fail to see why you're having so much trouble.

COOLMIST FOR FAE - Actually, the spinning disk type humidifiers burn out from the static pressure. The problem is that it forces moisture into the motor bushings, ruining them. I've used up to a 2" PVC pipe leaving the humidifiers and still had them burn up within two months. By leaving them inside the greenhouse, they last a year or more.

GREENHOUSE TEMPERATURE - Check your thermometers. There might be a degree or two of evaporative cooling until the humidity stabilizes, but the temperature of the room and the greenhouse will be the same. Usually, the greenhouse is a few degrees warmer with the lights on, then exactly the same as the room with the lights off.

MARTHA PROBLEMS FC - The tiny drops won't hurt, but if they build up, you're in for problems. This is a very common problem when running cool mists 24/7 because the air can't absorb all the moisture you're pumping into the greenhouse. If your casing layer becomes waterlogged, it won't pin.

COOLMIST - Cool mists can't build static pressure or the motor bushings get wet and ruin. If you use hoses from the humidifier to the GH, you cause static pressure to build. If you put the cool mist inside, you get high humidity, and if you cut slits you get FAE, plus the humidifier will last for years.

GREENHOUSE - Unzip and leave it unzipped. Continuous air exchange if preferable to occasional air exchange. I have holes cut all over mine and keep the door half open all the time, and easily maintain high humidity with two cool mists. My greenhouse is about the size of three martha units.

GREENHOUSE - Cool mist humidifiers need a free space of at least five feet above them to work properly. Your mist is blowing right on the bottom of the trays above, thus the mist can't evaporate into the air, but drips back down. For a fruiting chamber of that size, perlite is recommended.

MARTHA/GREENHOUSE - If you'll put trays of damp perlite on the empty shelf space and floor, you can easily get 99% humidity in a martha with a cool mist. I place mine inside the greenhouse, which raises humidity even more because it recirculates already humid air through the cool mist.

MARTHA FAE - I'd put two cool mists on timers or a humidistat inside the greenhouse for humidity, then simply cut about ten to twenty holes big enough to stick your arm through at various points in the sides. Put half the holes you cut high, and the other half of the holes down low.

COOLMIST - On the vics cool mists, the V shaped nozzle that spins in the water is detachable. Simply prevent the disk from turning, and rotate the nozzle half a turn and it will separate. It might have become clogged up inside where the rifling is, when you cleaned.

GREENHOUSE FC - I used a cool mist as you are for a year or two before settling on the way I now do it, with the cool mist sitting directly on a shelf inside the greenhouse. You'll need to connect it to a humidistat or timer to keep it from saturating everything inside.

MARTHA GREENHOUSE - Just put it inside for humidity, and leave a flap open or the door unzipped, etc., for constant air exchange. This system will get you to 95% humidity. You can use trays of perlite to catch drips and return them to the air as humidity.

HUMIDIFIER - I run mine less than five minutes on followed by five to ten minutes off. This maintains a high humidity without excessive dripping. You need to seal the bottom and put several trays of perlite down there to catch whatever drips do form.

GREENHOUSE - CO_2 isn't a problem in a greenhouse if you cut lots of small holes or windows. You can also leave the door cracked open. Put the humidifier on the floor or a lower shelf so it can shoot up and dissipate, rather than hit the ceiling of the unit.

MARTHA HUMIDITY - If you need even more humidity until you get it filled up, you can put trays of damp perlite everywhere you don't have a project sitting. It can sometimes be hard to keep enough humidity in an empty greenhouse.

FC. GREENHOUSE COOLMIST - If you live in the desert, you should run a cool mist 24/7 in the room your grow area is located. That will raise the humidity up to around 50% or so, making it easier to maintain 90+ in your

COOLMIST GREENHOUSE/MARTHA - I only use cool mists, with trays of perlite on the floor to catch drips. As you can see, it's steady at 95%. Put the cool mist inside the greenhouse and run it no more than 25% of the time.

GREENHOUSE FC - When fruiting cased substrates, I run it one minute on, six minutes off. Of course, these figures are based on my unique setup, so you'll have to experiment to find the sweet spot in your operation.

COOLMIST - An impeller type cool mist unmodified sitting on the floor or bottom shelf running a few minutes on, then a few minutes off will deliver 90% to 95% humidity.

FC MARTHA - MARTHA! Using a sonic Humidifier and Cool Mist...Providing plenty of FAE (Fresh Air Exchange) and RH (Relative Humidity) holes, flaps, cut open.

GREENHOUSE - If you're going to run a cool mist into a terrarium for air exchange, run it no more than one or two minutes per hour. That is a fact.

GREENHOUSE FC - You still want the greenhouse open though. The more openings the better as long as you can maintain humidity.

HUMIDIFICATION FC - Line the bottom of your terrarium with 2" of damp but not wet perlite, and watch your humidity go to 99%.

DROPLETS MARTHA - Lay wax paper loosely over the trays to prevent water droplets from falling on them.

HUMIDIFIER TIMING FC - I run the humidifier for two minutes every fifteen.

COOLMIST/HUMIDIFER/ULTRASONIC - Vicks 400 humidifier'

HUMIDIFIER - A vicks 400, 420, or similar will last for years.

TEK/SUBSTRATE/CASING ADDATIVES

PASTERUIZING TEK - Pasteurization tek
Load the pre-moistened to field capacity casing mix, compost or manure into quart mason jars. Place a lid and/or foil over the top. Put the jars into a large covered pot of cold water, with the water filled to 2/3 to ¾ of the way up the jars. A large kettle or pressure cooker works well. If necessary, put a plate or some other weight over the jars to prevent them from floating. Make sure you have a spacer or dishtowel under the jars to prevent the direct heat of the stove burner or flame from cracking your jars. Place the lid on the pot and turn on the stove. Bring the water to a boil, but watch over it and as soon as the water actually reaches a boil, shut off the stove, but leave the pot sitting on the burner. The preceding is for an electric stove that will remain hot for a little while after shutting off power. If you use gas, allow the water to boil for one to two minutes before shutting off the stove. After a couple of hours when they've cooled, the jars can be removed and used.
The first time or two you use this technique, monitor the interior of your jars with a meat thermometer. Place it right into the center of the peat or compost. You want to make sure the center of the jar reaches at least 140F and stays there for an hour, but don't allow it to exceed 170F. Depending on the thickness and capacity of your kettle and lid, you may need to adjust the above times slightly. This tek works because glass is an

insulator, so the temperature inside the jars lags the water in the kettle. When I use the above procedure with 7 full quart jars in my All American 921, it comes out perfectly just as written. If you use a smaller pot, you may need to turn the stove on briefly at the ½ hour mark for a few minutes.
The advantage to this tek is there is no pillowcase, etc., to drain and little to no mess or stink is made in your kitchen or pressure cooker. The disadvantage is you have a bunch of jars to wash when you're done.

WOOD LOVERS TEK, NO PC! - Wood Lover Smoothie Tek
Last year I had an idea for a cultivation of wood lovers that absolutely begged to be put to the test. I have put it to the test, and I succeeded.
There was NO sterile technique.
There was NO agar.
There was NO grain.
There was NO Pressure Cooking.
There was NO oven heating.
And yet I succeeded. I am now the proud owner of a storage box with 15 liters bright white, strongly rhizomorphic Psilocybe cyanescens mycelium, with that special mycelia odor I have come to love so much.
What did I do?

- -

WOODLOVER SMOOTHIE TEK

1.soak the right kinds of dried woodchips in desinfecting water for three hours.
You can prepare this solution easily by adding 100ml household bleach (5% sodium hypochlorite without additives) to 10 liters of water. Don't worry; it's what they use in swimming pools and in commercial edible mushroom cultivation.
2.leach the woodchips for several hours to get rid of excess moisture.
3.take fresh woodlover mushrooms, add ten parts of water and blenderize it to a "woodlover smoothie". Your goal is to create a suspension of very fine mycelium bits and spores in the water, so blenderize for a full minute, even when the job seems done in 15 seconds. You are creating very heavy mycelia inoculants in a liquid that has as much spores as spore syringe fluid. I used 30gr fresh Psilocybe cyanescens mushrooms in 300ml water to inoculate 15 liters of soaked woodchips.
4.spread out the woodchips and sprinkle the mycelial solution over it, turning it regularly with very clean hands or gloves. Your goal is to get a dab of the mycelium/spore inoculant on every bit of wood. When you are done, keep mixing up the woodchips because the inoculated chips will rub off mycelium onto the untreated chips.
5.put the woodchips into a plastic storage box and cover it with a sheet of plastic, which you fasten with clothespins. It should breathe, but not let dust fall in. Store this in the dark at room temperature. The woodchips will colonize in the usual time of a spawn inoculation.
There you have it! With wood lover mushrooms you collect in the wild you can very easily create loads upon loads of mycelium. Once the mycelium has colonized the woodchips, you can use one part of this spawn to inoculate five parts of moistened woodchips.
A couple of small wood lover mushrooms inoculate a storage box, a storage box inoculates a thrashcan and a thrashcan full of spawn can be used to inoculate several gardens and wild patches.
This TEK can be used on any scale. You can inoculate a few jars with one tiny mushroom you found, or load up a super soaker water gun and guerilla-inoculate a whole mulched park.

PHONEBOOK TEK - Phonebook Tek
You can inoculate pf cakes with oyster mycelium and grow out your spawn that way without a pressure cooker. Cut out a couple of dvd case sized holes out of the middle of the phone book, so you'll have a place to put a few slices of your cakes so they can inoculate the paper. After cutting the openings, you can boil the phonebook in water for a few minutes to sterilize/hydrate it, and then when it cools, simply open it up with clean hands and put your spawn into the places you've previously cut out. Did you see my phone book thread in the gourmet and medicinal mushroom forum? If not, take a look. Below are Hericium (Lion's Mane) but oysters grow from the same substrates. I'll have some oyster pictures on phonebooks soon. They're pinning now along with the Shiitake.


THE UNITED STATES OF AMERIC
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ONE DOLLAR

CASING TEK - Casing tek
Measure the appropriate amount of dry peat moss for your application. For the first few times you make up casing mix, you'll just have to take an educated guess as to how much to prepare, then add or subtract from that amount as needed for future projects.
Place the dry peat into a large bowl, five gallon bucket, wheelbarrow, etc., depending on amount. Leave room for the quantity to double, and still allow space to stir. Break up the dry peat very well. There should be no chunks when you get finished, having carefully broken up the peat until it's all the same consistency. To each cup of peat moss, add one teaspoon of hydrated horticultural lime, and one to two tablespoons of gypsum. Certain species can benefit from two tablespoons or even more of gypsum per cup, so don't be afraid to experiment, up to ten percent of the amount of peat.
Mix these dry ingredients together well. After mixing, slowly add water to the mix, stirring constantly. Add moisture until field capacity is achieved. I define field capacity as being reached when you can pick up a handful of the mix and no water drips out. If you squeeze lightly a few drops will come out, and if you squeeze very hard, a small rivulet or stream will flow out. Remember, the peat will not absorb all the water at once, so when you reach field capacity, let the mix sit for ten minutes and check again. Chances are, you'll have to add more moisture.
In a separate bowl, place an equal amount by volume of vermiculite. Fill the bowl with water so the vermiculite begins to float a bit. Turn the bowl over and allow all the water to drain off. A fine mesh strainer works well for larger amounts.
Mix the moistened vermiculite with the moistened peat/lime/gypsum very well and pasteurize at 140F to 160F for one hour. Use as soon as it's cooled. If you don't use it all, it's best to discard or use for your houseplants. Make a fresh batch every time for best results.

MY RYE TEK - My rye tek:
Measure out your organic rye berries from a health food store, one cup for each quart jar you intend to make. Place them in a large pot. Rinse the heck out of them. Fill the pot with hot tap water, shake and swirl it around

and pour it out. Do this three or four times until the water you pour out is clear. You'll be able to see when you have nice clean water to pour off instead of water filled with chaff and dirt.
You want to now cover the rye berries with three times as much hot tap water as you have rye. Use half coffee and half plain water. In other words, if you have two inches of rye in the bottom of your pan, you should have six inches of water/coffee above that, for a total of 8 inches.
Add 1/4 teaspoon per cup of rye of gypsum. Stir into the water/grain well. Cover and leave this to sit for 24-36 hours. Don't freak out if you go 48 hours and it smells like it's fermenting. No problem.
Stir well and set the pot on the stove. Bring to a boil. Boil for ten minutes, then, WHILE BOILING, drain the contents through a very large colander. (Spaghetti strainer) If you're making a large batch, you may need more than one colander. Tip the colander side to side to get the rye to drain as much of the water as you can. Then, shake the colander in order to 'toss' the grain. This will cause a lot of steam to rise from your rye. Great. Do this a time or two, and then let it sit for five minutes, then repeat. When all the moisture that will drip or evaporate from your rye has already done so, load your jars. The rye should look and feel dry to the touch when you load the jars. All the moisture you need is inside the grain.
Fill jars no more than 2/3 full if they are to receive grain-to-grain transfers, or no more than 3/4 full if they are to be inoculated by spore syringe or agar wedge. Use a lid with a synthetic filter disk, polyfill, tyvek or similar. Cover with foil and PC the jars for at least 90 minutes at 15lbs. When the jars are cool, they're ready to inoculate.

AGAR TEK - Here's how to do it. Get a whiskey or wine bottle with a screw on lid that will fit in your PC. Drill a hole in the lid and stuff it with polyfill or cut a synthetic filter disk to fit inside the lid. Prepare your agar and pc in the normal way. The filter will prevent contaminants from entering the agar as it cools.
Build a glove box. You can make one for the price of a clear Rubbermaid. All you need is a couple of arm holes. You don't even need-attached gloves, but if not, then be sure to wear latex gloves when you pour your dishes.
Allow the agar to cool almost to room temperature without opening the filtered whiskey bottle it's in. When it is cooled off, but still liquid is when you want to open it up to pour. Work fast. Open your sleeve of presterilized dishes just before use. Wash the outside of the sleeve with alcohol before opening carefully from one end.
Stack your dishes in two piles of ten. Pour the bottom dish by lifting the entire stack, then set it down and pick up the other nine. Repeat until you've filled both stacks, then CAREFULLY insert the sleeve back over the Petri dishes and seal the bottom so it's airtight.
The above procedure should give you a 100% success ratio with a bit of practice. I find no difference in contamination rates with a glove box or flow hood, but of course the flow hood gives you more elbowroom and is much easier to work in front of.

GYPSUM SOAK TEK - I add gypsum to the water the grains soak in. The first step is to wash the grains very well. Put them in a pot of water and swirl it around, then drain the water out. Repeat a few times until the water pours off clear. If you skip this step, your grains will be clumped up and sticking together whether you use gypsum or not.
Fill the pot with hot tap water and soak the grains for 24 hours. Add one tablespoon of gypsum for each two gallons of soak water.
After 24 hours, bring the pot of water/grain/gypsum to a boil for five minutes. Drain while still boiling into a strainer and allow to drain well for five minutes. Shake the colander to toss the grains in the air a bit to let the steam evaporate the moisture off the surface of the grains. Fill jars 2/3 full, cover with filtered lid and pc for 90 minutes after covering the top of the jar with aluminum foil.
If you'll follow the above instructions, you can leave the PC'd jars in the pressure cooker overnight to cool to room temperature. When you remove the cold jars and turn them upside down, every single kernel will separate from every other kernel, and they'll flow almost like sand in an hour glass, with absolutely no sticking or clumping. I'm no fan of micropore tape. Drill two very small holes of 1mm or 1/16" in the lid, then use a synthetic filter disk or extra thick (not post office) tyvek. Good luck.

AGAR POURING TEST TUBES - Fill your test tubes 1/2 full. I always insert a piece of wood, such as a medical tongue depressor into each slant. The mycelium colonizes the wood and lasts much longer under storage.
Get test tubes with screw on lids. Drill a 1/8" hole in the lid. Cut a synthetic filter disk to fit inside the test tube lid. Screw the lid down tight, and PC in a rack with the test tubes standing upright.
When removed from the PC, lay the rack over with a jar lid or something under one side so the test tubes are

at an angle as they cool. Try to get the mycelium within 1/2" or so of the opening, so you don't have to reach in as far when you want to get some myceium out. You'll have to flame any part of your scalpel that penetrates into the slant, so it's easier if you don't have to reach in as far.
I use triple the usual amount of water in the PC when I make agar so that the PC cools down slower and releases pressure slower to prevent boil over. One should NEVER lift the weight or release the valve to let pressure off a PC. It ruins the product inside. Agar boils over and grains (or your pot roast) dry out.
You also shouldn't use a jar for preparing agar. Use a whiskey bottle or something similar with a long neck that is made for pouring. It also will have a smaller opening that will be less prone to allowing contaminants to enter.

ALDER - I have an excellent source of hardwood (Alder) sawdust and chips in Seattle, but I've already looked into selling it in bulk and the shipping would cost more than the chips. You can call a local tree trimming company and ask them to dump any hardwood chips they collect in your yard. They're free that way because they need a place to dump them. You really need to find a sawmill to get the sawdust though. You don't want what you'd get from a woodworker or furniture shop because it's too fine. You want course sawdust. Sometimes, the pellet fuel you get for stoves is made from hardwood sawdust, and if so it works great. Most of what I've seen lately is pine, and not usable.

GENTAMICIN SULPHATE - Gentamicin sulphate has a place in agar work. Some growers have added it to grains, but I would discourage the practice. Not only is it expensive, costing about $5 to $10 for enough to do a 1 quart grain jar, but I'd worry about creating super strains of antibiotic resistant bacteria.

SEAWEED - Seaweed is extremely high in natural tryptophans, thus the reported increases in potency. I live on the coast, so go out and pick up seaweed off the beach. After drying, I mix it in with my bulk substrates at about ten to twenty percent. The myc colonizes it almost as well and fast as straw.

BLOODMEAL ONLY IF COMPOSTED - For nitrogen, you can add blood meal to all substrate materials including horse manure, at the rate of one tablespoon to ten cups of substrate. It really does make a difference in the quality of your crop after harvest.

HAIR - Yes. In fact, you can compost hair and grow mushrooms on it. I've been wanting to do a 'barber shop' grow for some time now, but just haven't gotten around to it.

PINE SUBSTRATES - Pine shavings are antifungal and used to control odors.

BROWN RICE GRAIN - Brown rice flour has more food for mycelium per gram than grains such as wbs. Your contention that BRF isn't 'nutritious' is in error. Have you ever noticed a 1/2-pint brf cake flushing? There are only a few tablespoons of brown rice flour in a cake. No other grain will perform as well in such small quantities.

BROWN RICE FLOUR - Actually, brown rice flour is far more nutritious than manure. All grains are. That's why when we use manure we use a much larger substrate. There are only a few tablespoons of brf in a 1/2-pint jar, yet they can grow some crazy mushrooms. A few tablespoons of manure will get you nowhere.

COCO COIR - About 4 years ago, I was the very first one to post that coir is a substrate material. After a year of flames from people claiming that "Coir has NO nutes", somebody else finally tried it, and then somebody else, and so on. Experimenting is how we learn. Plain vermiculite has been used as a casing layer hundreds, if not thousands of times. I used it many times myself, but I've said this for years, and the results of many experiments still hold true; Plain vermiculite is a horrible choice for a casing layer. It would be really nice for a change to see someone actually experiment and then report the results, rather than endless posts about 'will this work?' or 'will that work?' and then arguing about it. Just do it. If you really want to experiment, try something that hasn't already been tried a thousand times. Look in your kitchen, find something silly, and then grow mushrooms on it. It's fun.

COCO COIR - There are no rules for mixing substrates. Coir can be used as is, or you can dump in a few days worth of coffee grinds from your leftover morning pots of coffee. Worm castings, horse manure, etc., can all be added by the handful, or each can even be used for 100% of the substrate. Use between 5% and 10% gypsum by volume. Use 1/2 teaspoon of hydrated lime per cup of manure-based substrates.

COCO COIR - Coco coir is much better suited as a substrate material. It's superior to cow manure and nearly as good as horse. In fact, lots of growers use coir to fluff up their manure or other compost. I do not recommend using coir in a casing layer, although many growers do. In my opinion, the best casing mixture is peat/vermiculite. I'll bet that coir compost would make an excellent substrate.

COCO COIR - Every brick of coir I've ever tested was in the pH 5.0 to pH 6.0 ranges. You need to use gypsum and lime.

COCO COIR - Add 10% coir to your casing mix. That is somewhat like CAC'ing that some edible growers do.

COIR - Coir has as much food for fungi as horse manure and will grow very similar crops to horse manure.

COFFEE - Whether you believe it or not, the evidence is overwhelming with thousands of growers using it for many years. In fact, at least one commercial oyster farm in my area uses it exclusively for a substrate. Weak liquid coffee is used to hydrate grains instead of plain water. This provides a nutrient boost, and also lowers pH, which decreases colonization time. As a substrate additive to other ingredients, it raises the nitrogen levels, and nobody even knows how many of the other hundreds of ingredients such as antioxidants play a part as well. Use the search function and you'll find several hundred posts on coffee going back to my original experiments in 2003. You can use weak coffee in the pf cakes, and use spent coffee grinds mixed into the coir. Don't use liquid coffee in the coir or you're likely to get mold. Also, coir is much better to use as a substrate than a casing. It tends to overlay when used for casing.

COFFEE - First, simply spread the coffee grinds out in the sun so they can dry. Once totally dry, they won't mold and you can store them until ready to use. Use them at up to fifty percent of any bulk substrate. Actually, you can use coffee grinds as 100% of the substrate if you want. I know a commercial oyster farm that uses free coffee from starbucks as their only substrate. However, if you're growing cubes, mix the coffee with any other bulk substrate for a great boost. They do NOT contaminate before you can get them colonized if you pasteurize first and have them at the proper moisture content. As with all bulk substrates, add gypsum at up to ten percent by volume.

COFFEE - Quite often, the whole is greater than the sum of the parts. Coffee has thousands of elements, nitrogen only being one of them. Coffee works, period. Who really cares 'what' causes it to work? Folgers and Hills Bros work as well as Starbucks. I've seen no real evidence that coffee increases potency. It does decrease colonization times, and provides for more prolific flushes. The results are particularly astounding with sclerotia producing species, but every mushroom species I've ever grown has done better with coffee than without it. Reishi on coffee can even.

COFFEE - I was the first one to bring the use of coffee to the community a few years ago. Here's a 50+ page thread to read if you have the energy.
http://www.shroomery.org/forums/showflat.php/Number/2283143#Post2283143 You can use weak coffee to hydrate your pf cakes. Use it at 1/2 drinking strength, but no more. Too much coffee actually slows down colonization. Some growers thing it's the nitrogen, some think it's the 'nutes', others think it's the antioxidants, etc. All I know is it works and helps, but as said, use weak coffee, not drinking strength.

COFFEE - If you don't drink coffee, try using something else instead, like bagged chicken manure from the nursery. Use it at no more than 1 part chicken manure to 20 parts of the other substrate materials. The reason I say that is coffee is pretty darned expensive to buy for a substrate. If you drink coffee anyway, no problem, but otherwise there are other materials that work as well. Coffee should be brewed before using. You can brew up a pot of coffee, then use the liquid coffee to hydrate your rye or wbs, and save the spent grinds for your substrate.

COFFEE - Properly used, coffee will decrease colonization time, and provide more prolific flushes. I've proved that for many years. A common mistake with coffee is using it too strong. As I've said countless times, it needs to be at 1/2 normal drinking strength. That means if you use a standard amount of coffee in your trusty Mr. Coffee, mix it half and half with plain water after brewing, and then use that to hydrate your grains. Mixing it stronger is counterproductive and will increase colonization times.

COFFEE - Correct. Spent coffee grinds are an excellent substrate material/additive, and 1/2 the normal

drinking strength (or less) liquid coffee can be used to hydrate grains prior to sterilization. It doesn't matter if it's rye or wbs. If you use it stronger than 1/2 drinking strength, it will slow down colonization. That means for every cup of brewed coffee you use, add one or two cups of plain water, and use that to hydrate the grains.

SPENT COFFEE GRINDS - In addition to Starbucks, just about any restaurant such as Denny's, IHOP, or your neighborhood greasy spoon, will give you their spent coffee grinds. Just tell the waitress to toss in filter and all, because the mycelium will munch those too. I once scored nearly a five-gallon bucket of free coffee grinds from IHOP that was generated during the hour I was eating my breakfast.

COFFEE GROUNDS - IHOP and Denny's also give away all their coffee grinds to whomever asks. It's better for our substrates and gardens than the landfills. You can leave the coffee filters in with the grinds when you use them too, especially for edibles such as oysters. This has all been posted before, but it's good for the new folks to see it again.

LIME SUBSTRATES COFFEE - Correct. I add a teaspoon of hydrated lime to each two to three gallons of weak coffee/water mix. Use coffee at no more than 1/2 the normal 'drinking' strength. Too much coffee will actually slow down growth, lime or not.

SUBSTRATES COFFEE GROUNDS - I'm inclined to think the benefits of coffee come from the anti-oxidants rather than the nitrogen or caffeine, but I'll be the first to admit it's just a hunch based on a few years of observation.

COFFEE - Use weak liquid coffee. Instant would be fine. It's part nutrients and part the lower pH that coffee provides. Rinsing before the soak is also an important part. That gets all the dust and chaff out of the grain.

COFFEE GROUNDS - I stopped at starbucks yesterday and picked up ten pounds. They keep it in bags right by the door. The employees at your store must be lazy and throw it in the garbage.

COFFEE GROUNDS SUBSTRATES - You can leave the filter in the mix too. Coffee filters make pretty good substrate. If it sits more than a few hours after brewing, pasteurize.

COFFEE - Nobody buys coffee for substrate. You either get it free from starbucks, Dennys, IHOP, etc., or you use your own leftover grounds.

COFFEE - Coffee prevents sprouting. Don't ask me why, but when I use coffee, the seeds don't sprout.

COFFEE GRINDS - Coffee grinds hold as much water per cup as vermiculite.

COTTON SEED MEAL - Cottonseed meal doesn't need to break down to become available. It becomes available as soon as the mycelium consumes it.

D/E RATIO - I'd put about a teaspoon of DE per cup of peat in casing and substrate mixes. It will help provide moisture for the flush.

DIATOMACEOUS EARTH - Diatomaceous Earth is also an excellent additive that holds tons of water. If you use DE, add it dry to the dry peat and lime, then hydrate. I think it was Agar that pointed me to using DE in casings. It definitely holds moisture and gives bigger fruits because the same amount of casing material holds much more water without being saturated.

D/E - Use DE at up to 5% by volume of the dry ingredients. In other words, one cup of DE for each 20 cups of dry horse manure, etc. I always mix all dry ingredients together first, then add water. With DE, you'll think you have the moisture content right, and then ten minutes later when you check, it's dry again. The stuff really absorbs a lot of water. I check and adjust at least three times at 20-minute intervals before loading into jars and pasteurizing.

GYPSUM - That makes no sense. In addition, every commercial agaricus farm I know of uses gypsum in their substrates. Gypsum is not used to change pH. That's the job of lime to raise pH or sulfur to lower it. Gypsum contains both calcium carbonate and sulfur, thus it tends to keep the pH near neutral, preventing swings as

the metabolites try to push the pH down. We add lime to make the casing layer inhospitable to competitor fungi, which are less tolerant of a high pH than established mushroom mycelium. Calcium carbonate or hydrated lime is not used to counter the effect of the metabolites. As said above, that's what the gypsum does. Use gypsum on substrates such as compost or horse manure, but don't use lime. Save the lime for the casing mix, where you should use gypsum and lime together. It's more of a stabilizer. Gypsum helps to prevent swings in either direction. The ability to prevent clumping is why we use a small amount in grain jars. I'm sure it's a side benefit in substrates and casings as well. The other benefit of gypsum is to supply calcium and sulfur, which are both essential for good fruit body formation. Some substrates seem to have enough of both to develop great fruits without it, but it's still there for the pH stability. I pay just over $3 for a 25-pound bag, which goes a long way, so there's no reason not to use it.

GYPSUM - Studies at commercial mushroom farms have shown up to a 20% increase in yield when gypsum is used over the exact same strain and substrate without gypsum. I've been saying it for years, Paul Stamets has been saying it for years, and you can google gypsum & mushroom farms, and see the results for yourself. Mushrooms are one of the best sources for humans to get calcium. The calcium in mushrooms is much easier to absorb into your system than calcium from dairy products. Doesn't it make sense to make sure your substrate has plenty?
A few years ago, they said I was nuts when I reported that coir is a useful substrate material. Everyone said, "coir has no nutes", as if mushrooms somehow need NPK. Search 'coir' and my username here and in advanced from 2003-2004 and you'll see what I mean. Then they said mushrooms would never grow on coffee-it's too acidic. Now they say gypsum provides little benefit, despite evidence to the contrary.
You can grow cubes without using gypsum, as we well know. However, you'll get more bang for the buck when using it. In addition, it keeps the substrate nice and loose for the mycelium to easily colonize, and it resists pH swings as the mushroom metabolites try to swing the pH lower.

GYPSUM CASING - 10% by volume the amount of substrate is the correct amount of gypsum to use. Just eyeball it. Anywhere from 5% to 10% is fine. Lime isn't necessary in bulk substrates, but don't forget to use it if/when you use a casing layer. It's necessary for casing material because it doesn't fully colonize with mushroom mycelium, and therefore the uncolonized parts are susceptible to contamination.
Mushroom size, provided you used a good substrate is related to moisture content. If you had coir/coffee then you had a good substrate. I'd speculate the small fruits were related to not having enough moisture. Next time, dunk after full colonization. I like to make my substrates up a tad on the dry side because they colonize faster that way and are less prone to contamination. Then, at full colonization, give a 6-hour dunk to re-hydrate the substrate before placing into fruiting conditions.

GYPSUM - Gypsum is calcium sulphate. It should be available at any nursery or garden center. If you can't find it, drywall (sheetrock) is made from gypsum. You can get a sheet of it and smash with a hammer to get the gypsum out. In fact, the garden gypsum I get at a nursery is a byproduct of the drywall industry. It even has some of the white and brown paper mixed in. Use gypsum at 5% or so by volume of the total amount of bulk substrate. You don't have to measure it exactly. If you have twenty handfuls of manure, toss in a handful or two of gypsum.

GYPSUM - Actually, that's right on. Gypsum isn't used to adjust the pH. A side benefit of gypsum is it tends to hold the pH stable, preventing a swing to acidic conditions caused by metabolism of the fungi. Sulfur and calcium are both essential for good fruitbody formation, so gypsum helps to ensure that our substrates have plenty. In addition, it's a soil conditioner that helps prevent clumping. In some species, such as Shiitake, gypsum has shown a 20% increase in yields over the same substrate without gypsum.

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GYPSUM YIELDS - Commercial mushroom growers report up to a 40% increase in total biomass harvested when gypsum is added to the casing mix. Shiitake growers report up to a 30% increase in harvests when gypsum is added to the woodchip/sawdust substrate. Gypsum supplies calcium and sulfur, both essential

nutrients in mushroom metabolism. It's used in grains to prevent clumping, but it's used in substrate and casing mixes to supply valuable nutrients.

GYPSUM - Gypsum contains both calcium carbonate and sulfur, thus it tends to keep the pH near neutral, preventing swings as the metabolites try to push the pH down. We add lime to make the casing layer inhospitable to competitor fungi, which are less tolerant of a high pH than established mushroom mycelium. Calcium carbonate or hydrated lime is not used to counter the effect of the metabolites. As said above, that's what the gypsum does.

GYPSUM - Calcium carbonate is lime. Hydrated lime is calcium carbonate (crushed limestone) that has been heated in a kiln. The result in brief, is that it becomes water soluable so it goes to work right away, making it my personal choice for pH control. If you use limestone, oyster shell flour, or calcium carbonate, there is a lag time before the lime raises the pH. You'll want to pH balance your casing material to a pH of around 8 to start.

GYPSUM - The horticultural grade gypsum I get here is obviously a biproduct of the drywall industry. It has lots of pieces of white and brown paper mixed in, just like sheetrock. I think it's the broken pieces from the manufacturing process that they chop up and put into bags. It works great. Remove the paper, but don't get too anal about a few scraps you might miss. The mycelium will colonize them easily.

GYPSUM - Gypsum adds calcium and sulfur, both essential mushroom nutrients and can provide for up to a 25% increase in yields. In addition, gypsum prevents the grains from sticking together, which makes it harder for the mycelium to colonize. There's not a commercial grow operation in the world that doesn't use gypsum, and their livelihood depends on maximizing yields and performance.

COIR GYPSUM - If coir is your substrate you 'can' skip the lime and just use gypsum. Coir has a pH of around 5, which is pretty darn low. Trichoderma prefers a pH of 5, so without lime or gypsum, coir and peat are perfect trich foods. We can get away without balancing coir because it colonizes so fast, but I'd still use gypsum, which tends to set the pH in the mid 6 range.

GYPSUM - Without ph strips, try using equal amounts of peat and vermiculite. Add gypsum at the rate of one cup to each ten cups of peat. Add one teaspoon of hydrated lime to each cup of peat. Mix all the dry ingredients except the vermiculite together, and then moisten. Add moisture to the vermiculite, and then combine the two. Let sit for half an hour, then begin adjusting for field capacity.

GYPSUM - Every agaricus farm in the world that I'm aware of uses gypsum in their substrates and casing. All you have to do is google 'agaricus' and 'gypsum' and you'll see. Gypsum tends to hold the pH stable, as the mushroom metabolites try to swing it lower. Gypsum is not a substitute for lime. You still need to pH correct casing material with lime.

GYPSUM - Gypsum has been used as a soil conditioner for a very long time, and in mycology since I've been around. I know several articles that came out in the 70's, showing a dramatic increase in yields across many species when gypsum at up to ten percent was added to the substrate.

GYPSUM - Gypsum will actually lower the PH slightly due to its sulphur content. Gypsum supplies both calcium and sulphur which mushrooms need. The advantage to gypsum is that it tends to hold the PH steady, not allowing radical swings either direction.

GYPSUM - The other benefit of gypsum is to supply calcium and sulfur, which are both essential for good fruit body formation. Some substrates seem to have enough of both to develop great fruits without it, but it's still there for the pH stability.

GYPSUM MANURE - Gypsum keeps the manure nice and fluffy and loose afterwards. Many hobby growers skip this step, but it really helps. I don't know of any commercial ops that don't use gypsum. It's well worth the few seconds it takes to add.

GYPSUM - Yes, sheetrock is gypsum. I had a muddy as hell pond on my property, so when I sheetrocked my new house, I threw all the leftover scraps into the pond. The water was crystal clear in two weeks!

GYPSUM - Use gypsum on substrates such as compost or horse manure, but don't use lime. Save the lime for the casing mix, where you should use gypsum and lime together.

GYPSUM - Every commercial agaricus farm I know of uses gypsum in their substrates. Gypsum is not used to change pH. That's the job of lime to raise pH or sulfur to lower it.

GYPSUM - To provide calcium and sulfur, and also to prevent pH swings. Gypsum tends to hold the pH stable, wherever you set it with lime.

GYPSUM - Don't forget the gypsum. It increases yields considerably and is well worth the effort to find. Lime to an initial Ph of 8.

GYPSUM - Gypsum also tends to stabilize the Ph, preventing swings either direction. I consider it mandatory for all substrates.

GYPSUM - The metabolites want to decrease pH, as in lower it. The gypsum tends to keep pH stable.

GYPSUM/LIME - If you add gypsum there's no need for anything other than lime.

CHEAP GYPSUM - A 50lb bag of gypsum is only like 4 bucks though.

GYPSUM - Most important one for pH stability is Gypsum.

MIXING DRY INGREDIENTS - Try baking a cake by mixing the flour in after you've added the wet ingredients and see what happens. It won't look like, taste like, or even BE a cake. The reason for mixing the dry ingredients together first, is because dry ingredients WILL mix together. Wet ingredients will clump and bond to each other, and not mix properly. It ain't dogma, it's common sense.

POPCORN - The large kernel size, means a larger space between the kernels, thus more WASTED space in a jar. You can observe this by simply looking. The larger kernel size also means less total surface area within the jar, thus LESS mycelium is produced. It's no secret that a quart of popcorn will colonize faster than a quart of rye, but it has only about 10% as much mycelium as the same sized jar of rye, therefore it's MUCH slower than rye for producing mycelium. There are far fewer inoculation points with popcorn, therefore it doesn't go nearly as far when used to spawn to bulk. There is no doubt that despite its higher contamination rate, it does work, but you could get the same results with rye or wbs by simply using 1/10th of a jar to inoculate a substrate rather than the whole jar.Once spawned, the larger kernels are more prone to drying out, which weakens the mycelium on them, then when re-hydrated, the mold spores that have landed get the advantage over the weakened mushroom mycelium, therefore the higher contamination rate also continues right through fruiting, with more trichoderma contamination later on down the line. In short, if there's NOTHING else available, use popcorn as a last resort, but only while you look for something more suitable. You're paying twice the price per pound of product to get ten percent of the mycelium, and that assumes that you have 100% success, which you won't.

CORN - Corn often harbors an insanely high amount of bacterial endospores that survive pressure cooking. In addition, the large kernel size of corn means there is far fewer kernels in each jar, thus less mycelium in each jar than if a traditional spawn such as rye was used. Corn was never good and now bad. It was always bad. That's why not one single mushroom farm uses it for spawn generation, and they depend on success to make a living. Some people have success with corn. I made hundreds of projects with corn and had success, but not at the same rate as with rye, and it was never as good as rye when it comes to grain to grain transfers or spawning, because you need to grow out four or five times as many jars to get the same amount of mycelium, thus further increasing your chances for contamination.

DIATOMACEOUS EARTH - It won't do squat for the gnats once it's mixed into the substrate. DE has other benefits though, such as holding a LOT of water, so it's good to use. At one time, I'd put about a teaspoon of DE per cup of peat in casing and substrate mixes. It will help provide moisture for the flush. DE must be totally dry to work on insects. It works in much the same way a pile of broken glass would cut you up if you had to crawl naked on your belly across it.

DIATOMACEOUS EARTH - Don't go over 5%. That might even be a bit much. The only real benefit is it holds so much water. I've used the baited and unbaited and both work equally.

HAY - Hay doesn't work. It has flat stalks and seeds which will contaminate. You want straw instead. Straw needs to be pasteurized, never sterilized.

HYDRATED LIME/GYPSUM - Calcium carbonate is lime. Hydrated lime is calcium carbonate(crushed limestone) that has been heated in a kiln. The result in brief, is that it becomes water soluable so it goes to work right away, making it my personal choice for pH control. If you use limestone, oyster shell flour, or calcium carbonate, there is a lag time before the lime raises the pH. You'll want to pH balance your casing material to a pH of around 8 to start. I won't speak for why someone made a mistake on their website, other than stuff happens like that in any technical field. In addition, my experience isn't the last word on any subject. I have however, sent them a pm. With the amount of gypsum you'll use, and the fact that it's heavy and expensive to ship, I'd suggest a local nursery. I've never yet been to one that doesn't carry it. I get 25 lb bags of horticultural grade gypsum right up the street for just over $3. If you can't find it locally, and don't want to smash up a sheet of drywall (sheetrock) order your gypsum from a vendor.

GYPSUM/LIME - Actually, gypsum contains calcium which raises pH, and sulfur which lowers pH, resulting in a buffer that prevents wild swings in either direction. We use lime to raise the pH only for the reason that mushroom mycelium is more tolerant of a high pH than mold mycelium is. Both mushroom and mold mycelium grow best in a pH of around 5.5 to 6, but since mushroom mycelium can tolerate the higher pH, we do that so our casing layer favors it over molds. I use 1 teaspoon of hydrated lime per cup of peat. Don't figure the verm when calculating lime. Use gypsum at 5% to 10% by volume of the amount of peat. In other words, for ten cups of peat, use 1/2 to 1 cup of gypsum. As said above, always mix the dry ingredients first, then add water.Gypsum, as I said, prevents swings in either direction, but the commercial growers long ago realized that it also increases disease resistance and also increases the size of the mushrooms by providing valuable trace nutrients and minerals.

GYPSUM/LIME - 'Spawn' is your grains, and you can add a pinch of gypsum between your thumb and forefinger to each jar, or add a tablespoon to each few gallons of soak water that you soak the grains in to hydrate them. Add gypsum to your coir and manure substrates, but lime is usually optional because they're not generally exposed to contaminants except during colonization, and they've already been pasteurized just prior to that. Lime is for casing layers that are exposed to the natural contaminants in the air for extended times. We don't lime for the mushroom mycelium, because it actually prefers acid conditions. We lime for the contaminants because they are less tolerant of a high pH than mushroom mycelium.

HYDRATED LIME/GYPSUM - Actually, you want hydrated garden lime. Ground limestone takes too long to break down and go to work. Hydrated lime is water soluable and goes to work right away. A combination of hydrated lime and gypsum is the best way to buffer a casing layer. The most critical time for contaminants to enter a casing is during the initial colonization and first flush stages. Once the layer is fully colonized, it's very contaminant resistant. Hydrated lime and gypsum protect your casing layer during this critical early stage, where ground limestone or other buffers that take weeks or even months to break down do not.

GYPSUM/LIME - We use lime to raise the pH only for the reason that mushroom mycelium is more tolerant of a high pH than mold mycelium is. Both mushroom and mold mycelium grow best in a pH of around 5.5 to 6, but since mushroom mycelium can tolerate the higher pH, we do that so our casing layer favors it over molds. I use 1 teaspoon of hydrated lime per cup of peat. Don't figure the verm when calculating lime. Use gypsum at 5% to 10% by volume of the amount of peat. In other words, for ten cups of peat, use 1/2 to 1 cup of gypsum. As said above, always mix the dry ingredients first, then add water.

HYDRATED LIME - Make sure you use horticultural grade hydrated lime. If you got the masonry lime for mixing with mortar, it will cause the problem you're seeing. Using horticultural hydrated lime, a good ballpark figure is to use one teaspoon per cup of peat. Don't count the verm when adding lime. Also, make sure you mix the lime and gypsum together first, and then mix those into the DRY peat before adding moisture. If the peat is wet, the lime will dissolve and clump, meaning it won't mix well. You'll have zones of very high pH and zones of low pH.

HYDRATED LIME - The calcium carbonate is used to raise the pH. I prefer hydrated lime because it goes to work right away when you need it. We don't lime for the mushroom mycelium, because it actually prefers a slightly acid pH. We lime because contaminant molds require a low ph, so by making it 7 or above, the casing layer favors mushroom mycelium over molds. I'd suggest a teaspoon of hydrated lime per cup of peat. That will get you into the ballpark without danger of making the casing too sweet.

HYDRATED LIME - Mushroom mycelium prefers a pH of 5 to 6, so you're fine. We pH balance casing layers because they're left exposed and non-colonized on top of the substrate. For casing layers, hydrated lime is best because it goes to work right away. Calcium carbonate takes time to break down, so is of less use since the average life of a casing is only a few weeks.

HYDRATED LIME - As we know, mushroom mycelium grows fastest and is perhaps the happiest with a ph of around 6. Unfortunately, that is also the ph favored by most other fungi, which includes the mold fungi that are the enemy. We use lime because mushroom mycelium can tolerate a higher ph than the green molds can.

FINDING LIME - Lime can be hard to find locally if you live in an area that has alkaline soil. In areas where the soil is acidic, lime is sold everywhere. You can order it online from doitbest.com Just search for 'hydrated lime' when you get to their site. They have two industrial types, and two horticultural types of hydrated lime.

HYDRATED LIME - The high ph does indeed slow down the mycelium a bit, but it kicks the trich in the butt. Another good trick is to sprinkle a bit of lime right on the surface of your casing layer. This creates a high ph zone right on the top where the trich and other contaminant spores land. Hope this helps.

HYDRATED LIME - If it says "Safer than hydrated lime" on the bag, it's the WRONG type of lime. Consider 2% Mg to be the upper limit. Use HYDRATED LIME. You don't want to adjust the pH of your casing material next year; you want to adjust the pH now. That means using hydrated (water soluble) lime.

HYDRATED LIME - You want to use hydrated lime or calcium carbonate for pH adjustment. However, hydrated lime is water-soluble so it balances the pH right away. Calcium carbonate is a long term buffer that is better suited to gardens, since mushroom casing layers are not used long term.

HYDRATED LIME - Coir has a pH of around 5, which is pretty darn low. Trichoderma prefers a pH of 5, so without lime or gypsum, coir and peat are perfect trich foods. We can get away without balancing coir because it colonizes so fast, but I'd still use gypsum, which tends to set the pH in the mid 6 range.

HYDRATED LIME - I recommend horticultural hydrated lime for ph control. It goes to work immediately, and lasts the life of the average casing layer. If you skip the lime, your casing layer will have trich quicker than it can flush. I also recommend using ten percent gypsum in a casing layer.

HYDRATED LIME - Oyster shell flour can be used, but isn't as effective as hydrated lime because hydrated lime goes to work right away when you need it. Once the substrate is fully colonized, it can take care of itself, making so-called 'long term buffers' unnecessary.

HYDRATED LIME - Consider 2% Mg to be the upper limit. Use HYDRATED LIME. You don't want to adjust the pH of your casing material next year; you want to adjust the pH now. That means using hydrated (water soluble) lime.

HYDRATED LIME - About one teaspoon of hydrated lime per cup of coir (after hydration) will balance it pretty close. Be sure to use agricultural grade hydrated lime, not the stuff for mixing cement or mortar for bricklayers.

LIMESTONE - Limestone isn't dangerous. It's calcium carbonate. Some people pay big money for it in pill form when they have heartburn. (Tums)

HYDRATED LIME - It's in Stamet's GGMM, page 189 in my edition. He says to use 2 to 4 pounds of hydrated lime for each 50 gallons of water.

HYDRATED LIME - Don't use lime anywhere near your pressure cooker. It's highly caustic and will pit the aluminum. Use a plastic tub.

HYDRATED LIME - Hydrated means water-soluble, thus it's ground to a fine powder in order to be effective right away.

HYDRATED LIME - Try fifty with lime next time, there will be an assurance of zero contamination then.

HYDRATED LIME - Only use horticultural/agricultural hydrated lime, never slaking or masonry lime.

STERILIZING MANURE - Ponder this.
Manure is 3-tier gangbang. Bovine eats it, in bovines gut other microbes/bacteria have a go at it, once expelled everything out there as a go at it. Only the strong survive. So the turd pile is pretty well occupied with whatever is still munching down on it. It is also depleted on most nutrients other things - besides those microbes in it - even look for. Hey, it's a shit pile. On top of that, the microbes that do occupy that turd pile defend their space fairly well. So, any outside microbe tries to get a foothold, the homey's either eject them, kill or eat them. All in all, the turd pile is some well-defended turf.
Now, sterilize that third pile.
Suddenly, it is no longer - well defended turf. So, any blue/green mold gang that happens to wander by can enter & set up housekeeping. So, if you sterilize manure. Treat it like you would an LC. In other words, be very careful not to allow anything to come in contact with it. Except, what you want to introduce into it.

HORSE/COW MANURE - A cow does not have 4 stomachs. A cow has 1 stomach. A single stomach with four compartments is not 4 stomachs.
Cow manure is NOT already composted when it comes out.
Aged horse manure or cow manure does NOT need to be leached.
Washing/leaching manure does NOT remove ammonia. It needs to be air dried or cured in the sun to evaporate the ammonia.
You do not want fresh cow manure. You want aged manure. Cow patties work fine. In fact, when I first started growing mushrooms in 1971, picking up cow pies and bringing them home to place in compost was the only way we knew to home cultivate. All the current teks have evolved from those early trials.
Exactly which shroomery manure teks suck for people in colder climates? What difference does a cold climate make? Moisture and ammonia will sublimate from frozen manure as fast as it will evaporate from manure in a warm climate.
Growers can be successful with aged manure by simply breaking it up and using after hydration and pasteurization. In fact, I've NEVER leached manure.

HORSE MANURE - You'll find these outside any horse ranch. They're not rare. The problem is they're usually stable sweepings and often have cedar chips mixed in to control odor, which prevents much mycelium growth. In addition, they're usually fresh manure, not aged. What you want to grow on is field aged. A truckload delivered to your back yard might be good after you spread it out to dry and leach in the sun and rain, but I doubt dumping some spawn into a large pile at a horse ranch is going to do much. They constantly dump fresh manure with a front-end loader on top of the earlier pile, burying any spawn you put deep into the pile. Not to burst your bubble, but I doubt it would work unless it's an abandoned ranch and the pile is aged, in which case it's probably already got pan subbs growing/colonizing it.

COW MANURE SUBSTRATE - The coffee grinds, castings and coir are to break up the store bought cow manure which is ok to use, but too heavy by itself and the myc has a hard time colonizing it. The other problem with store bought cow manure is it has a lot of urea in it because it comes from crowded feed lots and the cows urinate as much as they defecate and it all gets scooped up together. Be sure when you open the bag of cow manure, if it smells like ammonia, spread it out on the back porch in the sun for a day or two and the ammonia will flash off, leaving it ok to use.

CHICKEN MANURE - Agreed. As said, just don't use very much. I've used the composted chicken manure available at nurseries with success, at no more than one cup of chicken manure to 20 cups of other substrate ingredients. Lay it on a tarp in the sun for a few days until there is no ammonia smell, then mix with your other ingredients and pasteurize. Bat guano is no good for mycology.

COW MANURE DEHYDRATED - Dehydrated would be better, but be sure if there's any ammonia smell to it that you dump it out of the bag and lay it out in the sun for a few days. Cut the store-bought cow manure by mixing it evenly with coir/vermiculite. You will end up with a substrate of 33% bagged cow manure, and 33% each of coir and vermiculite. Mix well and pasteurize.

STEER MANURE - Be sure to cut it with some coir or vermiculite, because the bagged cow manure tends to compress due to its texture, which makes it hard for the mycelium to colonize. The bag stuff you get at the nursery needs to be layed out and dried in the sun for a few weeks so all the ammonia evaporates.

CHICKEN MANURE - Composted chicken manure is great. Use at no more than 5%, which is one cup of chicken manure to each 20 cups of coir or horse manure. Be sure to open the bag and lay what you're going to use out in the air for a couple of days to evaporate the ammonia out before pasteurizing.

MANURE SUBSTRATE - Next time, leave the substrate loose and airy. I like to add a touch of vermiculite to manure for that purpose as well. A slightly dry substrate will actually colonize faster, so I don't think that's the problem. I make mine dry on purpose, and then dunk before first flush.

COW MANURE AND HORSE MANURE - Cow manure gets fed better/it's more compacted and has more nutrition. Horse manure is basically half digested straw and hey which is less nutrition and holds less moisture.

GYPSUM MANURE - Gypsum keeps the manure nice and fluffy and loose afterwards. Many hobby growers skip this step, but it really helps. I don't know of any commercial ops that don't use gypsum.

CHICKEN MANURE - Chicken manure makes an excellent addition to your compost/poo mix. Use no more than 5% by volume.

CHICKEN MANURE - Chicken Manure Gets Way to hot. It would BURN myc. Use only in small quantities.

OYSTER SHELLS - You can use oyster shell flour in both substrates and casing layers. Crushed oyster shells are sometimes added to casing material for texture,

REUSING PERLITE - I put the whole darn terrarium in the shower, and let cold water run for an hour or two to wash it clean. Of course, I have holes in the bottom of the terrarium for the water to escape. If there has been a contaminant outbreak, I'll pour some water mixed with bleach on first, then let that sit for half an hour before turning on the shower. Before any of the 'conserve water' people jump my ass, bear in mind I live where the more water we use, the less the rivers and reservoirs flood. If you live in a desert with limited water supplies, simply bleach soak and rinse the perlite if contaminants were present. Otherwise, simply rehydrate the perlite, drain well and use. Perlite is a mineral that will last for many years.

PERLITE - Using paper towels in the bottom of terrariums for humidity is a long-proven technique. In fact, for many years I've kept them stuffed into any spot in my mini-greenhouse that tends to collect drips of water. Change them out once a week or so, and keep them fairly well squeezed of excess moisture so that what's in the paper towel can evaporate back out. You can even press damp paper towels against the back and/or sides of the FC to give more surface area. Clean cloth towels can also be used, and simply tossed into the washing machine once a week.

PERLITE - Perlite is a hydrated volcanic ore from the Pennsylvanian era of geology, with the approximate chemical composition of glass. Expansion is due to between 2-6% bound water. When heated to 1400+ degrees, the water vaporizes forcing the rock to expand. Perlite in its crude form weighs 70 pounds per cubic foot, after expansion the weight is reduced to 2-10 pounds per cubic foot depending upon the application.

PERLITE - Perlite is a crystalline mineral that doesn't absorb water, so it would NOT absorb water in 24 hours, or 24 years. Perlite that is under water may as well not be there. This has been proved by hundreds of growers with humidity problems, who dumped the standing water out, and watched in awe as their humidity rose to 99%.

PERLITE - Perlite is crystalline and impervious to water, but with a large surface area to hold and evaporate it off from. Perlite is for humidifying terrariums and/or adding air and fluff to casing layers. A bit of perlite can also be added to casings, but then, it's to provide fresh air pockets that are conducive to hyphal knot formation.

PERLITE - Perlite is crystalline, like glass or quartz crystals, and it does NOT wick water any more than broken pieces of glass will wick water. Submerged perlite is useless, period. Look at the picture of perlite below and describe how it would wick anything if you doubt the above.

PERLITE - Misting should be enough to keep the perlite damp. You might also try 'raking' the perlite with your fingers to fluff it up. If it gets packed down, it won't work right. Fluff it up and that's probably all you need to do. I've had perlite still damp after two months. Peroxide and bleach are a waste on perlite. Just use plain water. You're not growing mushrooms on the perlite; it's only for humidity.

PERLITE - I've been using perlite from the same bag for at least ten years. All you have to do is rinse it off well, and bake in the oven for an hour or so, and it's just like new again. You never have to toss it out.

PERLITE - Perlite is not hydrophilic, although it can be treated to have hydrophilic type properties.

PH - It's important to mix the dry peat with the lime before adding moisture or the vermiculite. I also see you didn't add gypsum, which helps to moderate ph swings. In addition, I have not yet seen a probe type ph tester that was worth the powder it would take to blow it to hell. They are designed for soil, and just don't perform

properly in peat/vermiculite/manure.
I get a starting ph of 8 to 8.5 by mixing one teaspoon of hydrated garden lime and two tablespoons of garden gypsum to each cup of dry peat. Mix the peat, lime and gypsum, then add water to approximately field capacity, then set aside.
While the peat sits, mix the vermiculite with water in a separate container to approximately field capacity.
Now, you can mix the two together and make the final adjustments in moisture content. Be sure to let it sit for fifteen minutes, then check moisture content again by squeezing a handful of material. When you hold a handful of the casing mix, no water at all should drip out. Squeeze a bit, and a small amount will drip out. Squeeze hard and a small stream will flow out. This is field capacity.
Pasteurize and use. For home grower amounts, a great way to pasteurize is in quart mason jars sitting in a large pot of water. A pc or large kettle with a tight fitting lid is great for this. You want the interior of the jars to reach at least 140F for an hour, but not to exceed 170F. The use of quart jars preserves your ph and moisture content. Good luck.

PH - If coir is your substrate you 'can' skip the lime and just use gypsum. Coir has a pH of around 5, which is pretty darn low. Trichoderma prefers a pH of 5, so without lime or gypsum, coir and peat are perfect trich foods. We can get away without balancing coir because it colonizes so fast, but I'd still use gypsum, which tends to set the pH in the mid 6 range. Casing layers should be set to an initial pH of 8 because peat/vermiculite rarely colonizes fully, so you want protection from trichoderma, and a high pH is the best way to do it. For pasteurizing straw, you need hydrated lime. The others won't cut it. 'Hydrated' means water soluble, so it raises the pasteurization bath water to a pH of around 12, which nukes most organisms. Nobody can say exactly how much hydrated lime to use for casing layers. My 1-teaspoon per cup of peat is a safe starting point, but the correct amount to use is what it takes to get an initial pH of 8 to 8.5.

PH - Liquid coffee is slightly acidic, but coir is even more so. Coir runs pH 5 to pH 6.5 depending on origin. Acids lower pH, not raise them. I've found no evidence that coffee boosts potency. It does however; speed up colonization, because it's excellent fungi food. In addition, the lower pH results in faster growth because Cubensis prefers a substrate in the pH 5.5 to pH 6 range. Using a substrate with an acidic pH like yours results in faster colonization and better performance overall, but also exposes the project to an increased risk of contamination, because molds such as trichoderma also prefer an acidic food source. In my area, the mold spore count is so high; I'd never be able to get a substrate that had been hydrated with liquid coffee colonized before parts of it were green from molds. Hopefully, yours will work out. It's almost colonized. Good luck.

PH - While mushroom mycelium prefers a slightly acidic substrate, contaminants do also. What we've found from experience is that by adjusting the pH upwards with lime, the mushroom mycelium can 'tolerate' it, but the contaminants have a harder time. There is usually no need to adjust pH of substrates, but casing layers, which don't ever fully colonize, can benefit from a higher pH of 7.5 to 8. This will allow the mushroom mycelium to get the benefits of the casing layer, but will slow the onset of mold contaminants. However, remember that after a flush or two, the uncolonized parts of your casing layer are going to be susceptible to molds, so be sure to watch daily and toss out any tray at the first signs of 'green' molds. Good luck.

PH CASINGS - Actually, you want hydrated garden lime because ground limestone takes too long to break down and go to work. Hydrated lime is water-soluble and goes to work right away. A combination of hydrated lime and gypsum is the best way to buffer a casing layer. The most critical time for contaminants to enter a casing is during the initial colonization and first flush stages. Once the layer is fully colonized, it's very contaminant resistant. Hydrated lime and gypsum protect your casing layer during this critical early stage, where ground limestone or other buffers that take weeks or even months to break down do not.

PH - You don't need to pH balance bulk substrates. In fact, mushroom mycelium actually prefers an acidic substrate. We pH balance casing material because it remains partially uncolonized throughout the fruiting cycle, thus is prone to contamination. Bulk substrates colonize fully, thus are resistant to contaminants, so you can leave them slightly acidic and they'll do just fine. Mushroom mycelium is more tolerant of a basic pH than molds, and that's why we add lime to casings.

PH OF CASING - Pickling lime is hydrated lime. It's my favorite, and many commercial grow operations DO use it. Use one teaspoon of hydrated lime, and one tablespoon of gypsum per cup of peat, and mix into the dry peat. Mix the dry ingredients very well, then slowly bring to field moisture level and pasteurize. If you can't

find hydrated lime, you can get it online at www.doitbest.com When you get to their website, do a search for hydrated lime.

PH CASINGS - A buffers resist change in ph. Lime is not a buffer. Gypsum is an excellent buffer. If you wish to bring the ph of your casings higher, you would want to use hydrated (water soluble) lime. Limestone is for long-term use, such as in a garden. Casings, which flush for a month or so, do not need long-term ph adjustment. They need short term, therefore hydrated lime is what you would want to use.

PH - A pH of 8 is a good place to make your casing mix initially. Mushroom mycelium grows and fruits best at a lower pH of around 5-6, but unfortunately, that pH also favors contaminants as well. Mushroom mycelium is more tolerant of a higher pH than molds, which is why we add lime.

PH - Oyster shell raises Ph. Mushroom mycelium grows fastest with a slightly acid ph. You don't Ph adjust spawn. The only reason we use Ph buffers to raise Ph in bulk substrates is because mushroom mycelium, while it prefers a Ph of 6, is tolerant of Ph up to 8.5, while trichoderma is not tolerant of a high Ph. Thus, the hydrated lime or oyster shell flour makes our substrate selective for mushroom mycelium.

PH - A high pH will slow down trichoderma, as well as helping to prevent trich spores from germinating. It also stresses mushroom mycelium, which prefers a lower pH, but not as much. The mushroom mycelium is more tolerant of high pH than most molds.

PH - For a substrate, 5.5 to 6 will probably give the fastest colonization. It would be the same for casing layers as well, but since molds also thrive at a low pH, we lime our casings to sweet of neutral. A good starting pH for a casing is 8.

PH - In my opinion, a good starting point is around 9-10. I know that's sweet, but the myc doesn't seem to mind much, and most contams like a slightly acid ph. It keeps the little bastards at bay while the myc colonizes your casing.

PH BENEFITS - Lime raises the ph, and gypsum keeps it stable. They both provide calcium, but gypsum also helps with texture.

PH STRIPS - Squeeze some water out of the casing mix after it has sat for at least an hour, and then measure that with your strip.

PH - Contaminants prefer a low ph; a high ph is unfavorable for them.

PH - Gypsum added to an acidic soil will raise the pH.

RATIO SUBSTRATES - Use the chicken manure at up to 5% of the total substrate. It gives a nice boost. Most commercial mushroom farms use it at that percentage. Composted cow manure from the nursery also works well when mixed with coir or vermiculite to cut it a bit. If any bulk substrate you mix up seems a bit 'heavy' just add ten to twenty percent vermiculite to keep it nice and loose. Another benefit of vermiculite in bulk substrates is it makes an excellent moisture reservoir for use during fruiting.

PF/MANURE RATIO CASING - Break up your pf cakes into four times as much manure. That means one pf cake can inoculate 2 pints of manure. Don't crumble and case pf cakes. It's a waste. If you want to fruit your cakes as is, simply birth them, and then do a dunk and roll and place in fruiting conditions. This is the quickest way to a harvest, and spawning to manure is the best way to a larger harvest, although it takes a couple of weeks longer.

SUBSTRATE RATIOS - That's about right. 1 cup of hydrated chicken manure per 20 cups hydrated coir would make 5%. Add gypsum at ten percent as well. 1/2 teaspoon of hydrated lime per cup of coir/chicken manure will help give a bit of contaminant resistance, but it's optional. Lime is far more important in casings where part of it never colonizes. Substrates colonize fully, therefore can hold their own.

COMPOST - They use urine as a nitrogen boost to heat up the compost pile. If you're not composting, use aged manure.

SUBSTRATE RATIO - Spawn to manure, and then at full colonization, case. 1 to 4 is fine. I usually go 1 to 3 for the extra food the grains provide.

CAKE TO MANURE RATIO - Use one part colonized cakes or other spawn to three or four parts manure.

STRAW SUBSTRATE PASTURIZATION RR VIDEO - After pasteurization, I lift the straw out of the tote with a strainer, allow it to drain for a few seconds, and then place on a screen that is laying in the bottom of a second tote. When the pasteurization tote is empty (of straw), I take pot fulls of hot water out of it, and pour them into the toilet to get rid of them. By the time the straw has cooled, it has also drained long enough. Remember, you're going to have holes in your straw log and/or laundry basket, so any excess water will drain out during the first few days, leaving it at the perfect moisture content.

LIME FOR STRAW - I think hydrated lime is the BEST choice for pasteurizing straw. It causes a very rapid swing upward in PH, which is fatal to living organisms, which is the purpose of pasteurization. It's the only lime I use. I don't recommend chemical pasteurization alone for straw. Use 1 cup of hydrated lime per ten gallons of 140F to 150F water and pasteurize the straw for one to at most two hours. Drain and use. Be sure to soak the straw in warm water for two hours prior to the pasteurization to hydrate it.

STRAW - I soak in warm soapy water for two hours, and then transfer the straw to water that is kept at 140F to 160F for 60 to 90 minutes, and then it is removed and drained/cooled, and spawned. I use one cup of hydrated lime for each ten to fifteen gallons of pasteurization water. I don't add lime or bleach to the pre-soak, and don't use bleach at all in the pasteurization. There's a short sample clip of my procedure on youtube and also on my website. It should be enough to give you the basic idea.

STRAW - I use an electric weed whacker with the straw in a tote with the lid on it. I cut a very skinny rectangle out of the center of the lid so I can move the weed eater around in the box to get it all. It takes about five minutes or less to do a 125 quart sterlite container full of straw. I do this right in my living room, since I also live in a condo. There's some mess, but not much.

STRAW - Yea, 1 cup of lime should be plenty for a pillowcase. If the pot is aluminum, the lime will eat through it pretty fast, but it's your stuff, so you make the call. It's easy to boil the water in one pot and then pour it into a plastic tote or bucket with the lime. That way, you don't ruin the kettle.

STRAW - Straw is dry. Therefore, the 'straw juice' is the dirt, pesticides, and other debris that is stuck to the surface of the straw. Don't use it for anything. Mushroom mycelium doesn't want the dirty brown water you wash off the straw. Mushroom mycelium wants to eat the straw itself.

STRAW - Straw has a pretty good texture for fruiting uncased, and the hollow straw holds a LOT of water, negating the need for a casing layer, providing you maintain near 100% humidity at the surface of the straw.

SOAP IN STRAW SOAK - Soap for straw would help break down the waxyness of the straw. To absorb water better. Because it's anti-bacterial.

STRAW SUBSTRATE - Chopped straw. Wheat and Barley are the two most common ones in the US, and both work fine.

STRAW - Straw, something that contaminates the most, does better at pasteurization temps of 140-150.

STRAW - BE up to 200% is fairly common with straw.

SUBSTRATES! - People need to make a distinction between growing plants and fungi.
Worm castings are an excellent substrate additive material, but not because of nitrogen content. They are lower in nitrogen then either straw or horse manure, which are both lower in nitrogen than steer manure.
Blood meal is high in nitrogen, but is totally unusable to fungi unless it is applied in the composting process, which most home mushroom growers do not do. The use of blood meal added to manure or coir is a waste of resources and actually encourages algae to form on the surface of the substrate or casing layer, leading inexperienced growers to throw out a perfectly fine project thinking they have 'green mold'.
Chicken manure is high in nitrogen, but once again it needs to be added at the composting stage. However,

composted chicken manure available in bags at nurseries is an excellent additive to manure or straw because it's already composted, therefore available to the fungi.
Fish emulsion, available at garden centers is also an excellent additive to manure or coir substrates because it has already been composted or otherwise broken down anaerobically at the processing facility.
Gypsum should be added to all substrates for the texture it helps to provide as well as the calcium and sulfur, both essential nutrients for mycelia metabolism. An added benefit of gypsum is that it tends to hold Ph levels steady, preventing wild swings as the mycelium colonizes a substrate.
Coir, worm castings, horse manure, chicken manure etc., are all acidic and should be buffered with lime to a starting Ph of around 8. This high Ph favors mushroom mycelium that is tolerant of sweet substrates, but prevents germination of contaminant spores that favor sour substrates.

SUBSTRATES - Coir is very close in performance to horse manure. Cow manure can perform nearly as well too, but will benefit from a bit of coffee grinds and some loosening up with vermiculite. As I've said hundreds of times, a combination of substrate ingredients will give better performance than any one by itself. That means, you'll get more bang by mixing cow, horse, and a bit of chicken manure with coir, coffee grinds, compost and straw. Horse manure is a preferred substrate because its texture is easy for the mycelium to penetrate, and works fine by itself, as do any of the bulk substrate ingredients listed above. Horse manure edges them out a bit in my opinion, but coir runs a close second. My preferred spawn material hands down over all the others is organic rye berries. Rye grass seed would be second, with wbs coming in third.

COMPOST SUBSTRATES - I have a local source for yard waste compost and it's a great addition to substrates. It works best if you mix it with some manure, and even the composted cow manure from nurseries works well mixed with the garden compost. Add a small amount of bagged chicken manure from the nursery and you have a great substrate. If it seems thick, cut it with a bit of vermiculite and/or coir. You can also add perlite to bulk substrates to fluff them up. The perlite holds air, which comes in handy in manure-based substrates. You can also throw in a few days worth of spent coffee grinds. In other words, the more different things you add to your substrate, the better it will perform.

LIME FOR SUBSTRATES - Gypsum yes, but no lime. Mushroom mycelium prefers an acidic substrate, and since we pasteurize horse manure and then allow it to fully colonize, it's resistant to contamination. Therefore, a pH in the 5.5 to 6.5 range is perfect. I used to add a touch of lime to bulk substrates, but no longer do and performance is better. We add lime to casing layers to protect them against molds, since they don't fully colonize with mushroom mycelium. No lime in manure substrates. Cased or uncased. Performance will be higher. Besides, gypsum tends to stabilize the substrate into the mid to upper 6's.

SUBSTRATES - The coffee you use in substrates is ONLY what you empty out of the strainer or filter after brewing a pot. In other words, leached coffee grinds. Do not use instant or liquid coffee in substrates. Mix coffee in any percentage you want. I've grown on pure coffee. The more items you mix into the substrate, the better. If you have manure, coir, worm castings, compost, coffee grinds, straw, etc., use a little of all of them. Add up to ten percent by volume of gypsum and mix all the dry ingredients. Then, add water to field capacity and pasteurize.

SUBSTRATES - Coir in a substrate helps to provide food the horse manure doesn't. It's part of a balanced diet. Vermiculite is great mixed with everything mycological except straw. Used coffee grinds from your morning pot of coffee are also an excellent additive. Ditto for worm castings. A small amount of chicken manure is also beneficial but don't go over 5% by volume of the substrate. Put a combination of all-together in your substrate and watch your mushrooms thank you for it.

SUBSTRATE MIX - I like to mix store bought composted cow manure, coir, coffee grinds, and worm castings all together, then add 1/2 tablespoon of hydrated lime per cup of mix. Then, mix all that with an equal amount of damp vermiculite.
Bring it all to field consistency and pasteurize. It works like a charm.

BULK SUBSTRATES - Bulk substrate IS less nutritious than grains. That's why we need to use so much of it. Bulk substrate can be simply pasteurized, while the much more nutritious grains must be sterilized and kept sterile until colonized. Then, they add significantly to the total nutrients in the bulk substrate they're spawned into.

SUBSTRATES - Complex substrates are always better. Mix as many ingredients as you have. Coir, horse manure, worm castings, coffee grinds, cow manure, chicken manure, compost, straw, etc., are all good, and mixed they're even better. Don't go over 5% of the total as chicken manure though. Use gypsum at ten percent.

SUBSTRATE ADDATIVE - I did a few experiments several years ago where I added fish emulsion and several other nitrogen boosters such as blood meal to manure and compost mixes and saw no effect on the crop. I then added small amounts of chicken manure and saw a very noticeable increase in yield.

SUBSTRATES - Cow and horse manure are equally suitable for growing dung and straw loving mushrooms. Getting the texture right is part of the skills of growing. Horse manure is ready to use once it's been field aged. Cow manure works better when fluffed up with vermiculite, coir, straw, etc., but it's all-good.

SUBSTRATES - Performance will be poor at best. BRF has at least ten to twenty times the nutrition of manure or coir either one. They will only dilute the substrate. That's why they're bulk substrates. They need to be used in large quantities, not small.

SUBSTRATE ADDATIVE - It's been used successfully in substrates before, but it was a mistake to use in a casing. Casing layers should be non-nutritious.

SUBSTRATE - Dried pumpkin seeds have been used in the past, but the flesh of the pumpkin is ...garbage.

SUBSTRATES - Pick out the logs. The little sticks are fine, as they'll colonize.

VERMICULITE - Fine vermiculite holds more moisture per volume of measurement than course vermiculite, due to there being more of it. The basic formula of 2-1-1 works great with fine or medium vermiculite, but if you're using course vermiculite, you might want to cut down a bit on the water. I've found that cakes as well as grains, and even bulk substrates colonize a bit better and faster if made up on the dry side. With cakes, it's easy to adjust the water down, and then simply do a dunk and roll at birthing to put the moisture in for the flush at that time.

VERMICULITE - Vermiculite is soft and resembles a mineral sponge, able to soak up water and hold it. Vermiculite also has lots of passageways the mycelium can colonize while absorbing the moisture within. Vermiculite is for holding water as a reservoir and releasing it to the mycelium as needed. Vermiculite is used in pf cakes and casing recipes. It will also provide fluff and a rez effect (reservoir) in manure and compost mixes.

VERMICULITE - I use the fine vermiculite, which holds more water per cup then the medium grade vermiculite, but still use the basic 1-1-2-pf recipes. This makes a drier substrate that colonizes in two weeks. Give an extra week to consolidate, then birth, dunk and roll. I see pins regularly 48 hours after birthing this way instead of having the cakes sit there for a week or two.

VERMICULITE - Vermiculite is an excellent moisture reservoir that holds more water for its size than anything else. Any substrate, including sawdust/woodchips or manure can benefit from the addition of vermiculite. There is also no other method of growing that can grow more mushrooms on less substrate than pf cakes. That's a fact.

VERMICULITE STERILIZATION - I've done it both without and with sterilizing the vermiculite. Vermiculite is an inert mineral that does not harbor or grow contaminants, but if mold spores are present, they might have an opportunity to grow. I usually put mine on a baking sheet for half an hour at 350F, just because it makes me feel better.

VERMICULITE - In addition, the danger with asbestos is from inhaling dust from the fibers over a long time, such as working in a mine 8 hours a day for 20 years. It isn't from eating mushrooms from a cake with vermiculite in it, even if it DID have asbestos, which it doesn't.

VERMICULITE - I also use fine vermiculite, and it works fine. In fact, it holds a bit more water than course vermiculite, and the mycelium seems to colonize it just fine. It's also better for use as the contaminant barrier

on top.

SOAKED VERM SUBSTRATE - I have soaked straight vermiculite in various nutrient laden solutions. It will colonize, just fine - without anything else added.

METABOLITES/LIGHTING

METABOLITES - That quote above by Stamets in TMC written in 1985 when he was fairly new to cultivation was a mistake. He corrected it very well in the 1990's when he wrote 'Growing Gourmet and Medicinal Mushrooms', where he correctly stated they are antibiotic compounds.
Furthermore, the journal of medicinal mushrooms publishes articles on a regular basis identifying the various antibiotic compounds in various species of mushroom mycelia metabolites.
The first mass use of metabolites in medicine was in WW2 when the production of metabolites from the Penicillium mold saved thousands of Allied soldiers lives due to a product that was named Penicillin after the mycelium metabolites it was made from. I'm completely in awe that you folks don't know this. It should have been taught in elementary and junior high school, both in history and science. It's not brand new news.
Furthermore, there is a time and place for vulgarities. I'm no prude and no religious freak by a long shot, but in science one need not use vulgar terms if he wishes to be taken seriously. I'll be the first one to let out a four-letter tirade over politics when I'm having a few beers down at the pub, but not here, and not in conjunction with mycology. I hope this clears it up. I'll stay on it until people stop using the wrong terms. It's no different than correcting someone for referring to an uncased bulk substrate incorrectly as a 'casing' or referring to manure as a spawn, rather than a substrate, etc. It's simply incorrect and should be corrected or new growers trying to learn get fed the wrong information.

METABOLITES MYCELIUM PISS - Mushroom mycelium secretions do not equate to human urine in any way, shape or form. That is disinformation and it makes the hair on my neck stand on end when I see it constantly repeated. They are unrelated. In fact, the secretions from many fungi are used to make antibiotics. Read up on the production of penicillin, tetracycline, erythromycin and other antibiotics that are made from the secretions of fungi. This has been known for a long time in professional circles. For some reason, people around here keep repeating the same old 'mushroom piss' crap and others read it and repeat it ad nauseum. The secretions, which contain acetone and other volatile compounds can actually be fermented and distilled out of the liquid culture the fungi mycelium is being grown in. In commercial penicillin production, large fermentation tanks of over 30,000 gallons are common. It is not the penicillium mold itself that they make penicillin from, but its secretions. Please stop using urine as an analogy for the antibiotic secretions of our precious fungi.

METABOLITES FIGHT - Actually, I have harvested metabolites and used them on other molds, which they kill. Often, when a grain jar is left too long after full colonization, metabolites will begin building up in the bottom of the jar. These can be poured right on an infection in another tray. If caught in time, many molds can be neutralized this way. I doubt it's the antibiotic properties of the metabolites at work against molds, but rather the solvents. Antibiotics are effective against bacteria, which isn't a contaminant of casing layers.

METABOLITES PURPOSE - Mycelium produces metabolites in response to contaminants or stress. These are antibiotic compounds that the mycelium produces to kill competitor fungi or bacteria. They are not in any way, shape or form related to the urine that is secreted by mammals. The metabolites produced by mycelium of the penicillium fungus for example are used in human medicine as antibiotics to kill bacteria. The metabolites produced by mushroom mycelium serve a similar purpose.

METABOLITES - Actually, metabolites don't attract bacteria; they're a response to it. They're antibiotic. It sounds like you have some bacteria in the jar and they're being excreted by the mycelium to help fight it off. You can lay the jar on its side, and then rotate it once per day. This keeps uncolonized parts out of the liquid, helping them to finish up. The above assumes it's a grain jar. If it's a pf jar, disregard. Laying on its side and rolling can disturb the vermiculite filter leading to contaminants entering.

USES FOR MYCELIUM METABOLITES - Experiment. Put some bacteria on a Petri dish, and then put down a line of metabolite. Watch how they stop the spread of the bacteria. Without a lab, I doubt you could make your own antibiotics, but penicillin and the other common antibiotics are made from fungi metabolite. I've also

found that mushroom metabolites will kill trichoderma mycelium on a Petri dish. In fact, it would probably kill off any competitor fungi, even other mushroom species.

METABOLITES - Mycelium often produces metabolites of different colors depending on what infection they're fighting. This red color was on the top of the vermiculite barrier where the mycelium had worked it's way up to where contaminants had entered through the vent hole and were laying dormant on the vermiculite barrier. When the mycelium reached that spot, it produced metabolites (antibiotic compounds) to kill the mold spores or bacteria that were present in that location.

METABOLITES - The metabolites are antibiotic secretions, so when they're in large amounts, it usually means something is up. High colonization temps will also lead to metabolite production, so remember to colonize jars at room temperature. A jar with a good filter will contain any contaminants that are within, so don't toss it out. Don't use any jar with a lot of metabolites for grain-to-grain transfers, but if they colonize fine, they're good to use for spawning to bulk.

METABOLITES - Colonized poo trays sometimes emit a little honey yellow, to as dark as Tobacco juice colored metabolite type waste on the top of the tray. So long as it colonized nicely & the metabolite waste doesn't turn into a gusher. It's good to go. Been there & done that a few times, especially with big bulk trays that had a strong cow/poo mixture in them. The stuff is commonly called MYC PISS. If it's fully colonized, add a casing cover & go for it.

METABOLITES - There will be no live bacteria in the metabolites. They're acids and often ethylene based to kill bacteria and are produced in response to it. There may be bacteria in the grains, but not in the metabolites. That's why grain jars should be used at full colonization, not weeks later. The metabolites are the myceliums defense mechanism. I've used the metabolites from Hypsizygus ulmarium to kill bacteria and trichoderma on a Petri dish.

METABOLITES - It's metabolites since they're yellow. That is a sign of too much bacteria and/or excessive temperature. Is that uncased manure? I'd suggest gently dabbing the excessive off with a clean dry paper towel. The metabolites help to fight infections, but too much of a good thing isn't always good. Dry it off, and increase air exchange. You want high humidity, especially if fruiting uncased, but you also want lots of fresh air.

METABOLITES - The manure isn't eating the holes in the aluminum, the mushroom metabolites are. I have a mushroom that was sent for metals testing after harvesting from the tray pictured below. I should know within a few days if aluminum was conducted up into the fruit body. We know that heavy metals end up in the fruits, but as far as I know, nobody has ever had a fruit professionally tested for aluminum contamination.

METABOLITES - It sounds like metabolites and is often caused by excess temperature, which leads to bacterial contamination. Metabolites are antibiotic and are secreted in response to the bacteria or molds. Incubate at room temperature for best results and lowest contamination rate. I haven't even owned an incubator in ten years. They're not necessary and cause far more problems than they solve.

METABOLITES - The metabolites are generally produced in response to bacteria that are stimulated by high incubation temperatures. My rule of thumb is if you can see visible metabolites in the bottom of the jar, it's ok to spawn to bulk, but don't do a g2g with it, or the dormant bacteria will come back to life in the fresh grains. Next time, incubate your grains at room temperature.

METABOLITES - The excess moisture you see is metabolic discharges from the mycelium trying to fight off the contaminants, and/or metabolites from the molds trying to fight off the mushroom mycelium. Start over, and use a very light syringe, or better yet, prove your spores on agar, and transfer a proved, clean mycelium culture into your rye and watch it take off.

METABOLITES - A large amount of metabolites generally means a bit of bacteria in the jar. The metabolites

are antibiotic secretions, so when they're in large amounts, it usually means something is up. High colonization temps will also lead to metabolite production, so remember to colonize jars at room temperature.

METABOLITES - Mycelia metabolites are not urine. They're antibiotic and much more like medicine than pee. In fact, they also help to break down the substrate for the mycelium, much like the saliva in our mouth (which is also not urine) helps break down our food, making it available to the mycelium.

CAUSES FOR METABOLITES - Elevated temperatures are a major cause of that. The high temperature stimulates bacteria, and then the mushroom mycelium must secrete antibiotic metabolites to deal with them. It's important to use room temperature for colonization, especially with larger substrates.

WHAT ARE METABOLITES - Antibiotic drugs such as penicillin are, and have been made from fungal metabolites for over fifty years. It is not a theory. I have used a syringe to draw metabolite from a grain jar and placed it on bacteria in a Petri dish. It kills the bacteria dead within hours.

METABOLITES - Antibiotics such as penicillin are made from fungi metabolites. They're a powerful anti-bacterial. They also help the mycelium to break down substrate materials. There are still a lot of unknowns to be researched, but they're not urine or feces, that's for sure.

METABOLITES - I'm convinced many growers who think they 'cut away lipstick mold' and succeeded, actually cut away harmless metabolites from their jars. Metabolites are produced by the mycelium in order to attack competitors. They're a weapon.

METABOLITES - Metabolites are a natural secretion of fungi both as a defense mechanism against competitors and to break down food sources. Molds produce as much or more metabolites than mushroom mycelium.

METABOLITES - It's just metabolites from the high temperature. NEVER use a jar with a lot of metabolites for grain-to-grain transfers, but you can use it to spawn to bulk or lay in a tray and case.

METABOLITES - They're actually antibiotic compounds used to neutralize competitor fungi and bacteria. That's why medical antibiotics are made from them.

METABOLITES - An excess of metabolites can point towards bacterial contamination, over-colonization of a substrate, or too high a temperature.

METABOLITES - Yes. Excessive heat will cause the mycelium to produce more, so if there's a lot of metabolite, try to reduce temperature.

METABOLITES - The metabolites will do no harm. You can leave the substrate soaking in it. They destroy contaminants, not cause them.

METABOLITES - A large amount of metabolites generally means a bit of bacteria in the jar.

METABOLITES - Actually, metabolites don't attract bacteria; they're a response to it.

LIGHTING

Light has absolutely NOTHING to do with telling the mycelium that it has reached the surface. The increased fresh air, with the corresponding drop in CO_2 levels sends the mycelium that message.
Light is also NOT just to establish the direction the fruits grow. In fact, air currents have a greater effect on direction of growth than light. If you doubt this, place a fan on your crop and watch.
A few seconds of light per day will NOT help to generate a good pinset. In fact, light is a secondary pinning trigger, but an important one. The difference between three or four pins, and hundreds of pins on a substrate can be directly correlated to the length, intensity, and frequency of the light applied, provided the primary pinning triggers have been fulfilled.
The light needs to be intense enough to penetrate 1/2" into the substrate. Not all pins form on the surface. Many originate from deeper in the substrate or casing layer.

Higher frequency light above a color temperature of 5,000 Kelvin will generate far more pins than a 'red' source of light such as incandescent lamps.
Fungi are a living organism that is much more closely related to mammals such as humans, than to plants. People need to quit looking at mycelium as a different kind of plant, which it isn't. Mycelium has been shown to have circadian rhythms just like mammals, and this is the reason that 12/12 light cycles work best. This planet, and all surface life on it are based on the 24-hour day. For best results, learn to work with nature rather than against it. Mycelium has an amazing ability to cope with less than optimal conditions, and will often fruit when a grower does everything wrong. However, do everything right and watch your performance go through the roof.

TMC FAULT, LIGHTING, WHY - Recent experiments (over the last 23 years) have shown the error of that statement in TMC. Many experiments have shown conclusively that fluorescent lamps in the 6500K range produce better pinsets and healthier, meatier fruits than other forms of light. Stamets himself does not repeat that 'flash of light' triggers pinning nonsense. In fact, he recommends fluorescent lamps in the 6,500-Kelvin range for 12/12 just as I do. In addition, there's a huge difference in saying something can result in 'pins', and helping to trigger a very nice flush.
Light, and the intensity/frequency of light is extremely important if one is interested in greater than mediocre performance. Many species, such as agaricus and P. cubensis, can pin in the total absence of light. That doesn't mean light isn't required for best results, especially with light sensitive species such as P. cubensis and P. ostreatus.

WHAT YOU WANT! - You want full spectrum light for best results. Indirect light from a window is fine. Hyphal knot formation is stimulated more by light at the higher end of the scale than at the lower end of the scale. A color temperature of around 6500K is just about perfect. This is the color produced by 'natural daylight fluorescent' tubes. For the geeks, I'll explain color temperature briefly. We all know when we heat a piece of metal, it first begins to glow red. We see this when we heat a syringe needle over a flame. If we continue to heat it, the metal will eventually glow white hot. As we heat it more and more the white color begins to take on a blue hue, provided the metal doesn't melt down into a puddle first. This is why tungsten in a vacuum is often used for light bulb filaments.
The Kelvin color temperature system is essentially the color a piece of dark metal will glow when heated to a specific temperature. The Kelvin scale starts at absolute zero, roughly -237C. This is Zero K. The scale follows the Celsius temperature scale and remains constant. Therefore, water freezes at 237K and boils at 337K. If you heat a piece of metal to a temperature of 4,763C, the resulting glow will have a color temperature of 5,000K. The color scale is used as 'corrected' color temperature when fluorescent or other gas type lighting fixtures are used. A 'natural daylight' fluorescent tube with a color temperature of 6500K would glow with the same color as a dark object heated to a temperature of 6,263C.
Color temperature is not an indication of the intensity of light, only its color. Mycelium forms fruits best with light at the 'blue' end of the spectrum, thus a higher color temperature is required for best performance. Look for lighting with a high color temperature such as fluorescent. Cool white fluorescent has a color temperature of 5,000K and natural daylight has a color temperature of 6,500K. Avoid UV light that is too high, and has been known to damage mycelium, as well as cause mutations, and cancer in humans.
Incandescent light bulbs by contrast, have a color temperature of around 3000K, which puts them in the 'red' end of the spectrum, and they are the worst choice for fruiting mushrooms.

LIGHTING - Many things. I've found the brightest light stimulates more pins. You need to look at pinning triggers like the instruments in a band. One instrument can be slightly off, and the band still plays the song. Often one instrument can be taken away and the music still sounds ok. However, if all are working together, it's awesome.
Perhaps the projects you remove from light after exposure are maintaining a higher humidity due to no heat from the lights. Humidity is a pinning trigger just like light. Maybe the ones you remove from the lights get better air circulation. Fresh air is a pinning trigger just like light.
For the record, light has no effect on colonizing mycelium, good or bad. The old advice of "incubate in total darkness" is bunk. Stamets wrote those words in TMC 20 years ago, and he disavows that advice today. I concur. The only real time that keeping in the dark has an advantage in my experience is during casing run, when the introduction of light after casing colonization can serve as one of the pinning triggers along with air exchange and proper humidity. Bare in mind, you want a constant rate of evaporation from your substrate to achieve the best pinset. If you're at 100% humidity, there will be little to no moisture evaporating from your

casing layer, and pinsets will suffer.
To repeat, light is a pinning trigger, but it isn't the only one, and it's greatly overrated. For the best pinsets, you have to balance several triggers at once. Screw up on any of them, and pinsets suffer, regardless of what you do with light.

LIGHTING - Normal room lighting has no effect on colonizing mycelium, either good or bad. This is one of the old myths perpetuated by stamets 'The Mushroom Cultivator', that was incorrect 20 years ago when it was written. He corrected his own mistake in GGMM, but fewer people have read that one because it centers more on edibles, than on psilocybe mushrooms. My own research says light doesn't make one whit of difference to colonizing mycelium in jars. The time to protect from light is during spawn run of bulk substrates and casing layers. During the initial colonization of grains or brf cakes, it doesn't matter. Light is required for primordia formation as well. Bulk substrate colonization is the last step prior to fruiting. The only reason for keeping a bulk substrate, and especially the casing layer dark during colonization is for the timing of the pinset initiation. It allows you to introduce all the major pinning triggers simultaneously, resulting in an explosion of pins. A bulk substrate will colonize just fine if exposed to light from day one, but then you aren't maximizing potential by synchronizing the pinning triggers.

TMC FAULTS LIGHTING - TMC is a classic and I still refer to it a lot. In the last twenty years we've learned a few things though. One, as hyphae said is the mycelium metabolites. Another is that colonizing mycelium need not be kept in total darkness. I think Paul fixed that one in GGMM, but I know at his beginners and masters seminars he points that out, and his own incubation rooms filled with hundreds of species, are under 8 to 12 hours per day of fluorescent lighting while work is being done. That has been my experience as well. Light doesn't become a significant pinning trigger prior to full colonization and the introduction of fresh air exchange. This one is probably nitpicking, but I don't like the TMC method of preparing grain jars which is add dry grain, add water and a pinch of gypsum, and PC. We now know that if you'll take the time to rinse the grains very well before cooking, they don't stick and clump up later. There's a couple of others I can't think of now. Nothing major though. It's a great reference work.

LIGHTING - While enough light to read by might give a minimum pinset, you want bright, high frequency light to induce a massive pinset. An hour or two in a window with even direct sunlight is great to kick start a pinset, but don't let the tub overheat. For the rest of the cycle, find a way to get the fluorescent to shine through the clear part of the tub. Put the light in front of or behind the tub. It doesn't have to come just from the top. The white lid will reflect side light down just fine. My entire greenhouse is lit from the back with fluorescent fixtures attached to the wall the greenhouse sits against. Cool white fluorescents produce 5000k, which is very close to natural sunlight. Incadescents are a much redder light and only produce at around 3200k, which is not nearly as effective. You want high frequency light for best results. The natural daylight fluorescents are the best, putting out light at around 7000k, but are much more expensive than cool white. Good luck.

LIGHTING FREQUENCIES, PLANT LIGHTS - Plants require much more light than mushrooms because they derive energy from the light source. In addition, most mj growers switch to a redder light at fruiting time, not the high frequency 'blue' light we get from our fluorescents. Perhaps you're confusing the Kelvin color temperature scale with intensity? My fluorescent fixture provides light to six shelves, each one eight feet long and three feet deep. That's 144 square feet, thus less than 1 watt per square foot of shelf space. The foil helps to prevent the trays in the back from being shaded by those in front. I challenge the best mj grower in the world to try to grow plants under that. Compact fluorescent bulbs work great as well for fruiting chambers and mini-greenhouses. In addition, LED technology has progressed considerably in the last few years. I'm sure it won't be long before LED fixtures are made with controllers to adjust color temperature.

LIGHTING - "Of course myc doesn't need dark but we use it to our advantage as a pinning trigger"
Exactly. After spawning the grains or brf or whatever into manure, it's a good idea to cover with foil to keep it in the dark during substrate colonization and casing colonization, and then remove the foil for light and sudden air/gas exchange to trigger pinning. However, I've found no benefit or harm from allowing the grain jars to be exposed to light from day one. If a few pins form in the grains, it is actually a good thing. Contrary to popular belief, a few pins in the grains can be spawned right into the manure or straw (or used in grain to grain transfers) and they do not rot or otherwise cause contamination. There is evidence they actually help to give a faster, more uniform pinset in the eventual flushes. Stamets believes it's the hormones or other

chemical triggers in the pins that do this.

LIGHTING - Light is very important after full colonization, when an increase in FAE is made. Enough light to 'see the tray' is absolutely NOT enough light unless you're happy with shitty pinsets. Brighter light is better. Higher frequency (blue) light such as is emitted by 'natural daylight fluorescent' tubes which produce light at 6500K are best from mine and Stamets tests. Cool white fluorescent tubes would be a second, lower cost choice and will work fine. Incandescent bulbs which emit 'red' light at 3000K are the worst choice. In addition, 24-hour light is extremely counter productive because hyphal knots form, and the fruit bodies seem to grow the most during the period of darkness. You can all prove that by simply measuring your growing mushrooms when you turn the light on, and again when you shut it off. You'll find growth is higher during the dark phase.

LIGHTING - Use full spectrum light, or a light that is in the higher frequency range. Don't use 'blue' lights or a 'blue' tub. Such is not in any way, shape, or form what the mycelium needs to perform well. The use of 'blue' led's or blue tubs is based on a misunderstanding of what Stamets was talking about in GGMM when he recommended high frequency lights, such as natural daylight fluorescent. This has all been covered ad-nauseam in previous light threads. It absolutely amazes me that people still repeat the 'any light will do' or 'if you can see, your mushrooms have enough light', or 'only a few minutes is enough' etc., etc. If one is satisfied with shitty pinsets, the above is true. If you're less than satisfied with shitty pinsets, use a light in the 6,500-Kelvin range. Incandescent grow lights are one of the worst possible choices.

LIGHTING - At full colonization, light becomes very important. The only real time you need to put your trays in the dark is during casing run. This allows the casing layer to colonize partially without the additional pinning trigger of light acting on it. At the proper time, you expose to light, increase FAE, and have full colonization all at the same time. This results in the best possible pinset. Read Hyphae's pinning strategy in his sig for more information on timing these events. There is no point in putting it into the dark now that it's already pinning. The fluoros you have will be plenty, but try to attach or hang them higher so they can give better direction to the fruits as they grow. It will also help hyphal knots to form if you'll have the light above the casing layer because it will penetrate deeper into it, thus helping to trigger knots. Good luck.

LIGHTING - Light is extremely important to good mushroom formation, and it's nothing to do with which way is up. Gravity takes care of that function. The post quoted above is only one of many times I've typed that. The problem is every time this question gets asked, people repeat the same 'stuff they've read' and thus if one of us fails to catch the misinformation, then somebody gets a grow compromised by using a desk lamp or some other less than desirable lighting source, rather than the best possible lighting. There's enough confusing points in mushroom growing to keep a board like this busy forever. Ask about things you're not sure of, or of the details you don't understand after searching. However, for the basic questions, the answers are all right here at your fingertips. Good luck to all. I'll try to be less pissy.

EXPOSING LIGHT FROM DAY ONE - In my experience, it's better to expose to light from day one. If you'll just let your bags or jars colonize on a shelf in a room of your house, they'll be exposed to normal room light. This will help to initiate pinning as soon as the substrate is ready to support fruitbodies. Colonizing your jars in the dark only delays pinning, and delay is not good in this hobby. Get light on it right away. I seriously disagree with keeping cubie mycelium in the dark at any time. I expose to light from the time the spores germinate on agar. Sometimes there are even a few pins in the jars when I break them up for the casing. That is no problem. Just mix them in and case it. If you give light from day one, your yields will go up, and you won't face overlay problems.

LIGHTING - Lighting is EXTREMELY important for a good pinset. Cubes will fruit in very low light conditions, but bright fluorescent light will help to trigger the pinsets the old timers show all the time that makes folks drool. Actually, you're probably right. The mushrooms don't care that much about light, but the mycelium sure as heck does. Lights, especially fluorescent, should be outside the terrarium, but near enough to flood the fruiting chamber in bright, high frequency light. Don't put the ballast outside and the lamps inside. The tombstones have a fairly high voltage potential across them, and wrapping a warm item in plastic in a wet environment is ...dumb. There isn't much more useless than 'blue' mood lights, especially from led's.

LIGHTING - There's a world of difference between 'blue spectrum' and what you get when a red light (incandescent) shines through blue plastic. (Dim) By 'blue' they mean high frequency light, such as would be

emitted by a metal halide bulb, or natural sunlight fluorescent. You'll want to get better lighting to get the best pinsets. It's better than nothing, but only ten percent of the electricity to run an incandescent is turned into light. The other ninety percent is turned into heat. Fluorescent fixtures are the opposite. 90% of the energy is turned into light and ten percent into heat. They're also closer to the frequency that is ideal for pinning.
http://www.shroomery.org/forums/showflat.php/Number/6611363#6611363

LIGHTING - All lights will produce heat. The light needs to be outside the fruiting chamber. Electricity and 100% humidity don't mix. Don't use blue Christmas lights. They're NOT the correct color temperature. By 'blue' we mean light at the high end of the spectrum. It will still look white to your eyes. As said, 6500 Kelvin fluorescent lights give the best bang for your buck. They're usually labeled 'natural daylight' on the package, as opposed to 'cool white' which are 5,000K and 'warm white' or 'kitchen and bath' which are 3000K, which is referred to as 'red' light, even though they still look white to our eyes. You can also simply place the terrarium in a room with a bright window and let the natural sunlight do the job.

LIGHTING - 2700K are awfully red. It might be nice for room light and for reading because it's 'warm', but you want light in the bluer end of the spectrum, so shoot for a frequency above 5,000 Kelvin. Lumens do matter to an extent. We're not deriving energy from the light, but it does need to be bright enough to penetrate into the casing layer. Bright fluorescent light from a 'daylight' type tube seems to help generate the best pinsets over a wide range of species. I have a four-tube 48" fluorescent fixture with 6500-Kelvin tubes in all four slots. This light is plenty for my mini-greenhouse. I have it hanging from the ceiling so it shines into the front of the greenhouse. Reflective foil is on the back wall of the GH.

LIGHTING - It sounds like something else growing in the area. MH is known to cause early pinning in jars because of the high frequency light output of MH. However HPS is more of a red light at the lower end of the spectrum, so it shouldn't be that bad. I'd still move the jars away from it. The heat could cause problems. There is no need to keep colonizing jars in the dark, but there is also no need to expose them to very bright lights either. When fruiting time comes, you'll probably do better to get a natural daylight fluorescent. The 6500K color temperature seems to stimulate primordia formation better than the lower color temperatures of lamps such as incandescent and HPS.

LIGHTING - You want bright light for 12 hours per day, not normal room light, which is usually at the red end of the spectrum if it's from incandescent bulbs, and is the worst possible choice. Incandescent bulbs produce light at 3000K. Cool white fluorescents are a higher frequency light and perform much better, with a color temperature of 5000K, and natural daylight fluorescent produce light at the 'blue' end of the spectrum with a color temperature of 6500K. You don't want blue lights. Light at the high (blue) end of the spectrum will look white to your eyes. You don't get high frequency light by using a bulb with a blue dye on the lens.

LIGHTING - Not at all. They will do best with 12 hours of light. I'd put them in the dark when they're about 90% colonized, then when they are at 100%, birth and begin giving them light at that time. This allows the four major pinning triggers of full colonization, steady rate of evaporation from the substrate, fresh air exchange, and light to all happen at the same time. Such has been shown to give the best pinsets. Light does not become a significant pinning trigger until the other factors have also been met. Many growers dunk at the time of birthing to pump the moisture content up for the first flush.

TMC FAULT, LIGHTING - Light has neither good nor ill effects on growing mushroom mycelium. It will not hurt, nor help, but there is no need to keep your jars in the dark. Stamets makes this clear in GGMC. He used to recommend incubation in total darkness (TMC), but he no longer recommends this. I concur. If you visit fungi perfect you will see he has 10,000 square feet of incubation space that is exposed to overhead fluorescent lights during the full workday. My jars sit on a shelf in an open room as said above and they're exposed to light from the day spores are started.

LIGHTING - The Kelvin scale refers to the color temperature of the light. Briefly stated, if you took a piece of white paper and looked at it under 2,000K such as you'd get from hps, it would look yellow. If you looked at it under 5,000K fluorescent tubes such as you'd find in an office or school classroom, it would look white. If you look at it under 7,500K fluorescent, it would have a blue tint to it. That's what is meant by 'blue' light. You can pick up an inexpensive fluorescent fixture and 7500K fluorescent tubes fairly cheaply at your local hardware store.

LIGHTING - My current setup is a larger fluorescent fixture that holds four 48" tubes, and I have it hanging vertically so it shines in from the front to bathe all five shelves in bright light. I have it about 12" from the door of the GH, so the farthest any substrate is from the light is about 36". The fruits tend to grow toward the light a bit, but that problem is fixed by rotating the trays 180 degrees every couple of days so growth is even. I'm glad to see you got the right frequency of light. 6500K are awesome. You'll never go back to silly night-lights or cool white fluorescent after using one of those. They really do make a difference in pinsets.

LIGHTING - I've still never seen a 150-watt cfl that small. At any rate, with multiple shelves or long shelves, tubes will spread the light out better, thus giving more coverage. I use 5 shelves in my mini-greenhouse, with a 48" fixture hanging vertically in front of the unit, which holds four fluorescent tubes with a color temperature of 6,500K. By hanging the light fixture vertically, the fixture lights the entire greenhouse between all shelves. With only one bulb, you're limited in coverage. They'd be great for tubs and the like, but there is no need for 250 watts. It will burn five or more times the electricity your projects require.

LIGHTING - They do care if they don't get air. You'll get a very poor pinset without several air exchanges per day at the very least. Four to five per hour are recommended. Water beads on the inside of the terrarium have NOTHING to do with humidity. They indicate a temperature differential, nothing else. You want your light outside the terrarium. Fluorescent ballasts generate a high voltage, and that doesn't go with near saturation humidity at all. In addition, a fluorescent ballast and light inside will heat your terrarium a lot. It will be over 90F in there within a few hours. Also, the heat will lower humidity, not raise it.

LIGHTING - Mushrooms grow towards the light. Very true. However, as an experiment, you can put the light above and a fan blowing from right to left. Watch what happens. In the absence of any wind, the mushrooms grow towards the light. You can also screw with your mushrooms if you're bored. Every morning, rotate your trays of pinning/fruiting mushrooms by 90 degrees, and leave them until the next morning, then rotate them an additional 90 degrees. They'll grow up in a spiral.

LIGHTING - You can't argue that light makes a big difference with growers that are happy with crappy pinsets. However, if you want the best pinset and growth you can get, and then use bright light with a color temperature of 5,000 Kelvin to 7500 Kelvin. Of course, there's other parameters that are just as important, if not more important than light. Failure to pay attention to ALL the pinning triggers is like trying to win the Indy 500 with a clogged up air filter or dirty spark plugs.

LIGHTING - It's true that they tend to grow more during the period of darkness, but that's only part of the equation. The other part is that pins for second, third, and future flushes often form during the time of first flush. If you go cheapie on the light after the first flush is set, you hinder primordia development for future flushes. Mushroom mycelium has circadian rhythms just like humans. Give them a day/night cycle and they'll be much happier over the course of several flushes.

LIGHTING - One, a 25W incandescent bulb only puts out the amount of light that a 2.5W fluorescent bulb would put out. Over 90% of the electricity used by a light bulb goes toward making heat, and only 10% of the electricity goes toward making light. With fluorescent, that ratio is reversed. In addition, incandescent bulbs put out light at the red end of the spectrum, and fluorescent lamps put out light near the blue end of the spectrum, which is much better for fungi.

LIGHTING - I've been saying for years that both light and total darkness are vastly overrated when it comes to mushroom growing. Some strains seem to be better at pinning in low light conditions, while others require much more. The other pinning triggers of full colonization, steady evaporation of moisture, and air exchange are much more critical than light. As a general rule however, pinsets will be better with bright, full spectrum lighting over dim/darker conditions.

LIGHTING - The reason intensity is important is because the light needs to penetrate the casing layer to the substrate below. Frequency is also important with light at the higher end of the spectrum, such as natural daylight fluorescent with a light temperature between 6,000K and 7,500K providing the best results. Cool white fluorescent tubes are generally in the 5,000 Kelvin range, and regular incandescent bulbs run about 3,000K, which is the worst possible choice.

LIGHTING - They need light for much more than to know which way is up. A lot has been written about this. Bright, intense light is going to stimulate a much better pinset than dim, low light. 12/12 has shown over the years to give the best performance. I don't even have my lights on a timer anymore unless I go out of town. I plug them in when I get up, and unplug them sometime in the evening. They rarely get exactly 12/12, but close.

LIGHTING - Bright, high frequency light at 12/12 will deliver the most prolific pinsets. You want maximum FAE, high humidity, and bright light, especially with cased substrates. The light needs to be bright enough to penetrate the casing layer for best results. 'Some' pins will form with low levels of light, but if you want the WOW factor, use bright fluorescent light or sunlight from a window. They do best with a period of darkness each day.

TMC FAULT, LIGHTING - Light has little to no effect on colonizing mycelium. I expose all jars to light from day one. I also incubate on a shelf in an open room at room temperature. If you visit fungi perfecti, you'll see that stamets has 10,000 square feet of incubation area, all of it exposed to fluorescent lights for 8 to 10 hours per day. He no longer recommends incubation in total darkness as he did 20 years ago when he wrote TMC. I concur.

LIGHTING - Two things. First, don't install lights inside a terrarium. Even a small light will create heat that causes other problems. Second, if it's incandescent, it's the wrong color temperature. You want a high frequency light such as natural daylight fluorescent for best results. Simply hang it above the terrarium. Bright, intense, high frequency light provides the best pinsets, so get a good one. I use four, 4' natural daylight fluorescent tubes.

LIGHTING - Many fluorescent tubes will have the light temperature stamped on them at the end. Cool white bulbs are in the neighborhood of 5000k while the kitchen and bath fluorescent tubes are warm white, and at 3000K, similar to regular light bulbs. The higher 'k' numbers will deliver better pinsets, because they match outdoor sunlight closer. Fortunately for us, cool white fluorescent which is superior, is also the least expensive.

UV LIGHTING - UV light strong enough to STERILZE will F/U your eyes, skin, cause cancer & other BS. If it is contained, as in well shielded..... it works great, but you still need filtration. Best is hepa filter run into UV light shielded in metal ductwork. Instance I refered to was UV light in metal ductwork behind filter, because it killed anything that got past the filter. The ductwork fed into a "clean" room area & it was fully sheilded.

LIGHTING - Natural Daylight fluorescent has been shown to produce the best results. Your milage will vary depending on the genetics of your strain using other types of lights. However, mushroom primordia seem to develop best in the 5,000 Kelvin to 7,500 Kelvin range which is exactly what is delivered by most fluorescent tubes. The Natural Daylight tubes are rated between 6,500 and 7,500 Kelvin depending on manufacturer.

LIGHTING - Brighter lighting will work better than dim, far away lighting. The light needs to penetrate the casing layer. Don't listen to those who say if you can see what's happening, there is enough light. That is incorrect. You can get small fluorescent fixtures intended for under kitchen cabinets for less than ten dollars. Put one a few inches above your plexiglass. Put it high enough that heat isn't transferred, but bright light is.

LIGHTING - The only reason for keeping a bulk substrate, and especially the casing layer dark during colonization is for the timing of the pinset initiation. It allows you to introduce all the major pinning triggers simultaneously, resulting in an explosion of pins. A bulk substrate will colonize just fine if exposed to light from day one, but then you aren't maximizing potential by synchronizing the pinning triggers.

LIGHTING - If you're going to use LED's, use white ones. Your mushrooms need full spectrum light, not mood light, and some evidence points to light at the higher end of the spectrum being somewhat better at setting primordia. Bright light will penetrate deeper into the casing layer, stimulating more pins than dim light. Avoid lights that produce excess heat such as incadescent or halogen.

LIGHTING - The color temperature (not light temperature) of any specialty bulb should be stamped on the package. Normal incandescents are in the 3000K range, which is too low. HPS is even worse, in the 2000K range. You want light at the other end of the spectrum. Cool white fluorescent is around 5000K and natural

daylight fluorescent is 6500K, making it the best choice for the money.

LIGHTING - Use natural daylight fluorescent with a color temperature of 6,500 Kelvin for best results. I said use 6,500 Kelvin natural daylight fluorescent for best results. There is no contradiction. Mushroom cultivation was in its infancy 25 years ago. We've learned a lot since then. Lamps with a color temperature of 6,500 Kelvin are NOT low frequency-they're considered 'blue' light.

LIGHTING - Normal room light has no effect on colonizing mycelium, either good or bad. Usually, when mycelium stalls, it's due to lack of air exchange. If you have a verm filter, take the lid all the way off for a few minutes and then put it back on. If the mycelium starts to grow again, you know that was the problem. Make sure the inoculation/gas exchange holes are open.

LIGHTING - Correct. A 60 watt light bulb on the ceiling is enough to trigger a few pins. Failure to use proper lighting doesn't mean the entire project is going to fail. It simply means it will be less than what could be achieved by a tad more work. It's sort of like driving your car with one tire flat. You'll still get there, but not as fast, and people will point and giggle.

LIGHTING - Xmas lights have been used for years with poor to mediocre results. Don't put too much faith in the experiment done several years ago. Many, many tests since then have shown otherwise. Most any light will stimulate some pins to form, but the higher frequency lights in the 5,000 Kelvin to 7,500 Kelvin range will help to provide the best pinset possible.

LIGHTING - Yes you do. They require light right up until harvest. It provides direction for growth. In fact, many species such as oysters will turn into a mass of coral without adequate light. Shiitake won't grow at all. Cubes without light will twist around, not knowing which way to grow. Performance will suffer. 12/12 right up until harvest is the proper procedure.

LIGHTING - Even MH is at the 'red' end of the spectrum, just not as red as the old SV or HPS. MH has a color temperature of around 4,000K and HPS is around 2000K, but cool white fluorescent is 5,000K and natural daylight fluorescent is 6500K. Regular household light bulbs are around 3000K. The higher the color temperature in Kelvin, the more 'blue' the light is.

LIGHTING - I've measured many flushes of various species on a day to day basis and found that most mushrooms grow more during the period of darkness than during the period of light. The change in temperature caused by cycling the lights 12/12 is also positive. Mushrooms are not plants, but as said above, light does indeed have a major effect on them.

LIGHTING - The main pinning triggers are full colonization, an increase in fresh air that comes with the decrease in CO_2 levels, and a steady rate of evaporation from the substrate. Once those conditions have been met, light becomes a secondary pinning trigger. A few minutes of light will work, but 12/12 has been shown to produce superior product.

LIGHTING - That's why growers who use a very bright fluorescent light in the higher part of the color spectrum have much better pinsets and yields than those who use ambient room, or worse yet, only a few minutes a day of dim light. The light should be bright enough to penetrate well into the casing layer, which should also be loose and airy.

LIGHTING - Light is only a secondary pinning trigger, not the main one. Full colonization of the substrate, with an increase in air exchange are the two biggies. For best results, all the pinning triggers should be introduced at once. You'll have to say more than 'kit' to get help, and 'dirt' is what you get under your fingernails. Mushrooms don't grow on it.

LIGHTING - Light at the higher end of the spectrum is far superior to light at the low end of the spectrum. Incandescent light bulbs with a color temperature of 3,000 kelvin are considered 'red', and natural daylight fluorescent with a color temperature of 6,500 kelvin are considered 'blue' which is superior. Search the above terms for much more.

LIGHTING - Lots of people are satisified with 'less' light. It's just that if you want the best possible results, go

with the best of all possible setups, which means best light, best substrate, best temperature, best humidity, etc. By all means if anyone is satisfied with less, go for it. Many of use raise growing to an artform, but not all. To each his own.

LIGHTING FRUITING - Just use a plain fluorescent bulb, and keep it above the terrarium, not inside it. Heat isn't an issue that way. As said, there's a big difference between short wavelength light(blue spectrum) and a light that makes your walls 'look' blue. However, the whole blue light thing is overrated. Use a full spectrum lamp.

LIGHTING - All you need to do is rotate your tubs every day or two to offset the light from an angle. Even if you don't, it's cool to see them grow towards the light. There's really no reason they need to grow straight up, and growing at an angle actually gives the caps more room to spread out without interferring with each other.

LIGHTING - What you're giving is great. There are no hard and fast rules. Some experienced folks give more light, some less, but all get great pinsets, so don't worry too much about light. A few hours a day is fine, so placing your project near a window where it gets diffused sunlight, but no direct sunlight is ideal.

LIGHTING - You want lights that are high in the color spectrum, thus a color temperature of 6500 to 7000 Kelvin works great. It will look bright white to your eyes. Christmas lights are a poor choice. They do have some full spectrum LED's out now, or you can use 'natural daylight' compact fluorescent lamps.

SMART FRUITING CHAMBER LIGHTING - If a light 'looks' blue to your naked eye, it means the blue has been filtered out of the spectrum. It's counterproductive. The blue light is at the high frequency end of the spectrum. The best source of blue light, if you want to experiment, is a Metal Halide lamp.

LIGHTING - Incandescent is never recommended for mushrooms. Incandescent lamps emit a red light that is at the opposite end of the spectrum from what mycelium prefers for primordia formation. Use fluorescent, preferably 'natural daylight' tubes with a color temperature above 5,000 Kelvin.

LIGHTING FC - Higher intensity light helps deliver a better pinset than lower intensity light. A few hours is cool, but most growers report better success with 12. The darkness time need not be total darkness. Turning on the light to see what you're during your mushies 'night' won't hurt anything.

LIGHTING - They never need total darkness at any time. Ambient light is fine. 'We' don't say mushrooms require only a small amount of light to grow however. Depending on the species, the results on pinset and performance from much brighter lights is well documented.

LIGHTS, IN OR OUT OF FC/MARTHA - The problem is when the lights are turned off, they will draw in moisture as they cool, then will be wet inside next time they're turned on. It's best to keep the lights outside of the terrarium or mini greenhouse unless they're battery operated.

LIGHTING - And natural daylight fluorescent takes it a step higher than cool white. They're the best of all. Warm white=3000K, cool white=5000K, and natural daylight fluorescent=6500K. The higher the light temperature in Kelvin, the higher the frequency, or closer to blue light.

LIGHTING - I use four 4' natural daylight 6500K fluorescent tubes for my mini greenhouse. It works like a charm. The important thing is to keep the humidity to as close to 100% you can get while still allowing plenty of air exchange. All three are important pinning triggers.

LIGHTING - I've found the brighter the better. You might even move the cakes to where they can get some diffused sunlight each day. Even direct sunlight for a few minutes is a good thing. You might try some damp verm on top of the cake too. That seems to help with pinsets.

LIGHTING - 5100K is fine. I think 6,500K to 7,500K is better, but when you compare to incandescent bulbs which burn at 3,000K, they're way better. Definitely, you don't want red. You also don't want any sort of colored cover over the bulb, and that includes blue.

LIGHTING - If it's a 'kitchen and bath' fluorescent, it probably has a color temperature of 3,000 Kelvin, just

like incandescent. It will still work, but possibly not as well as 'natural daylight' fluorescent. Put it right up close to the fruiting chamber, but not inside.

LIGHTING - 12/12 is optimum, as is light at the high end of the spectrum. For the best bang for your buck, get natural daylight fluorescent tubes and run them 12/12. Mushrooms grow and hyphal knots form primarily in the period of darkness, so 24/7 is a mistake.

LIGHTING - To repeat, light is a pinning trigger, but it isn't the only one, and it's greatly overrated. For the best pinsets, you have to balance several triggers at once. Screw up on any of them, and pinsets suffer, regardless of what you do with light.

LIGHTING - Light has no effect on colonizing mycelium. The information from twenty to thirty years ago to keep them in the dark is just plain wrong. Light is not a pinning trigger until full colonization and a reduction in ambient CO_2 levels.

LIGHTING - You want bright fluorescent light in the high frequency range. Look for 'natural daylight' tubes or whatever they call them in your country. They should have a color temperature of 6,000 Kelvin to 7,000 Kelvin for best results.

LIGHTING - NEVER use 24 hour light. They grow and form primordia during the period of darkness. Attics are usually horrible places to grow due to wild temperature swings. Light is required for primordia formation as well.

LIGHTING - 12/12 from a high spectrum fluorescent, such as 'natural daylight' tubes with a color temperature of 6,500 Kelvin, will outperform other sources unless you have a bright south window. Avoid direct sun.

LIGHTING - Incandescent is the worst possible light for mushrooms. While it might 'work', you'll get much better performance and pinsets if you'll screw in a compact fluorescent instead of an incandescent light bulb.

LIGHTING - Cool white fluorescent gives the most bang for the buck in my experience. You'll definitely see an increase in pinning activity with metal halides, but they use a lot of energy and produce a lot of heat.

LIGHTING - CFLs use a tiny fraction of the electricity an incandescent bulb uses to produce the same amount of light. If you buy a CFL for mushroom growing, look for one that says 6,500 K on the packaging.

LIGHT - Light has absolutely NOTHING to do with telling the mycelium that it has reached the surface. The increased fresh air, with the corresponding drop in CO_2 levels sends the mycelium that message.

LIGHTING - Lighting is extremely important, and it's important to provide it at the right light temperature and intensity. Look for tubes with a light temperature above 5,000K.

LIGHTING - A 13 watt cfl does not produce 60 watts. It produces the lumens a 60 watt incandescent bulb does, but at a higher frequency, which is better for pin formation.

LIGHTING - I'd check the manufacturer website for that info. You can get a 6500K fluorescent fixture and tube for under twenty dollars at your local home megacenter.

LIGHTING - Diffused sunlight through a window is great. In fact, five to ten minutes of direct sunlight will often get a stubborn substrate to begin pinning.

LIGHTING - Bright light stimulates pinning. The light has to be bright enough to penetrate the casing layer. Dim light will result in poor performance.

LIGHTING - Warm white=3000K, cool white=5000K, and natural daylight fluorescent=6500K. The higher the light temperature in Kelvin, the higher the frequency, or closer to blue light.

LIGHTING - Fluorescent lighting is great. Look for a color temperature in the 5,000K to 7,000K range. UV light is bad for mushrooms.

LIGHTING - For those of you who have a project that 'just won't pin' try switching to natural daylight fluorescent and watch them take off.

LIGHTING - You don't need a light right on the tub. You can have it near a window(recommended), or use just a regular ceiling light.

LIGHTING - That would explain the no pins. You want a light at the other end of the spectrum. I'd suggest fluorescent tubes.

LIGHTING - I use four 4' natural daylight 6500K fluorescent tubes for my mini greenhouse. It works like a charm.

LIGHTING - You don't want blue. You want full spectrum. That means they will look white.

LIGHTING - Light is a secondary pinning trigger, once full colonization has been reached.

LIGHTING - Any cfl would be better than an incandescent light bulb.

LC/AGAR/CLONING/STERILE PROCEDURE/HELP/PROBLEMS/OTHER

AGAR - Put a lid on the jar that has been drilled and fitted with a filter. In other words, if you're using a jar, treat it like a grain jar. I use a whiskey bottle with a filter in the lid for agar because it's easier to pour. Pour the dishes after the agar has cooled, but before it's solidified. I wait until I don't need an insulated glove or pot holder to protect my hands from the heat. This will prevent condensation. Pour the dishes in a vertical stack, and then slip the sleeve back over them as protection while they cool. The agar will settle out until after pressure cooking. Just before pouring the plates, give it a stir. By the way, you can PC any sealed container, except some plastic bags. I routinely PC water in jars and also test tubes of agar that are tightly sealed. They don't blow up. Pressure inside the jar and outside is the same, therefore there is little to no differential between them. Just don't do something stupid like pop the weight off the PC at the end of the cycle and you can seal jars just fine. Agar being sterilized for Petri dishes in a jar or bottle should get a filtered lid, as I said above. You can use jars as Petri dishes, but you'll tire of it quickly. They're much more of a pain in the ass to work with than Petri dishes. Many growers new to agar use their jars, but once they switch to Petri dishes, they don't go back. A simple strain isolation series can easily generate fifty or more dishes working simultaneously, and that's a LOT of jars to keep stacked up.

AGAR - A few years ago, I ran several experiments to prove/disprove stamets' theory that if you clone very young healthy pins, the hormones that stimulate pinning are active, therefore the mycelium that grows from those pins will in turn produce better flushes with abundant primordia and fewer aborts. These pins were not sterile by any means, yet they were layed on the agar and the rapidly expanding mycelium simply overran any bacteria or molds that may have been present. You wouldn't get that same performance from a large fruit that was fully mature. Of course, I would never transfer those sections to grains because of dormant contaminant spores that may be present. Instead, a small piece of mycelium from the leading edge should be transferred to a new dish, which once grown out for a few days can then inoculate up to ten quart jars, or be transferred to LC to grow out the isolated strain for even larger inoculations. It was inconclusive on the hormone thing. This was already an isolated strain and an excellent performer. If anything, it may have pinned a day or two sooner, but there's too many other variables involved to be able to attribute it to just the hormones. Use pins. The pins grow very aggressively to eat for lunch any contaminant spores that might be on them, a large already slowed down fruit will not. I used Gentamicin Sulfate.

AGAR/ISOLATES - The hot agar is a way to isolate away from contaminants. It's mostly used when cloning wild mushroom tissue that is infused with bacteria and molds within the mushroom itself. You pour the piping hot agar over the contaminated culture until it's completely covered with agar, and then watch it carefully over the next few days. The bacteria and molds are 'pasteurized' by the hot agar, but in this case, the mushroom mycelium is more resillient and begins to grow up through the top layer of agar, reaching the surface in 48 hours or so. Shave off the mycelium with a scalpel as it appears on top without taking any of the agar. Do this

with each growth that appears on top as soon as you see it, preferably within an hour or two of its appearance. This tek separates healthy mushroom mycelium from the contaminants. After the transfers, each dish is inspected under the microscope to identify perfect vs imperfect fungi. The molds are tossed out and the mushroom mycelium is kept.

AGAR - Do not turn them upside down. As workman said, keep temperature swings to a minimum. Keep the dishes in a vertical stack, and usually only the top one will have any condensation after a few days. It also helps if you wait to pour the Petri dishes until the agar has cooled enough that it starts to thicken. You won't need heat protection for your hands at this point either. This is the best way to avoid condensation. Always colonize agar at normal room temperature. You'll need to transfer away from contaminants as soon as they're noticed. Antibiotic agar will help with bacteria if you're attempting to clone outdoor wild mushrooms, but the antibiotics aren't needed when working with indoor clones or spores.You want to wrap Petri dishes with parafilm. It breathes, yet has a pore size that prevents contaminant spores from entering. Without parafilm, the slightest temperature variation will cause contaminants to be drawn into your dishes, where they might remain dormant until you spawn the agar to grains, at which time you'll wonder where all the green came from. I would imagine micropore tape would work also. Some growers use Glad cling wrap. I use Parafilm.

POURING AGAR - Don't disturb them unnecessarily. Over time, the excess water will replace moisture that evaporates from the dish. The moisture is caused from the inside of the dish being warmer than the outside.
When you pour agar, let it cool until it begins to thicken a bit. You want it to cool in the bottle you sterilize in, not the Petri dishes. When cool enough to pour without heat protection for your hands, fill your Petri dishes, and leave them stacked in a vertical pile. This will equalize the temperatures between the dishes and reduce condensation to a minimum. If you don't have a flowhood, you should slide the plastic cover back over the stack to enclose them as they solidify.
An excellent bottle for agar is a used whisky or other liquor bottle with a long neck and screw on lid. You can use polyfill or a synthetic filter disk cut to size in the lid. Just drill a 1/4" or larger hole in the lid. Cover with foil and PC. The filter will keep the agar from contaminating as the PC cools and until ready to pour. Don't remove the foil until just before you pour the dishes.

AGAR - In a glovebox you can easily get a tiny piece of good mycelium from that dish and move to a fresh one. Get the mycelium from the opposite side of the dish to the contaminant. Once you have the mycelium on a new dish, about two to three days later, you'll see the mycelium crawling off the wedge to the new agar. At this point, transfer a tiny piece of the fresh growth to a new plate. If you make the second transfer before the mold germinates, you now have a clean culture. If not, continue doing transfers until you get ahead of the mold. It's easy to clean up cultures from contamination on agar. You need to wrap your dishes to prevent contaminants getting under the lid. Remember, any time the air temperature in your room changes, the agar expands and contracts, forcing air in and out of the dish. This causes contamination if you don't have a gas permeable wrap around the edges such as parafilm. Some growers use cling wrap with success, but I stick with parafilm. At any rate, get the edges wrapped. Good luck.

AGAR - One swipe of spores on agar will yield hundreds of strains. By selecting a dozen or so of the best rhizomorphic strains and fruiting each one separately, you can find the super performer that will cover every spot of your casing layer with healthy pins. It might take hundreds of multispore grows to find that strain, if ever, because multispore inoculated substrates usually end up with only one or two strains by the time they fruit because they've all combined. (anastomosis). This means the good fruiting and potent strains combine with the poor fruiting and bunk strains. You never know what you're going to get. Isolate on agar, then fruit separately and test each strain. When you find the best one, you can keep master slants in the refrigerator and grow that isolate forever.

AGAR - The reason you don't see rhizomorphs early on is because there's so many substrains active, they cover each other up. It usually takes two or three transfers to begin to see rhizomorphic growth. I'd transfer a tiny piece from each sector to new dishes. I usually make the first transfers as soon as the spores begin to germinate, when the total growth is the size of a dime or less. Repeat the process a few times. Don't try to isolate 'one' rhizomorphic growth. Instead, isolate as many as you can, and then fruit each one. Once you determine the best isolate, you can store it in master culture slants to use for years to come without degradation.

AGAR/TRANSFER - A Petri dish that is fully colonized is not one that I'd use to inoculate grain masters with, even if the dish was wrapped with parafilm. I'd suggest taking a small piece of mycelium from the Petri dishes, and use it to inoculate fresh dishes. Allow that to grow for a few days, and then grab a very tiny piece of mycelium from the leading edge of the new growth. Transfer that fresh mycelium to a third dish and allow to grow 2/3 of the way across the dish. This clean mycelium can then be used to inoculate up to ten 1 quart/liter grain masters, which can each inoculate ten more via grain to grain transfers.

AGAR - You simply lift the lid of the grain jar and drop the agar wedge in. Prior to that, wipe the surfaces of the Petri dish and grain jar with alcohol, flame sterilize the scalpel, wear surgical gloves that have been washed with alcohol, and work as fast as possible, leaving the agar culture exposed for only a few seconds, and the grain jar lid open no more than 2 seconds. It may be stating the obvious, but the use of a glovebox or flowhood should be considered mandatory. Let the mycelium recover from the wedge into the grains for a few days before you shake.

ISOLATING ON AGAR - Sometimes, even with a clean sporeprint, you'll get a bit of contamination on the dish along with the mushroom mycelium. This is easy to transfer away from, by taking a small piece of mushroom mycelium and moving it to a new dish. Always take mycelium from the leading edge of the growth because this is the farthest away from the contaminant. We also transfer individual sectors away from each other so individual strains can grow out to determine the best fruiting ones. When cloning wild mushrooms, there's almost always molds and bacteria present, so it takes several transfers to get a clean culture.

AGAR - It often takes a few transfers from the initial spore swipe for strains to differentiate. Take a series of transfers of pieces of mycelium from the leading edge of the circle of growth and transfer to new plates. As these start to grow out, you'll probably see some sectoring. Transfer each sector to a new dish, and continue until you have single sector isolates, and then fruit each one to find a few stellar performers. Be sure to keep them properly labeled so when you fruit out a great one, you can go back to the original Petri dish that you've stored in the refrigerator, to get an earlier version of it to propagate and store in a culture slant.

AGAR - The purpose of agar is to be able to isolate mycelium away from contaminants, and to be able to isolate strains. By inoculating and leaving, if contaminants are present, they'll germinate and get a head start on the slower growing mycelium. I'd wait until you get back to inoculate. Often, bacteria and molds will be growing along with the mushroom mycelium, and you'll want to be there to make transfers. Agar isn't for expanding mycelium, so don't allow a dish to grow fully out.

AGAR - A single swipe of spores from a print, or a couple drops from a syringe might generate dozens or more sectors. I'd suggest transferring all of them to new dishes. You don't want to just isolate one strain, because it might be a dud. Isolate several promising looking strains and then grow each one out to determine the one(s) you want to keep for perpetuity in master culture slants.

AGAR - Cool the agar until just before it's too thick to pour. In addition, be sure to stack the dishes in a vertical configuration for colonization. Temperature differential causes condensation, so both the hot agar, and also the heat produced by the mycelium will cause condensation. Stacking the dishes helps prevent condensation from the latter by equalizing the temperature.

AGAR - You'll be much more likely to inoculate with molds and bacteria using powdered material. The dry tissue can also be grown out on agar without spores, but it takes a lot of transfers and patience. I'd suggest antibiotic agar. You can use up to 15mg of Gentamycin sulphate per liter of agar to help control bacteria. You'll just have to isolate away from the molds though.

AGAR/LC - Can you get DEXTROSE (straight corn sugar) & LIGHT DRY MALT powder? Both can be had at wine & beer (home brew) places. If so? Level teaspoon of each, into quart water. Simmer on stove to dissolve, filter, pour in jars, PC 5 to 8 minutes & you should end up with a fluid that is a light golden beer color (no chunks or flakes).

AGAR - We don't use agar to expand the mycelium so large dishes are worthless. We use agar to clean up our cultures from contaminants in the two dimensional space of a flat plane. Therefore, smaller dishes are most efficient because you shouldn't leave a culture growing more than ten days or so on a dish before doing

something with it.

AGAR - Never use a warming plate with Petri dishes. Leave them in the bag they come in until they are IN your glovebox or in front of a flow hood. Wrap with parafilm, four squares per dish as soon as you inoculate. There is absolutely no reason to worry about keeping Petri dishes in the dark. Light has zero effect on agar or colonizing mycelium.

AGAR/SPORES - Unless the spores were from a cap that just dropped them an hour or two earlier, it takes a bit longer to see growth. You might see something if you put the dish under a microscope, but it takes a few days after germination for them to thicken up enough to see with the naked eye.

AGAR - Always mix the dry ingredients first, then add a small amount of room temperature water and swirl it around until the powder is dissolved. Don't shake, just swirl. Then add the rest of the water and sterilize. Pour the dishes before the agar cools below 100F or it will begin to solidify.

AGAR - If two drops or even three land, it won't kill your plate. One is usually enough though, especially if you're doing strain isolations. Just be sure to put one drop on each of a dozen plates so you can isolate out a LOT of strains to find the best performer(s).

AGAR - Antibiotics such as Gentmycin sulphate will help protect against bacteria, but do nothing to slow down fungi such as trichoderma or the other contaminants of mushroom culture. Sterile technique is the key to avoiding contaminants of all kinds in our art.

AGAR - When working with wild prints, I'll often use antibiotic agar, and mix it with less malt. If you buy pre-mixed agar powder from fp or sporeworks, you can mix it a bit weaker than recommended. This will keep from feeding the mold and bacteria quite so much.

AGAR - Agar is for germinating spores and isolating strains from each other and away from contaminants. You can use agar wedges to inoculate jars, which you then use for grain to grain transfers to expand the mycelium. Agar itself isn't used to expand mycelium.

AGAR TRANSFER - You want the Petri dishes open the least amount of time possible. I follow the 5 second rule. Never allow a Petri dish or jar lid to be open for more than five seconds at any time. Never have more than one Petri dish open at the same time.

WATER, AGAR - Lake water works fine, as does bottled or even tap water. I use regular tap water for everything except mixing agar. The organisms in the lake water won't help as they'll be 86'd by the PC.

AGAR - Fungi is perfect bacteriological agar made from the correct Petri types of agar, has malt/peptone/yeast which is the best combo, and has alot more then those packets you get from those 10 dollar packets.

AGAR - Normally, the term nutrient agar is used to refer to agar that has blood or other ingredients to tune it specifically to bacteria, which is what we are trying to tune against. I recommend MEA.

AGAR - I don't remove it from the pressure cooker until it's below 150F, and I then wait to pour until I don't need any heat protection for my hands. That's about 115F or perhaps less. If you pour it too hot, you'll get a lot of condensation on your Petri dish lids.

AGAR - The moisture on the lid is caused by the temperature differential. Don't store dishes upside down. Inoculate as soon as the agar cools. There is no need to wait.

AGAR - If not the pre-mix, you'd want to get some bacteriological grade, light malt extract, dextrose (optionally) nutritionally yeast, and peptone.

LC/AGAR - I use extra water in the PC when doing agar or LC so the pressure will drop more slowly due to the thermal mass of the extra water.

AGAR - Yes. You can also transfer healthy mycelium away from the contaminant, thus cleaning up the culture.

LC/AGAR - Extra light malt, dextrose, nutritional yeast, gypsum. Makes the strongest growth.

AGAR - One fruit body MAY contain multiple sub-strains of the same original. Look into agar.

AGAR - Gentmycin sulphate makes a great antibiotic because it's autoclavable.

AGAR/PETRI DISHES - Glad cling wrap instead of parafilm.

CLONING - Often, the reason later flushes produce only a few larger fruits is because the pinning surface has been torn up by previous picking, and the few remaining spots to pin from are all that's left...thus larger fruits form. Cloning these does not insure you'll get large fruits next time. That said, large fruits are not desirable. Smaller fruits have more active product per gram than larger ones, so try to produce larger flushes of smaller fruits. When cloning, select a young, rapidly growing fruit for best results. You want a fruit that is rapidly dividing cells, so it will take off quickly on agar. I prefer to clone from clusters, because they'll tend to produce clusters on future flushes, giving the volume desired, but with smaller and more desirable fruits.

CLONING TEK - Just so you take the tissue from the center of the stem after tearing it open with your hands. Use a flame sterilized blade. You can probably skip the alcohol. The air inside the bag should be still. I do similar when cloning wild mushrooms on backpacking trips. I take several Petri dishes sealed up in a baggie, a clear trash bag to use as a glovebox, and a scalpel and alcohol torch. The scalpel is flamed outside the bag, then stuck in while still hot. When it cools, the clone is taken. Don't forget to wear latex gloves.

CLONING - You can pour iodine over the stem to kill live bacteria on it, but it's really not necessary if you rip the stem lengthwise first to expose tissue that has never previously been exposed to air, thus generally free of contaminants. Outdoor mushrooms should be dipped in iodine no matter what before cloning, but with indoor grown ones usually it isn't necessary. Don't use alcohol on mushroom tissue.

CLONING - It won't affect your pinset because that's related to your technique, but it's well known that mycelium cloned from a cluster will produce mushrooms in clusters. That's not just cubes either. Edible growers have noted this for decades. The best oyster strains have been cloned from wild fruits that grew in clusters. In other words, clusters are a genetic trait.

CLONING - You can use iodine, or better yet, just tear the stem lengthwise to expose virgin tissue in the middle, and then cut a tiny piece out from there that has never been exposed to air. Use a flame sterilized needle or scalpel to get the tissue.

IODINE CLONING - I get iodine from a local drug store. It says "10% iodine solution" on the bottle. I like it for cloning because it kills bacteria without stressing out the mycelium the way peroxide does. When you're cloning, you want the mycelium to grow as fast as possible, and peroxide shocks it, and then it has to recover before it grows again. As we all know, molds grow faster than mushroom mycelium, so we don't want to do anything to slow down growth.

CLONING INDOOR FRUITS - I should also mention, when cloning clean indoor fruits, no iodine is needed. Simply split the stem as shown in the video, and scrape a touch of mycelium out of the center where it hasn't been exposed to air. The iodine/betadine is perfect for cloning wild outdoor mushrooms that have all sorts of bacteria and molds growing in conjunction with them.

CLONING STRAIN - Small, rapidly growing fruits make the best candidates for cloning. If the mushroom has already matured, the cells have stopped dividing, thus it's not a good candidate. If you like clusters of fruits, clone from a cluster. If you like individual fruits, clone a loner.

CLONING BLEACH - I've cloned wild mushrooms before by dipping in 10% bleach for up to fifteen minutes to kill bacteria before placing on agar. The bacteria is killed, but not the mushroom OR mold mycelium that might be along for the ride.

CLONING MUSHROOMS - I often dip wild mushrooms, and dry mushroom tissue into a ten percent bleach solution before cloning, to kill off bacteria. The fungi survives just fine, but it kicks the bacteria out.

STRAIN ISOLATION VS CLONING - As for cloning vs strain isolation, they're not related. By the time a substrate fruits, hundreds or perhaps thousands of strains have exchanged DNA, either weakening or strengthening the mass. What you get is a 'heinz 57' that may or may not be that great because the weaker genes and the stronger genes(mycelium) have all combined. An example would be mixed breed dogs. We've all seen good examples and others that are dumber then hell.
Strain isolation on agar begins when the spores first start to germinate. I make the first transfers as soon as I can see mycelium growing from the point of inoculation, long before sectoring can be detected. By doing this, and by continuing to separate each individual growth, you can isolate mycelium prior to the process of anastomosis combining dikaryons into a single mass.
You don't isolate looking for one super rhizomorphic strain. You isolate down to single sectors and then fruit out each one to determine the best performer. When you transfer mycelium to a grain master, the original Petri dish the mycelium was taken from is placed into a clean refrigerator. By doing this, when you find the best performing strain, you then go back to your well marked Petri dishes, thus your original P1 culture. This Petri dish can be used to inoculate a few test tube slants that can be incubated for a week, then placed in cold storage. Whenever you need mycelium, a tiny piece the size of a grain of rice can be taken from the test tube and put on agar to grow out, while the test tube is placed back into the refrigerator. These stored test tube cultures preserve the low P value of your isolated strain for years.
I have a complete video tek on strain isolation and master slant preparation and use already filmed. I'll release it when I get the rest of the teks filmed, and editing completed. Hopefully soon.

ISOLATING STRAINS - Right. You isolate every single strain you can, and then fruit them all. While they're fruiting, the 'master' from each strain is in the refrigerator. After you determine the best performers, you go back to the appropriate masters and get them out. Those are the ones you transfer to culture slants for long term storage. Rhizomorphic mycelium tends to fruit better than cottony mycelium, but a single swipe of spores on agar is likely to generate fifty or more individual sectors(strains), and half or so of those will be rhizomorphic. Those are the ones I keep for fruiting, and discard the cottony sectors.

ISOLATING - Don't wait for the first dish to fully colonize. As soon as it begins to grow, transfer mycelium away from the point of cloning to new dishes. This way, you can isolate healthy mycelium away from contaminants. You won't be doing strain isolation on a clone, so don't bother looking for rhizomorphs. Just get healthy mycelium.

STRAIN ISOLATION - For strain isolations, you can't beat the three section dishes. You're only letting the mycelium grow for a few days before making the next transfer, so you can do three times the amount of work on each dish. The four section dishes are great too. I don't even order the plain dishes anymore.

CLONING/ISOLATING - Cloning a fruit from within a cluster will provide a strain that will produce clusters. It matters not which fruit you choose from within the cluster, but you'll have better success if you'll clone while they're still small and rapidly growing.

STRAIN ISOLATES - It's extremely rare for rhizomorphic isolates to be none fruiting.

LIQUID CULTURE - 1000ML LC a.k.a Liquid Culture
1%=1.92Ts
2%=3.84Ts
3%=5.76Ts
4%=7.68Ts
1%=0.64TB
2%=1.28TB
3%=1.92TB
4%=2.56TB

LIQUID CULTURE - Throwing spores into honey or karo has to be the worst possible way to make a liquid culture and I'll be glad when this current fad passes and folks can get back to established techniques. Just inoculate some grains or brf in the standard way and you'll be miles ahead. For those who wish to make LC for inoculation, here's a way to get 100 syringes full of inoculant in two weeks: 1) Inoculate a quart jar of rye berries or wbs with your spores. Upon full colonization, shake the jar to loosen each individual kernel. Be sure

to give it the smell test to make sure it smells like fresh mushrooms. 2) PC a quart of distilled water in a jar with a filter disk or tyvek, etc. In a glovebox or in front of a flowhood, pour 2/3 of the quart jar of sterilized water into your jar of shaken grains. 3) Shake well and then pour the now mycelium rich water back into whatever was left of your jar of sterilized water. Use the jar lid to hold back the grains themselves from pouring out. You now have a full quart of highly concentrated mycelium water that can then be used as is, or diluted two or three times again, and used to fill syringes. Because the grains were shaken first, the mycelium is ripped into shreds and will be sucked through even small needles easily, although larger needles always work better for this. Remember, mycelium grows poorly in water unless under constant stir which oxygenates it. With grains, they colonize in two weeks or less because oxygen is throughout the jar in the spaces between the kernels.

LIQUID CULTURE - A glovebox is not advanced equipment. One can be made free with stuff around the house, so there's no need for people to work in open air or fecal and mold infested bathrooms and kitchens. There is also no way to generate 100 full syringes of liquid mycelium in very small pieces within two weeks from injecting spores into honey or karo. I'm sure if people blindly used the grain method I described above, many would still have problems too, because they're inserting unproved and possibly contaminated spore solution into grains, which also isn't proper mycological technique. However, agar can easily be poured in a glovebox, and the Petri dishes used to isolate healthy mushroom mycelium away from any contaminants in less time than it takes to even know if a karo LC is contaminated or not. That agar wedge can then be used to inoculate the quart(or pint) jar of grains, that can then be turned into at least 100 syringes, or used for g2g transfer to get ten jars the old standard way. In addition, after the water is poured out of the grain jar, it can be placed back on the shelf to re-colonize, and the process can be repeated again. I just strongly feel new growers are doing themselves a disservice when they simply inject spores into honey water and then sit there waiting for something to happen. At the very least, inject directly to grains so you can visually inspect the process. Perhaps Agar's lids with injection ports will help those who have never used grains to get off to a good start.

LIQUID CULTURE - You might want to read more than the last paragraph. I described a method to generate ten times as much LC in a shorter period of time without contamination. I'm not against liquid culture. I use it all the time. I'm simply dead against the idea of squirting a syringe into a bottle of karo/water. I insist on having at least some verification my LC is good before I inject a bunch of jars. The analogy of a new growers greatest fear doesn't hold water. If his pf jars contaminated due to contaminated spores/syringe, it does no good to have even ten gallons of contaminated LC on hand. If they contaminated due to his sloppy procedure, he's likely to have used the same sloppy procedure making an LC. In my posts, I always try to show a way to have the greatest possible success rate, not necessarily the cheapest, easiest or laziest method.

LIQUID CULTURE - Sort of, but if you want liquid culture syringes, all you have to do is grow out a quart jar of rye berries, and then when it's fully colonized, shake it well, and pour nearly a full quart of sterilized water into the jar. Shake well again, and then draw the myceliated water back out into syringes. As an alternative, you can pour the quart of myceliated water into a sterile gallon of water to dilute the solution. You'll then have enough liquid culture to fill a few hundred syringes, and it only takes two to three weeks to get to this point from spores. In addition, after harvesting the mycelium from the surface of the grains as described above, you can then still use the left over grains to inoculate ten to twenty additional jars of grains via grain to grain transfer in the traditional method.

LIQUID CULTURE/COLONIZED SPAWN JAR - You want a fully colonized jar of grains to start with. Add sterilized distilled water to nearly fill up the jar, then shake well, and draw the now myceliated water back out. This is far faster and more dependable than making LC from spores because you can smell the rye jar before using to make sure it isn't contaminated. In addition, a jar of rye colonizes in two weeks, and will make at least 30 syringes. You won't get that performance from karo water.

LIQUID CULTURE - You can harvest liquid mycelium from the rye or wbs several times. After shaking the jar of grains to break them up, you can pour nearly a full pint of sterilized water into the jar, then shake again. Since there are nutrients in the grain juice/mycelium, you only need to pull a small amount of this solution into each syringe. Finish filling the syringe with sterilized water, and the mycelium will grow into it, expanding by several factors within a week.

LIQUID CULTURE - The more air to a liquid culture the better. That's why experienced growers always use a magnetic stirrer running 24/7. This ensures the entire LC is constantly oxygenated. I still don't understand why growers are slowing down their work so much trying to grow liquid cultures in mason jars. You can expand mycelium at least ten times faster in grains than in liquid, AND you'll know if it's contaminated before you use it.

LC CONTAMINANT EYE - If it's snow WHITE. It's right. FOR LC If you don't stir or agitate one every day, myc gets to the top & forms little islands that turn to thick pancakes. As, it has better gas exchange on the surface. How, I test for LC contams, is to STOP stirring one. If anything grows on the surface that isn't snow white. It isn't RIGHT. Most often contams show up as light gray / light blue growing on the surface.

LIQUID CULTURE - In addition, many growers waste valuable time by injecting spores into sugar water. Many times, you don't know you have contaminants present until you use your 'lc' to inoculate grains or brf. By then, you would have long ago discovered the contamination and replaced the contaminated jars, had you been growing on grains or brf directly.

LC JAR - Every tiny exposure to unfiltered air, increases the chance of a contam getting in. After jars are cool. With polyfil in one hole, simply stick syringe needle right through tape on other hole, inject & tape (with sterile tape) over the existing tape. That minimizes external air exposure.

LIQUID CULTURE - I sterilize the water that will be used for the LC syringe. In a separate pan I boil the syringe for at least half an hour. Put a lid on the pot and leave the syringe in the boiling water right up until you're ready to go to work.

STORING LC - You can store G-1 LC in 5, 50 or 100 vials of sterile water (years & years). Any time you want G-1 pull a tube out of the Fridge & go for it. Either start a new LC with it, or go to grains, then G2G.

LC - If you allow LC to go longer than five days post eberbach, the mycelium begins to grow into a solid organism which is not nearly as effective to inoculate with as a few million individual colonies.

LC - 1/2 teaspoon light dry malt, 1/2 teaspoon corn sugar to quart water, simmer, filter, add to jar, add lid w/filter, PC 15 minutes, innoc, store at around 82F.

DON'T USE MARBELS FOR LC - FOR LC...Marbles tend to break glass and not have that swirling tornado twirl when using.

LIQUID CULTURE - In fact, I have liquid mycelium cultures stored in the refrigerator for years that are still viable.

INOCULATING WITH LC WBS - Drain the WBS much longer, if you inoculate with LC. (rids WBS of excessive moisture).

LIQUID CULTURE - People have used bottled fruit juice for LC for years. It requires no sterilization.

LC - LC's are very prone to contamination, if ever exposed to open air.

FLAVOR OF MUSHROOMS - You won't add anything to the substrate to change the flavor. Mushrooms are NOT plants and don't have a circulatory system. Mushrooms grown on straw don't taste like straw and mushrooms grown on a bible don't taste like paper, and mushrooms grown on horse manure don't taste like horse manure...you get the point.

CONTAMINATED NATURE MUSHROOMS - In nature, thousands upon thousands of organisms can inhabit the same square inch of soil, thus each has his own niche and they all work together in harmony like instruments in a band.
Since we have no way to duplicate this indoors, we use sterile culture where the only organism allowed to grow is the mushroom mycelium.
It's a common misunderstanding that a contaminated substrate means a contaminated crop, which is incorrect. By that definition, all outdoor mushrooms would be toxic, yet they are not. If our sterile culture

becomes contaminated, the contamination might kill off our mycelium, but will be of little harm to us. Eating mushrooms from a cake with green mold will NOT hurt anyone.

MUSHROOMS FROM CONTAMINATED SUBSTRATES - Every mushroom that grows in the wild grows in conjunction with molds. In fact, I don't think I've ever picked an oyster mushroom from a log in the forest that didn't also have trichoderma growing on it. That's how common trich is. In fact, trichoderma inhabits nearly every cubic inch of soil on earth except extreme deserts and the arctic. On page one of Paul Stamets 'Mycelium Running', he starts with this sentence: "There are more species of fungi, bacteria, and protozoa in a single scoop of soil than there are plants and vertebrate animals in all of North America". However, we can pick wild boletes, chaneterelles, agaricus, matsutake, etc., etc., from this mold infested soil, and eat them without getting sick. We can pick Cubensis from a nasty pile of maggot infested cow shit and eat it without getting sick. If you put blue cheese salad dressing on your salad, you're eating huge chunks of the penicillium mold, because it's floating in the dressing. It never ceases to amaze me the fear that gets spread on these boards over harmless molds. If your fruits were covered with yellow or brown molds, I'd say toss them, as you would any moldy fruit or other food. Likewise if they were wet and became rotten from bacteria, because bacteria can cause food poisoning. However, as I've said for many years, just because there's a spot of mold on a cake, does not mean the fruits growing from that cake are contaminated. Mushrooms do not have vascular systems like plants, and do not suck up contaminant molds or bacteria from the substrate. If the fruit is fine and healthy, munch away. And, for those of you who don't know, please stop spreading myths and fear.

SPENT MUSHROOM MYCELIUM - Once your mushrooms have fruited a few times, the substrate is used up. You can't replace it with more fertilizer, because mushrooms are not plants that uptake water and nutrients to create energy in the leaves. Mushroom mycelium, which lives in the soil, eats its food, therefore after a few flushes, the food is gone. If you have a straw and dung loving species, you can bury the spent substrate into some horse or cow manure in a shady spot outdoors. Keep it slightly moist, and in a month or two, you'll probably see a nice flush. If you have a wood decomposing species, do the above, but with hardwood chips and sawdust.

COOKING WITH MUSHROOMS - Next time you have a bunch of fresh cubes, cut off the stems and set them aside for another day. Take the caps and rub a little blue cheese or ranch salad dressing into the gills. Rub olive oil on the outside of the cap. Add salt and pepper to taste, then grill outside on the bbq until done(gill side up), usually only a few minutes, when the dressing in the gills starts to boil, it's done. It's hard to beat cubes for good taste when cooked. When raw, they're nasty as hell, just like any raw mushroom. The heat will degrade them slightly, but not much. Cook up about 50 grams of fresh caps and you'll be happy.

MUSHROOMS FROM CONTAMINATED SOURCE - Mushrooms from a contaminated cake are safe to eat. They don't 'absorb' contaminants from the substrate or all wild mushrooms would be unsafe to eat. If the mold or bacteria is on the fruit itself of course, don't eat it. It's common in the commercial industry to harvest fruits from contaminated substrates and send them to market. There are no health regulations against it because it's not a risk factor.

EATING MUSHROOMS - Getting nausea and the shits from eating raw mushrooms is not a sign that they were contaminated. It's very hard for our systems to digest raw mushrooms, thus it's normal for the body to want to puke them out. Raw mushrooms are not digested, thus you excrete them in much the same form as you swallow them. Therefore, getting the shits a day after tripping is also common.

MUSHROOM SUBSTRATE NEED - What do mushroom nutriment needs? SUBSTRATE: carbon / nitrogen ratio <17:1, nitrogen 2.6%, phosphorus 0.2-0.5%, potassium 1.5-2.5%, calcium 1.5-2.5%, available boron <2 ppm, available ammonium <10 ppm, soluble salts 3.0-5.0 dS/m. This suffices from spawning to cropping.

SPENT MYCELIUM - The reason is it's probably not out of food. It's old. You can't take some 100 year old dude and if you keep feeding him, he'll keep on living. It doesn't work that way. Things live for a given time, then die. It's nature.

KEEPING MUSHROOMS FRESH - I've used a combination of CO_2, Argon, and Nitrogen gasses, and they still rot. You need to dry them though.

CONTAMINATED MUSHROOMS - Molds would be visible, and bacteria needs water to survive. If they were cracker dry, they're fine.

MUSHROOMS CAN'T SUCK UP SHIT LIKE PLANTS - Mushrooms DO NOT HAVE circulatory/vascular systems.

MUSHROOM GENETICS - Mushroom genetics are far different than plant genetics. With mj, one can plant seeds that will generally produce a crop similar to the parents. Such is not the case with mushrooms. Each mushroom produces millions, if not billions of spores. Each spore has a set of genetics unlike any other spore. 'Think fingerprints'. Now, another analogy. Humans breed fairly true because a male and female produce offspring, thus the child is a 50-50 cross. Following that analogy, understand that mushrooms can have 20,000 or more 'sexes' represented in those billion or so individually unique spores. Thus, the chances of a collection of mushroom spores breeding true to the parents is very low.

MUSHROOMS - It's not just nutrients, because mushrooms aren't plants. Mushrooms eat their food just like humans and produce body heat as they metabolise the food, just like humans. They also release the carbon in their food as CO_2 just like humans. Therefore, they need solid food, not just nutrients. Their preferred food in artificial cultivation seems to be grains, such as rye and rice. You can expand your harvest by using large amounts of less nutritious foods for the mycelium such as manure and coir. You won't find a 'nutrient' that you can add to the solid food that will enhance the crop much, if any at all.

MUSHROOMS - Nitrogen is for plants. Mushrooms eat their food. I speculate in a few years, you won't ever even hear the term 'nitrogen' in relation to fungi. Potency isn't related to substrate, so you can add all the junk you want and it won't make them more potent. You'll want to isolate for a strain on agar that is more potent, and then save it in master slants.

MUSHROOMS - You are correct. Mycelium doesn't have a vascular system. It's composed of long cells, stacked end to end to form a network. It doesn't take a circulatory system for heavy metals to be absorbed. Other substances are metabolized by the mycelium. That's why mushrooms can grow on manure, but we don't get e coli from eating mushrooms. However, according to stamets, if there's lead or mercury in the soil, they will absorb it. I've never personally tested for such.

MUSHROOMS - Mycelium does NOT absorb myco-toxins from other species such as molds and transmit them to the fruits! This is very well known in mycology. Every wild mushroom grows in conjunction with hundreds of other fungi, yeasts, and bacteria, yet who has ever been poisoned by wild morels, chanterelles, cubensis, etc?? However, it's best not to use them because the contaminant molds have already eaten some of the substrate that you want your mushroom mycelium to eat.

MUSHROOMS - Mushroom mycelium consumes oxygen and releases the carbon in its food as CO_2, just like humans. Plants do the opposite. Mushroom mycelium produces heat as it metabolizes its food, just like humans. Plants get energy from the sun, but mushroom mycelium gets energy from its food source, just like humans.

MUSHROOM SPORES - Mushrooms can have up to 23,000 'sexes', and millions of spores on a print, so it's always a crap shoot. If you want a particular set of genetics, you need to isolate strains down to single sectors, then keep master slants. Single sector isolates can be crossed with other single sector isolates by dikaryotic mating on agar as well.

MUSHROOMS - I haven't grown cubes in years. I grow legal edibles. We also harvest several hundred pounds per year of wild reishi. For those who are not aware, reishi brings $1,000 per kilo on the legal market. That takes a lot of drying space. Cubensis are a great way to learn the mushroom life cycle, but it only takes a few months to grow a lifetime supply. That's why most growers move on to other species, or lose interest in the hobby. I suggest to all to stop in at the gourmet and medicinal forum to exchange tips and ideas on legal edibles. Mushroom growing is great fun, and if you play your cards right, there's a lot of money to be made.

MUSHROOMS AND PLANTS - All fungi help to break down material in the soil, which in turn makes the nutrients more available to plant roots. In fact, our nemesis trichoderma is a very beneficial organism in the

soil for that reason. I've noticed also that burying spent and/or contaminated cakes into houseplants or the garden benefits the plants. They always green up and look much better a month or two later.

ANASTOMOSIS MYCELIUM MUSHROOMS - Anastomosis is the pairing of dikaryotic mycelium with other dikaryotic mycelium. In other words, combining strains, but not species. For example, Penis Envy could combine with cambodian cubensis via anastomosis, but neither could combine with oyster, shiitake, or mold.

MUSHROOM MYCELIUMS LIFE - The mycelium runs out of food and/or it reaches the end of it's natural cell division life cycle. Both often occur at about the same time. Adding nutrients or more manure will be of little benefit, just as giving a steak dinner to a 100 year old man isn't going to make him 20 again.

MUSHROOMS/PLANTS - As for helping with the CO_2/O_2, forget it. The mycelium produces way more CO_2 than plants can metabolize, and the amount of plants that would fit in a mini-greenhouse won't do squat as far as helping with O_2 for the mushrooms.

LIFESPAN MYCELIUM - It's worse than a g2g because once a mycelial network flushes a few times, the natural cycle is to die back like a spawned out salmon. To get maximum growth, it's best to always use fresh spawn when going to bulk.

MUSHROOMS - Mushrooms depend on a LOSS of moisture from the substrate to fruit. If you saturate them, or keep a steady moisture level, they fruit poorly if at all. Mushrooms are not plants, which benefit from steady moisture levels.

MUSHROOMS - Mushrooms EAT their food, not drink it from blue water. Fungi is much more closely related to mammals than plants(fact). You wouldn't put miracle gro into your kids baby bottle would you?

MYCELIUM - I once saw a chanterelle lift a rock that weighed at least ten pounds out of it's way as if it wasn't even there. It's amazing how much hydraulic pressure mycelium can build when it needs to.

MUSHROOMS - Growing mushrooms is as much about water as 'nutrients'. In other words, a jar of brown rice won't fruit nearly as well as a jar with 1/3 rice flour and 2/3 verm. That's a fact.

MUSHROOM LIFE CYCLE - Hyphal knots are the very first stage of pinning. They're the size of the head of a pin. They develop into primordia, which then grow into pins.

MUSHROOMS - Growing mushrooms is part art, and part science, but it's not magic. Follow proper procedures, and you'll have success. Good luck.

MYCELIUM - Nice. Fungi in the soil helps to break down the manure, making it more available to the plants as well. Both species benefit.

MUSHROOMS - Mushrooms EAT their food, so you want to provide solid food. Don't use the liquid left over from soaking straw.

MUSHROOMS - Molds are fungi. I don't think there's an organism that can tell perfect from imperfect fungi.

MUSHROOMS - Plants and fungi rarely compete with each other, but often each benefits from the other.

MUSHROOMS - They're part and parcel of the same cell lines that colonize the substrate.

MUSHROOMS - Mushrooms don't 'suck up' toxins from a moldy substrate.

MUSHROOM - A Mushroom Viel is Made Of Tertiary Mycelium.

MYCELIUM - Mycelium is the vegetative part of a fungus consisting of a mass of branching threadlike hyphae that exists below the ground or within another substrate. It is through the mycelium that a fungus absorbs nutrients from its environment. It does this in a two stage process. Firstly the hyphae secrete enzymes onto the food source which breaks down polymers into monomers. These monomers are then absorbed into the mycelium by facilitated diffusion and active transport. Mycelium is also a vital component in many ecosystems

in that it helps increase the efficiency of water and nutrient absorption of many plants and also is vital to the decomposition and breaking-up of plant material to form the organic part of soil and to release carbon dioxide back into the atmosphere.

MUSHROOMS/MYCELIUM - Mycelium grows by cell division. Primordia grows by cell division. Once they're fully formed mushrooms(ie pins), they grow by cell expansion, but not entirely. Basidia are single cells that produce spores at the ends of tube-like projections called sterigmata, and they're located on the gills. A larger cap will have more basidia, thus more spores. In other words, you'll get far more spores from a large cap than a small one. When we say mushrooms grow by cell expansion, it doesn't mean that no new cells are produced. It means these additional cells do not directly contribute to growth.

MYCELIUM - Aerial rhizomorphs, usually because they're searching for moisture from the air. You can tell from Road's pic above [see below] the cake is dry from the bluing. That's caused by the standing water in the perlite, which renders the perlite useless. Mycelium can be quite creative in finding ways to survive.

MYCELIUM - Fungi, including molds, grow mycelium. Most mycelium looks similar. With few exceptions, one can't tell what kind of mycelium it is by looking. An experienced cultivator on the other hand, can recognize the fragrance signature of different mycelia. Shiitake has a distinct smell, as does oysters. Ditto for morels. Cubensis has a distinct mushroomy scent. Trichoderma has a 'dirt' type smell to it. If I have an outbreak of trich, I can smell it when I open the greenhouse door, a few days before it's visible as a green spot when it

sporulates.

MYCELIUM STORAGE - One last thing you might want to try is to take a piece of mycelium from the agar and drop it into a jar of sterilized distilled water. Be sure to cover the jar with a filtered lid. Sometimes, dry mycelium will recover in pure distilled water. Don't add any nutrients to the water that might also feed molds or bacteria. If the mycelium begins to grow that way, simply suck it up with a syringe and transfer to agar.

MYCELIUM - Mushrooms do not have roots OR root like structures. The mushroom fruiting body is mycelium, and it's genetically identical to the mycelium that is colonizing the substrate. No comparison can be made to plants/roots when discussing mycology. In fact, mycelium is a closer relative to humans and other mammals than it is to plants. That's a scientific fact.

MYCELIUM - Mycelium is much more closely related to humans than plants and that's a fact. Mycelium consumes O_2 and releases CO_2 as a waste product. Mycelium also produces body heat the way we do. I've often compared artificially increasing CO_2 levels to putting a bag over your head and trying to run a foot race. You'd run out of air, as will your mycelium.

MYCELIUM SMELL - If a jar smells sweet, sour, like vinegar, the kitchen garbage or stinky feet, toss it. All those are caused by various bacteria.

MYCELIUM - Hyphae from two compatible spores can exchange genetic information and become dikaryotic, thus able to fruit.

MYCELIUM - 'Fuzz' on the stems, contrary to popular myth is NOT a problem, and is NOT caused by high humidity.

MUSHROOM MYCELIUM - Most mushroom mycelium once 'mated' holds two nuclei in each cell.

MYCELIUM - Mycelium will suffocate and stall or die with no gas exchange, so I'd say it's very important.

MYCELIUM - I've generally found strains that poke spiky mycelium out end up being good fruiters.

MYCELIUM - The most aggressive mycelium I've worked with would be Morel.

MYCELIUM - Rhizomorphic mycelium is the type that forms primordia, so that's a good sign.

MYCELIUM - Mycelium has very little actives to extract.

ALCOHOL - First things first. 96% alcohol is a terrible sanitizer, but a pretty good fuel. For a cell to be destroyed by alcohol, the alcohol must be admitted into the cell via osmosis. However, cells are very good at keeping out substances that would kill them. That's why we mix water with the alcohol. The water 'tricks' the cell wall into admitting the alcohol, and then it kills the cell when it evaporates back out again. Use 70% alcohol for best results. However, alcohol will do nothing against the contaminants that are INside the needle, so you'd be injecting them right into your substrate. Use flame sterilization, and there is no need to wait for the needle to cool. It will cool enough on the way from the flame to the jar, and the first drop or two of solution will finish cooling the needle so that the rest can flow cleanly.

ALCOHOL - It's an explosion hazzard, a fire hazzard, and worthless against airborne contaminants because it settles out of the air too fast. The only way alcohol kills cells is when it penetrates the cell wall, and then evaporates back out. Alcohol by itself, if it doesn't penetrate the cell wall isn't toxic. That's why 70% alcohol works better than pure alcohol. The water 'tricks' the cell wall into admitting it, and then the alcohol evaporates back out from the inside, destroying the cell. Cells admit moisture by osmosis, and therefore exclude toxins such as alcohol unless water is mixed in with it.

ALCOHOL - No. Pure alcohol kills little. That's why it's mixed with water. The reason is that alcohol kills when it evaporates away from whatever it is in. Cells, including bacteria cells admit water through osmosis, but reject toxins. By mixing water into the alcohol, the cell is tricked into admitting it, then when the alcohol evaporates away, it kills the organism. Bacterial endospores are in grains, but we PC for those. The use of 70%

alcohol is great for tables, gloves, needles, etc.

ALCOHOL - 70% is preferred, but it has nothing to do with rate of evaporation. Cells admit water through their cell walls via osmosis. Cell walls are particularly good at preventing the entry of toxins, so by mixing water with the alcohol, it 'tricks' the cell wall into admitting the mixture, which then kills the cell as the alcohol evaporates back out. I'm sure one of our resident chemists can put it in more scientific terms, but that's the jest of it.

ALCOHOL - 99% alcohol is a poor sanitizer. The whole idea of using alcohol is to kill bacteria and mold spores. Cells don't admit substances without water. That's why up to 30% water is added to alcohol used to sanitize skin or other surfaces. It tricks the cell walls into admitting it, and then as the alcohol evaporates back out, it kills the cell.

ALCOHOL - Actually, the reason 70% is more effective is because living cells admit water through the cell membrane by way of osmosis. If there is water mixed in with the alcohol, it's admitted into the interior of the cell where it does the most damage. 99% alcohol can't penetrate the cell wall as effectively, therefore it's less effective.

DENATURED ALCOHOL - Use denatured alcohol from the paint department in your local hardware store. It doesn't create soot. Flame, then use while still hot. Don't cool the needle first. The first few drops of solution will cool the needle, allowing the rest to flow cleanly. Repeat between jars to avoid cross contamination.

ALCOHOL - Personally, I use 80% because it has enough water to penetrate cell walls of organisms, but not so much water it doesn't evaporate completely. The 70% takes too long to dry off my gloves or table when I wash them with it. I mix equal amounts of 91% and 70%. Works like a charm.

ALCOHOL - Just a note here too: 70% alcohol will do a better job of killing off contaminants than 90% or 99% alcohol. The reason is that the cell wall is tricked by the water in the alcohol into admitting it into the interior of the cell, where the cell is then destroyed as the alcohol evaporates back out.

WATER/ALCOHOL - The higher water content is what allows alcohol to penetrate the cells walls by imitating H_2O.

ALCOHOL - Alcohol is not a sterilizer. It is a sanitizer. Big difference.

BLEACH - Actually, bleach is approved for use in organic mushroom farms. I doubt seriously that the running water washed away the trich. It's possible it spread it even more, but only time will tell. Bleach also doesn't kill most fungi, including trichoderma. Good luck with that grow. I hope it works out. The trich sure won't impact your product or harvest, so if your second flush comes quickly, you'll be fine.

BLEACH - Bleach is not toxic to fungi, only spores. It's fine to clean out a glovebox or table if you mix it at ten percent, or also mixed at ten percent it can be used to disinfect a mini-greenhouse to kill flies and fly larvae between crop cycles. 30% bleach is too strong though. Don't go over ten percent or it isn't as effective.

BLEACH - Bleach doesn't harm mycelium much. I've soaked tissue for cloning for several minutes in a ten percent bleach solution. The bacteria is killed off, but the mycelium survives. Bleach seems to harm mycelium far less than peroxide.

DISINFECTANT - Alcohol is the recommended surface disinfectant. Some use lysol, but remember lysol is 80% alcohol and perhaps ten times the price of buying alcohol at the local drug store. To clean your table, just pour it out of the bottle, then wipe with a paper towel. Save the expensive windex for windows.

DISINFECTANT - Use alcohol for your surfaces and ozium for the air.

IODINE - You shouldn't need to do anything but clean the surface if you're using that tek. In fact, skip all the cleaners and just peel off a strip of mycelium like a banana peel, and then stick the needle into the freshly exposed flesh. Iodine is fine for cleaning the outside of the tissue, but use it at no more than ten percent.

LYSOL MUTATIONS - I want to scream every time I hear that. It's wrong. Lysol doesn't cause mutations. I can only catch it so many times, and this Lysol/mutant myth is spreading like a damn virus. Your new homework assignment is to spray Lysol near(not on) one of your fruiting cakes and report the results. Lysol is mostly alcohol and isn't good for mushrooms, but using it in the room isn't going to cause mutations. I spray the face of my flowhood with Lysol prior to transfers, so it's always blowing on something.

PEROXIDE - To avoid confusion, people should mention the percentage of hydrogen peroxide they USE. If you have 30 count peroxide such as it is measured in Europe, it is at ten percent. If you dilute it three to one, you have 3.33% peroxide. If you purchase it at a drug or grocery store in the US, it comes in 3% concentration. If you dilute it ten to one, you have roughly .3% after mixing. As I said above, peroxide is toxic to mycelium, all mycelium, therefore it is hated by mushrooms and mold alike. If you have an outbreak of Dactylium, you can spray the casing layer with it to wipe out the cobweb. This doesn't hurt the mushroom mycelium because Dactylium rarely colonizes over the top of mushroom colonized casing layers. I've found it's a mistake to use as a preventative measure because it sets the mushroom mycelium back and makes it less aggressive, then the faster recovering molds get the upper hand. Sterile technique will prevent molds in spawn, and fresh air exchange will prevent most molds in the growing environment, so go with that for best results.

PEROXIDE - The problem with peroxide on agar is it stunts the mycelium, and then oxidizes away to nothing, leaving the mycelium weak, but having no further effect on bacteria. For cloning, you can have far better results by dipping tissue into iodine before placing on agar. Gentamicin sulphate added to the agar will help prevent bacteria from growing, while not slowing down the mushroom mycelium at all. In all cases, strict attention to sterile procedure will outperform peroxide. I suppose that's what I meant to say, even if I was a bit harsh on ol' Rush.

PEROXIDE - Don't use peroxide on grains. Also, don't use tools to make the transfer. Peroxide will not sterilize spoons, forks, etc. Bang the unopened jar against a tire to break up the grains, and then pour the grains from the master jar to the receiving jars without touching them with anything.

PEROXIDE - Peroxide is toxic to fungi, all fungi. Personally, I no longer use peroxide in the humidifier, but I can assure you that isn't the problem. Peroxide in the humidifier only serves to help control molds within the humidifier itself.

PEROXIDE - Don't use peroxide in the mist water. Peroxide injures mycelium, so to use it for a preventative against contaminants might cause the very problem you're trying to avoid by stressing the mycelium, weakening it.

PEROXIDE - Peroxide does stress mycelium a great deal. We all know that. That doesn't mean it can't survive limited exposure, but it causes damage at the cellular level and that's a fact.

PEROXIDE - Don't use peroxide on your cakes for anything but cobweb control. Peroxide is highly toxic to mushroom mycelium and shocks it, allowing the faster growing trichoderma to take over.

PEROXIDE - Peroxide is no substitute for sterile procedure. Peroxide will wipe out cobweb mold on a casing layer, but it has little other use, imho of course.

PEROXIDE - Peroxide attacks mushroom mycelium too, so dunking in it can weaken the mycelium, making it more likely contaminants can get a foothold after the dunk while the mycelium is still weakened.

PEROXIDE - Don't assault your mycelium with peroxide. That's like throwing acid in your girlfriends face just to see if it sizzles.

PEROXIDE - Peroxide is toxic to fungi, all fungi. Some can tolerate it better than others, but none 'like it'.

OZIUM - Ozium air sanitizer is the best way to keep the air in your home or work space clean and smelling fresh. Ozium does not cover up the odors associated with sewer, pets, cooking and smoking - it eliminates them! . Ozium, the original air purifier, is a chemical agent that actually eliminates smoke and unpleasant odors and reduces airborne bacteria. Ozium actually cleanses the air through glycolized action. The Ozium glycolized formula acts directly on odor causing particles in the air. Ozium is distinguished from other

products that simply mask odors. Ozium is an EPA registered air sanitizer and is safe to use residentially or commercially in homes, rental property, hospitals, nursing homes, hotels, veterinary clinics, restaurants, bars, laundry rooms, cars, mobil homes, offices, and just about anywhere there might be an odor problem. Do Not Breathe It Though!

MULTI SPORE INOCULATION - Every time you do multispore inoculation you mix hundreds, if not thousands of strains in the same jar. It makes absolutely NO difference if the spores come from the same print or from prints from halfway around the world. The definition of a strain is NOT the name some vendor put on a print he mailed out. The definition of a strain is two compatible hyphae 'mating' to form dikaryotic mycelium. Hyphae from a PR print are just as capable of mating with each other as with hyphae from a Tex or any other print. It's the same species so they're all compatible. There is NO competition between strains of the same species. Once they become dikaryotic, they continue to fuse by a process known as anastomosis, again with NO competition. Hybridization between 'strains' occurs in every single multispore project.

MULTISPORE - Every hyphal pairing makes a new 'strain' thus every grow is different and will have a different feel because there's millions of spores on each print and each spore has a unique genetic code. That's why there's far more variation in trip quality and macroscopic appearance from each crop from even the same print than there is difference between siblings of the same human or animal family for example. The 'cube is a cube' means just that. They have the same growth and nutritional/environmental requirements. Every trip will be different, so it matters little which named strain one chooses. You won't have the same trip twice, even from the same strain. In fact, you're very unlikely to have the same trip twice, even from fruits from the same substrate tray.

MULTISPORE - Multispore inoculation from a sporeprint is a roll of the dice. You can do ten grows from the same print and have ten crops that hardly resemble each other, other than being the same species. A fruit grown from multispore inoculation may or may not be an isolated strain. This is well known in the edible field. More than one substrain can be present in a single fruit. That's why clones from mushrooms grown from multispore inoculation do not always form single sector isolates on agar. I've seen this many times. However, if you isolate down to single sectors on agar, fruits from each single sector isolate will be genetically identical. However, if you fruit these and take sporeprints, you're back to square one.

MULTISPORE - What you're seeing is the effects of multi-spore inoculation. Often, several strains develop that are not compatible with each other, thus they don't form into a single organism via anastomosis. Therefore, more than one strain is fruiting on the same substrate. If you clone that big ol' choad, future flushes will have all choads, but whether you'll get enough of them to matter remains to be seen. I'd clone it, and then after you eat the thing, you'll know if it's a strain you want to keep or not.

MULTI-SPORE - When you grow from multispore inoculation, it matters little what the name on the syringe was. A cube is a cube and that's a fact. What this means is every grow will be different. When you buy a Cadillac, you can expect a luxury ride. When you buy a Ferrari, you can expect a fast car. When you buy a pickup truck, you can expect it to haul things. No such guarantees exist with cubes. Every multispore inoculation will be different, thus we say, "A cube is a cube".

MULTI SPORE - If you want to mix strains, do so. You can have multiple strains in the same terrarium, or for grins and giggles, you can inoculate a cake with four different strains, one strain per hole. You'll probably not notice anything different from any other multispore grow. This has all been covered hundreds of times, and the information is right here for searching. Strains of the same species are generally compatible.

MULTISPORE SYRINGE - Whoever made that syringe had no idea what he or she was doing. It's way too dark. Dark is bad. Fewer spores are better. That is a fact. A large number of spores is also going to have a large number of contaminants attached. Using too many spores is counter productive. That was known over twenty years ago when Paul Stamets wrote 'The Mushroom Cultivator' because he made that clear in the book.

MULTISPORE - Very often with multispore inoculation, what you have is many different types of mycelium growing together and one on top of the others. What is often mistaken for one type of mycelium is actually this pile of various types, or even the same type. If your cakes are in the FC and fuzzing up, they're good to go.

MULTISPORE - Sometimes with multispore inoculation you even end up with a non-fruiting strain. Other times, you end up with a poorly fruiting strain. Often, you end up with an awesome fruiting strain. It's all a dice roll.

MULTISPORE - If using multispores culture on both, you will have a different results no matter what and each sub-strain will have different properties/levels of chemicals within them..

MULTISPORE - The silly name on the syringe means nothing. Every grow from multispore inoculation is going to be different, just like every child born is different. It's all the same species.

MULTISPORE - In a spore print MULTISPORE = Millions of diff sub strains, within the strain you are using... Spores are like sperm, other then they mate with eachother

MULTISPORE - Multispore will produce different results everytime, because theres millions of genetics.

SPORE MIXING - Since multispore inoculation from a single print creates hundreds of strains, mixing two different prints would behave no differently. As has been said many times, a 'strain' is two compatible hyphae coming together to exchange genetic information, so it makes little difference how many prints go into making the multispore 'tea'. The mycelium doesn't give a darn what silly name somebody put on the print or syringe, it's only concerned with A and B mating types, and since all the cube 'strains' are the same species, hyphae from one spore will exchange information readily with hyphae from another compatible spore. Nobody can answer what the offspring will look like because nobody can say that mushrooms from GT will always be 'such and such' but PR's will always be 'this or that'. I've studied all types of spores under the microscope and I'm here to tell you, these so-called strains floating around with all the fancy names can't be identified either microscopically, or macroscopically from each other. That's why we stickied the strain thread up on top. It was to keep worthless discussion about 'strain' confined up there so it didn't litter the board with wasted bandwidth.

DARKER SYRINGES/SPORES - Darker syringes will result in more contamination problems. There is always going to be a certain percentage of contaminant spores on any print. Therefore, if you use more spores, you get more contaminants. In addition, when you use a massive spore inoculation, you force the mycelium to spend a lot of time and energy combining all the genetics into a common network. Many growers think that more spores results in faster colonization. What it results in is the substrate turning 'white' faster, but there is no evidence at all the project will actually fruit sooner. I'm a firm believer in using the minimum amount of spores necessary to achieve a crop. Clear(to the naked eye) syringes perform better than dark syringes. Nobody can see individual spores with their eyeballs. What you see is clusters of a few thousand that are stuck together. The spores in the center of these clusters are locked out of the moisture in the jars, so they rarely even get a chance to germinate.

VIABLE SPORES - I've ran several tests with the microscopes to determine spore viability. A brand new print will give about 1 spore in 100 that will germinate. After two weeks, that drops to about 1 spore in 500. At one month since taking the print, less than 1 spore in 1000 will germinate, and after one year, you're doing good to get 1 spore in 10,000 that is still viable and it drops even faster after one year. The thing to remember is take clean prints and store them properly. An old print will still work, but remember that you'll need to use many more spores to get the few that will germinate. Remember, when you use more spores, you also risk using more contaminant spores that may be hitch hiking along for the ride. Thus, fresh prints are better.

SPORES - Using more spores is counterproductive. I agree they will 'colonize' faster by using more spores, but the problem is that not all strains are going to be compatible, therefore by using an excess of spores, an excess of strains are going to be created, some of which won't unite to form a common whole. The result is you have several separate mycelial networks, none of which has access to the total amount of food(BRF) in the cake. The best fruiting results from multispore inoculation comes from using minimum spores. Even better, a single sector strain you've isolated on agar in a Petri dish.

SPORE INOCULATION - Using more spores to inoculate a grain or brf jar will result in faster colonization, but that's not always a good thing. You'll be left with many strains in the same substrate because not all are compatible enough to combine into a single organism by anastomosis. Therefore, each 'strain' will have a small

piece of the substrate rather than being a single organism in control of the whole substrate, which is better for performance. That's why we practice strain isolation on agar prior to inoculating our grains.

SPORE LIFE PRINT - Actually, the life of spores on a print is three to five years, and less if the print was taken on acidic paper. In a syringe they last longer, provided the syringe was made properly. I have prints going back nearly 20 years, and even the ones I made four to five years ago won't germinate and grow anymore with very few exceptions. Good luck and check out "The Mushroom Cultivator" by Paul Stamets. You can get it from fungi.com or amazon.com.

SPORES - With multispore inoculation, it's common for two or more strains to make it to fruiting. They usually combine into a whole via the process of anastomosis, but some strains are incompatible and remain separate. They don't fight, being that they're the same species. Fruiting is not impaired either as you can see. The same often happens when someone injects one side of a cake with one strain, and another side of the cake with a different strain.

SPORES - I've been saying for many years, and Paul Stamets has been sayin for over 20 years(it's in TMC) not to use an excessive amount of spores. It's counter productive. Since no print is 100% clean, the more spores you use, the more contaminats you inject as well. Since molds and bacteria grow faster than mushroom mycelium, dark syringes give the advantage to contaminants over the mushrooms.

STORING MYC/SPORES - For live mycelium, I inoculate a test tube slant of agar. When the mycelium has colonized the agar in the test tube, I pour a small amount of distilled water over the top of the mycelium, then place the test tube in the refrigerator for long term storage. Once per year, take out the test tube and transfer the mycelium to a new test tube and repeat the process.

SPORES GERMINATING - With a powerful magnifying glass, you can sometimes see it on the second day. Using a microscope, I've observed fresh spores germinating within 20 minutes of swiping on wet agar. That blew me away. I never thought they'd germinate that fast. It can take four days to two weeks to be visible to the naked eye, with closer to four days the norm.

SPORES DROPPING - Spores drop due to internal pressures within the basidia that literally explode the spore away with force. Once dry, the process stops totally. To get more spores, put a drop of water on the cap so it stays wet longer. Nothing will speed it up, but lots of things can slow it down. You should have a readable print in three to four hours.

SPORES - It's genetics, and something else I've discovered, is there are often basidia on the gills producing clear spores. Check your prints under a microscope. You might have good prints, but just can't see them. The clear spores have a far lower germination ratio, but many still do germinate and grow, if used fresh.

SPORES DROPPING - There is some evidence that a heavy spore drop will inhibit future flushes. In addition, it makes a terrible mess, and furthermore it makes the fruits taste even worse than they normally would. Pick just before, or just after the veil breaks for best quality.

SPORES - Spores drop spores when the pressure in the basdidia reaches a crucial point, and then the spores are blown into the air with considerable force. You make a print by setting a freshly cut cap on paper, glass, foil, etc., and waiting for nature to do its thing.

STORING SPORE PRINTS - I think prints will definitely last longer on glass or aluminum foil. Refrigeration might help, but I'd make sure it's a dedicated lab frige. There's too much mold and bacteria in the kitchen refrigerator.

SAVING SPORES IN FREEZER..IF - Spores can be frozen without significant loss of viability by suspending in a 10% aqueous solution of sterilized glycerol (glycerin U.S.P.; available at most pharmacies).

SPORES - The spores will be fine since the water in the syringes didn't freeze solid. Freezing would likely destroy the cell walls of the spores, but just being very cold is fine.

STORING SPORES - Distilled water is the best method for storing spores or live mycelium. Spores stroked in

distilled water don't dry out the way they do on a print.

SPORE PRINTS - After a year, they're down to less than one spore in a thousand that will germinate. It gets worse from there. Prints are best used when fresh.

FRESH SPORES - If done in a clean environment, spores can be scraped directly into grains or agar. They need not be re-hydrated first.

SPORES - Many minerals in tap water, and especially well water do effect the survival rate of spores in a syringe.

DROPPING SPORES - The big deal is it makes a horrible mess and makes the mushrooms taste even worse.

SPORE SOLUTION - That was enough for 4 jars. 2ml per jar is plenty.

SPORE PRINTING - I quit taking prints on paper. There's a lot of lime and other chemicals used in pulp production and papermaking. I don't know if that's the cause or not, but I've found prints taken on foil last MUCH longer than prints taken on paper. You can use the same methods, just with foil instead of paper. I'd tear a foot or so off the roll first, and save it for the kitchen, then use the clean foil beyond that point for your prints. I prefer to cover the printing cap with a tyvek sheet. I buy tyvek coveralls at the hardware store, and unzip them and do the printing on foil inside the torso area, then I zip it back up. You can tie knots in the arms and legs, and hood, so it totally seals your printing area up, yet still can breathe so bacteria is reduced. Heavy duty foil. It's several times the thickness of the cheap stuff. For immediate syringe making, you can use the non-stick foil. Spores slide right off it. They will slide right off the foil and into a shotglass still in the shape of the print.

SPORE PRINTING - If you're going to be streaking the spores onto agar, there's no need to be sterile in taking the print. I don't even put a glass or bowl over the cap. Just lay it on a piece of typing paper, and set a coffee filter over the top. After you streak the agar dish, watch it daily, and when the spores germinate and grow half a cm or so, take a small piece of mycelium from the FARTHEST away from the point of germination, and transfer it to a new Petri dish. Discard the original. This allows the mycelium to outrun the contams, and you can get clean cultures this way. Of course, doing it this way, you'd just drop the agar wedges into your grain, as opposed to making syringes. One Petri dish can innoc 10 quarts of rye or corn. Much faster/safer, imo.

SPORE PRINTING - If they're for printing, let the caps begin to drop spores prior to picking. Don't let the caps flatten all the way out because that wastes your spores and makes a mess all over your grow chamber. If they're for eating, pick just prior to veil tear for best overall quality. I agree that paper is a poor printing medium. Its porous surface attracts and holds contaminants, and the lime and acids used in production gives paper a wildly varied pH, which doesn't do much for the spores longevity. I use foil.

SPORE PRINTING - For printing, wait until the cap begins to flatten out, and you'll see spores on the stipe above the veil remnants as well. I disagree with the technique of printing under a glass. I'd suggest laying a sheet of tyvek over the printing caps. All you want is to keep dust off and restrict drafts. A glass can tend to keep the caps too wet, and bacteria may bloom.

SPORE PRINTING - Agreed, you don't need light. Personally, I don't let caps sit for more than 12 hours during printing because I don't want bacteria to be able to form in the stale air beneath the cap as it prints. The good news this way is you can get two prints from each cap. Although they will be lighter prints, they will work just fine.

SPORE PRINTS - Dark prints equal more spores, and since no print is completely clean, it also means more contaminant spores, which germinate and grow faster than mushroom spores.

SPORE PRINTING - After five years, especially if the print is on paper, there's little chance of success. It's not impossible, but less than one spore out of perhaps a million will still be viable.

SPORE SYRINGE GERMINATING - It doesn't make them germinate one second sooner. It just causes such a

mass of mycelium you SEE it sooner. It's a horrible idea by the way because your mycelium spends needless energy combining cells(anastomosis) in order to become a single organism. You're much better off using a minimum of spores. Dark syringes or the over use of spores is also a good way to get contaminants. Remember, more mushroom spores also means more contaminant spores that hitch hike along for the ride. Since it takes longer for all those strains that germinate to combine, it gives the contaminants a better chance of getting the upper hand.

DARK SPORE SYRINGES - It becomes much worse when people make their own syringes and make them very dark. Some strains are not compatible, so when someone uses multispore inoculation, it's common to still have two or three strains active at fruiting. Each strain carves out its niche and holds it. Most strains combine into a single organism through the process of anastomosis, but the non-compatible ones don't, therefore you'll have several different substrains growing in the same tray.

SPORE SYRINGES - Having thousands of strains in the same jar may turn it white sooner, but in no way increases performance or yield. Time is spent combining all those pairings into a coherent whole. Fewer spores is much better, and in fact the clearest spore syringes often give the most massive flushes. The reason is that many strains are incompatible, so when you start off with a black syringe, there may be hundreds of incompatible strains at the end, greatly reducing harvest.

INOCULATING - 2CC's is plenty for quarts of grain. Shoot over to the side of the glass so the spore solution can run down. Don't shake until 20% or so colonized with mycelium.

INOCULATING - A torch lighter will leave the needle sterilized. Just make sure you get the needle to glow red hot. No need to wipe with alcohol afterward.

SPORE SYRINGE - A print should make up to ten or even more syringes, depending on size and darkness of the print.

SEX LUBE SPORE SYRINGES - Astroglide or Jet Dry.

INOCULATION - 'Inoculation' is the process of introducing spores to your substrate. 'Colonization' is the phase where the mushroom mycelium is working its way through the substrate, 'colonizing' it. 'Fruiting' is the stage you're at now.

STRAINS - Strains of the same species do NOT compete for nutrients and they do NOT fight it out. That's absolutely silly. Do the genes of a lady from Florida and a man from Texas fight it out when they make a baby? Of course not. Squirt as many different strains into the same jar or substrate as you want. It's no different than multispore inoculation from one print. It's all the same species. Everybody who's done it has reported the same results. A normal flush that looks just like any multispore inoculated flush. Most of the named 'strains' were simply named after the geographical location the print was collected from, as if a man made line in the sand changes the genetics of biological creatures. If a guy collects a print in Florida and names it treasure coast, and another guy collects a print in Georgia and names it hillbilly, are they really different? Both grew in the same region, under the same weather conditions, and spores from both mix freely in the wind. It's the same with all the SE Asia 'strains' in circulation. Lines on a map drawn by the British 50 years ago do not cause the mycelium that's been evolving for millions of years to suddenly morph into new strains, marketing considerations aside. They're all Cubensis. There are distinct strains such as Penis Envy, various albinos and fruits that drop slightly different spore coloring, but the rest is marketing, not mycology and they all mix and match easily. My point was that putting spores from several named 'strains' in the same substrate does not result in a hybrid, since there's no verifiable difference between them.

MIXING DIFFERENT STRAIN SPORES - Different strains do not fight it out. They do not compete for 'nutes', they don't make small fruits, they don't disrupt each others networks, and they don't get cut off from their own network. I speak from experience. Use the search feature and you'll see this issue comes up every couple of months at least, and this same disinformation gets repeated over and over again by those who have never done it. Here's a post I made in a similar thread several months ago with a picture showing two different strains fusing by anastomosis to create a third strain on a Petri dish.
http://www.shroomery.org/forums/showflat.php/Number/5545843#Post5545843Cubensis is easy to cross. Some

mycologists use the term hybrid, but I prefer 'cross', instead using the term hybrid to refer to cross-species matings. Every single multispore inoculation results in hundreds of 'strains'. Where is this fighting? Remember, a strain is born when two compatible hyphae exchange genetic information to become dikaryotic. It doesn't matter one whit whether the spores those hyphae came from originated from the same sporeprint, or sporeprints from the opposite sides of the world. Vendor named strains are just that-names. If the species is cubensis, they will combine normally. That is a fact.

STRAIN - Strain is irrelevant in mushrooms, unlike in mj cultivation where it's everything. A cube IS a cube. The long-time growers know this, thus the disreputable spore sellers constantly invent new names to stamp on the same old strains that have been around for years. Pick a strain from a shroomery vendor for your microscopy study. Sporeprints easily slide into a regular mail envelope. Cubes are cubes, and no named strain produces faster, more rhizomorphic, more potent, blah, blah, than any other on a continuing basis. Strain questions need to be in the strain thread at the top of the page please.

MIXING STRAINS - They may or may not share genetics(cross), but either way there is little to no harm in mixing vendor named strains because they're all the same species anyway. The chances are very high that they will combine into a single organism via anastomosis by the time fruiting comes. Search the posts. This has been asked and answered dozens of times in the last year or two. There's several grow logs in that forum where guys have mixed 'strains' in the same tray with no problems.

STRAINS - People, for the millionth time, the 'named strain' crap is completely irrelevant to growing. Cubes are a SPECIES, and they all grow under the same conditions in the same substrates, under the same temperatures, moisture contents, etc. It seems that everyone who makes a print these days gives it a name and calls it a new strain, which is total bullshit. As far as growing parameters are concerned, cubes are cubes, period.

WHAT IS A STRAIN? - Remember, a strain by definition is a pairing of two compatible hyphae into dikaryotic mycelium. The location the original print was taken from has no more to do with the size and shape of the fruits than being a human from New York or New Jersey or England has to do with how tall or how smart you are. Remember, cubes are all the same species, just like we humans are all the same species.

MUSHROOM STRAINS - Some strains just don't attach well to the substrate, therefore they tend to pick themselves by falling over. Other strains are so well attached they leave a huge divot when you pick them. Multispore inoculation will give one strain one time and the opposite the next. It's just the luck of the draw. It's not related to anything you're doing, except handling them. They prefer to be left alone.

MIXING STRAINS - Most likely, you'll end up with cubes. It matters little the name on the print. If it's a cube, it will grow cubes. If you mix spores from more than one print, you'll still grow cubes. Compare it to a human from Canada having a baby with a human from Mexico. The child will still be human. As long as they're the same species, the genes usually mix freely.

CROSSING STRAINS - Crossing one cube strain with another is quite easy actually. Dikaryotic mycelium readily exchanges genetic information with other dikaryotic mycelium. However, such is not a hybrid. It's a cross. This site operator has a long history and is not a vendor here for a reason. I won't repeat the whole step story here. Click.

SPORELESS STRAINS - I've had a few sporeless strains pop over the years. If they have the other qualities desired, it's a great trait since there's no mess if you wait until after work to harvest a flush. Sometimes, they're only half sterile, and you get zebra stripes on the gills,

STRAIN - PE is definitely slower to pin than other strains. Correct, the PE6 is a PE/Tx hybrid. Hope you guys enjoy it.

PRESSURE COOK TIMES - For larger jars or substrate bags, I've got a little different technique to know how long.
The bacterial endospores in grains need about 30 minutes @ 15 psi, at sea level, to ensure they're killed off. That does not mean 30 minutes from the time your PC reaches pressure, but 30 minutes from the time the interior of the jar or bag of grains reaches full temperature. The way to achieve this is to always use the

minimum stove setting that will hold 15 psi. If your PC rattles at 15, then use 14 so it doesn't rattle at all. Now, you'll notice after pressure is reached, for about 1/2 an hour or so, you'll have to constantly turn down the stove in order to prevent the weight rattling. Once you reach the point where you don't need to reduce the stove burner anymore, your substrate is fully heated all the way through. At this point, allow 1/2 hour to ensure the bacterial endospores in the very center of the substrate bag are killed off. If you're above 5,000 feet elevation, double the above time to one hour.

STERILIZATION JARS - Total sterilization would take at least 24 hours in the PC and your grains would come out as a sticky mush. The one to two hours we use for 'sterilization' gives us a window of opportunity to get the jars colonized before the contaminants that survived the pressure cooker can get a foothold. Don't wait three days. Instead, if you're having contamination problems, simply cook up a few extra jars and always keep a blank or two at each step that you don't inoculate. If you do a grain to grain transfer, keep one jar back that you don't use for g2g. If you experience contaminants and your blanks are contaminant free, the problem was in your sterile technique. If both the blank and the inoculated jar contaminate, the problem was in your sterilization process. By using blanks at every step, you can always narrow down the problem to exactly the step you went haywire on. Once you get your procedures down pat, you won't need to use blanks.

PRESSURE COOKING - You can remove the jars when the pressure cooker returns to zero pressure, but I'd still wait a little while. If you remove the jars while they're too hot, they can loose some of their moisture content to evaporation. Overnight is not necessary, but if you're going to let them sit anyway, the PC is a fine place to leave them. If you need to cook another batch, then there's no harm in removing them. Allow to cool to near room temp before inoculating.

PRESSURE COOKER - The biggest cause I see of dry jars is lifting the weight or relief valve to let pressure out faster at the end. That causes the grains that are at a temperature above the boiling point of water due to pressure, to suddenly loose all their moisture because the pressure that was holding the moisture in place disappears. Let the PC cool naturally until you can handle it without gloves or a pot holder before opening.

STERILIZATION - Sterilization is never complete because that would take overnight in the PC, which would turn the grains to mush. The hour or two we PC gives a window of opportunity for the mycelium to colonize and get a grip on the grains, but it's only a window.

PRESSURE COOKER - I use 90 minutes for quart jars at 15 psi. At 10 psi, go for two hours. I wouldn't attempt corn at ten psi. Corn sucks anyway as a spawn. Just use rye or wbs.

PC. TRICHODERMA - Trichoderma is killed at temperatures far below boiling, so there's no way it survived the

PASTERUIZATION - I can pasterize in a Crock Pot IF I can watch and control the temp!

PASTEURIZING - We pasteurize bulk substrates because molds are killed at very low temperatures that are below pasteurization temps, but some of the bacteria survive. Bacteria in manageable quantities are not a contaminant in bulk growing, but molds are. A sterilized substrate is a prime breeding ground for whatever lands on it, thus if you sterilize bulk substrates, you'll have a higher rate of contamination.

CLEAN MEANS - Sanitize means to reduce the number of contaminants to a safe or relatively safe level as may be judged by public health requirements.
Disinfect means elimination of all recognized pathogenic microorganism but not necessarily all microbial forms.
Sterilize means the destruction of all microbical life by use of chemical or physical procedure.

HOSPITAL SANITATION - Clean clothes & work-place, along with good sanitary procedures. AND Hair covering (net/cap), face mask, exam gloves & Lysol/Oust. ARE YOUR BEST FRIENDS. These are common-place inexpensive items, found at most local drug/pharmacy stores. Using these will cut down on contamination. I am amazed, why many don't use them. Then wonder why their jars/bags, syringes, prints or whatever get contaminated.

THE OVEN TEK - The oven will increase contaminants by stirring up turbulence that swirls contaminants

around. The oven tek is bogus. You'd be better off in a still room in open air than using the oven. An air temp of 150 won't do squat to a contam spore in the two seconds it takes to swirl into your jar.

AIR SANITIZER - Lysol is a surface sanitizer. Get some Oust for the air. When you spray oust, it completely fogs up the room. I do about 30 seconds with a can in each hand, which really leaves a thick fog that kills airborne bacteria

OPEN AIR INOCULATION - Anyone who recommends open air inoculations can be compared to a drunk who recommends drinking and driving.

STERILE AIR - If you want sterile(relatively) air, get a laminar flow hood.

CONTAMINANTS BY HUMANS - Growers must realize that WE are the biggest source of contamination. I'll add to the above not to talk or sing, etc., while inoculating jars or doing other clean work. Your breath leaving your mouth is traveling faster even than a flow hood can blow it back. It's also perhaps the largest source of bacteria in our jars. The bests surgical masks will stop 99% of the bacteria leaving your mouth, but think about that 1% of several billion that gets through. That's a lot of bacteria even with a good medical, not dust mask. I hold my breath anytime a jar or Petri dish is open. Gloves are mandatory for consistent success. A box of them is less than the price of a single spore syringe. They'll save a lot of failures.

WASHING HANDS - Soap lifts the oil and bacteria skin cells and washes away with water. There is no true "anti-bacterial" soap that will kill it all (THIS IS A MYTH). Even soap/sanitizer can't even kill it all though. Skin is constantly shedding bacterial cells, You want the beneficial bacteria on your hands. True anti-bacterial soaps need to be left on for a couple minutes too.

FUNGICIDE IN CASING - They use Banrot 40WP. I ran several experiments with this fungicide a couple of years ago. It is so powerful you can soak rye grain in it, then PC, then leave the lid off the jar for 24 hours in an open room, and the grains won't contaminate. It can also be applied to casing material, and I guarantee that no trich or cobweb will grow on it.
It works by preventing spore germination, so it has to be inoculated with live mycelium, as nothing will happen if you try to inoculate with a spore syringe.
After determining that the Banrot 40WP works, I stopped the experiments because I see no reason to use chemicals to replace proper clean room procedure. A properly pasteurized, NOT sterilized casing layer will have no trouble surviving two flushes, which delivers 90% of the fruits you're going to get anyway. After two flushes, I recommend tossing the tray into your outdoor garden and replacing it with a fresh tray for the most effecient use of your growroom space. Thiophanate-methyl is approved by the FDA for use on mushroom crops and I ran some tests on it a few years ago. It's the active ingredient in Banrot 40WP. Banrot 40WP is so powerful you can put it in a jar of grains prior to sterilization, then leave it sitting out with the lid off in a dirty room and it won't grow mold, but if you put live mycelium into the jar it will grow unaffected. However, it's a chemical cure for laziness so I don't recommend it. Just use proper procedure, then toss out contaminated projects. It seems I used 1 tablespoon of Banrot per the several gallons I soaked the 10 cups of rye berries in overnight prior to PC'ing. It's been awhile, so you might search some more and find the posts that I wrote when my memory was still fresh on it.

FUNGICIDES - If fungicides have been used, they only effect spore germination. As long as you inoculate with live mycelium, there won't be a problem. You'll just have to do a test run.

RHODODENDRON LEAVES - Dried Rhododendron leaves are nearly as effective if someone is really having trouble with trich or cobweb. Simply dry them, then grind up in your hands and mix with the casing material at the rate of ten percent. Pasteurize and use. Fungus spores won't germinate in the presence of Rhododendron leaves.

BUG PROBLEM SOLVERS - You can also suck them out with a vacuum cleaner hose, which is kind of fun. They normally bread in your houseplant soil then fly out of your mycelium to feed. They can be killed off in the houseplant soil by soaking the entire pot from the soil line below in the sink for 24 hours. This drowns the adults and larvae. I use sticky paper. Works like a charm. Place it near the entrances to your grow area, and also on the inside. They're likely breeding in your houseplants too. A good cure for both houseplants and

casings with fruit flies is dunking. A 24 hour dunk will drown them and their larvae. If you'll cut a lemon or lime in half and leave one of the halves near your grow, they'll congregate on the lemon rather than your mycelium. It's easy then to get them with the vacuum cleaner hose. Shot glass 1/4 full of wine are good traps. Glass with coco cola in it, they drown from the sticky ness. Fly Straps, they work great. I'm not talking about little pest strips, but 2' x 4' mats. You might try some DE to see if it works, but it only works when dry, and it won't stay dry for long on a substrate. Disposal is probably the best option. You could bury them into manure or compost in a shady spot outside to get a crop. They looooove stale beer and wine. Leave a half full bottle of either lying around for a couple of days, not more, and they'll crawl in and drown in the stuff. change the bottle every couple of days. You can use the yellow duct tape, but put a layer of vaseline on it so they stick to it. That's what a lot of the farms around these parts do. DE will help if it's dry. You can even sprinkle it around the shelves, or try baiting them with a bit of honey on a piece of wax paper, surrounded by DE. One needs to be careful handling nematodes and growing mushrooms. Many species are death to fungi, while other types of fungi can trap and kill the harmful nematodes.

GNATS - My favorite method is to cut a lemon in half and leave it near the grow area. The gnats are attracted to the lemon much more than to the mushroom mycelium. You'll see the lemon covered in gnats, and then you sneak up with the vacuum cleaner hose and suck them all up. Works like a charm.

GNATS - They avoid turbulence, but it's also likely to dry out your substrates. Try this if gnats are a problem. Cut a lemon in half and drop it into the bottom of a quart jar. Keep the lid next to the jar. The gnats will be attracted to the citrus, and when there's a bunch in the jar, quickly put the lid on before they can get away, and dispose of them.

BUG PROBLEM - Get a bag of DE from the garden center and sprinkle a thin layer on top of your casing. Completely cover the casing layer. The DE is extremely sharp to insects and will rip them to shreds when they crawl across it. DE is only effective until it gets wet, so you'll have to reapply it after misting. It's non toxic.

FRUIT FLIES BUG PROBLEM - They're attracted by the smell of mycelium for a snack. I've never seen them set up home and breed in a cake or other project. While an irritation to see in our FC's, they're for the most part harmless. I chase them down with the vacuum cleaner hose if their numbers get too large.

ANTS ATTACK - Another tip for ants is to put a bit of borax into a jar lid of honey or karo. The ants suck up the karo with the borax in it, then take it back to the nest to mix into the feed. Within two weeks, the entire colony including the queens is wiped out.

BUG PROBLEM? - Dung/straw based substrate draw gnats (fruit flies). Your infested - already...Get electric bug zapper.

FRUIT FLIES - Normally, they breed in your houseplant soil and then fly out to your mycelium to feed. They can be killed off in the houseplant soil by soaking the entire pot from the soil line below in the sink for 24 hours. This drowns the adults and larvae.

BUG PROBLEM - You can also get a bottle of red wine and drink all but the last inch in the bottom. Leave the bottle in the fruiting chamber as a trap. They're attracted to the wine, then can't get out of the bottle and drown.

KNAT PROBLEMS - Use 'Knock Out Knats' Bacillus Thuringiensis Thuricide to destroy gnats in your grow room.

UV LIGHT CANCER - Skin, or eye exposure to hard UV light is KNOWN to cause cancer. I have used then in air sterilization. But, they were enclosed in 16 gauge sheet metal duct work. Which, the air was forced through in a hepa filter housing. Just be careful, malignant melanoma skin cancer is NO FUN.

SURGICAL MASKS - The standard they're testing is how the mask protects the wearer, which we don't have a concern for. Our projects are not going to give us a fatal disease. Respirators are tight fitting around the cheeks, to prevent you from inhaling air from the edges that doesn't get filtered. This is important if you need protection from airborne pathogens. Surgical masks are open at the cheeks purposely to allow a low pressure route of escape for your exhaled bacteria(breath). What passes through the mask generally has 99% of the

bacteria filtered out, depending on brand. Hospital operating rooms have HEPA filters in the ceiling that draw the room currents up and away from the patient. By having the doctor's breath leave in the direction of the ceiling, thus the filters, the patient is protected. This is our scenario as well. When the FDA says they don't test surgical masks, it means THEY don't test surgical masks. It doesn't mean they don't get tested. A surgical mask with the N95 rating is going to do our job just fine. However, a cheapie surgical mask works very well too. It's all I've used for years. The thing NOT to use is a construction type dust mask.

SURGICAL MASKS - Neither of the above. Go to a drug store and get surgical masks. They're designed to filter 99% of your exhaled bacteria. One of those above is only good for 97%, and the other one isn't even rated. You can do much better locally.

STERILE - Kitchens are the worst possible place to work. There is more fecal bacteria floating around a kitchen than in the bathroom right after you take a dump.
I've noticed the new growers that are saying it's ok to be nasty are also buying syringes from vendors so have their sterile lab work already done by someone else. That isn't mycology folks. When you learn to harvest a crop, take prints, germinate spores on agar, isolate strains, and produce a killer fruiting strain that blows you away with its potency, you'll understand what I mean.
Lab work isn't supposed to be clean. It's supposed to be laboratory sterile. No cut corners. When it comes to spawning a bulk substrate, who gives a shit if you pick your nose while working? It doesn't matter. If the grains were properly prepared and colonized in sterile conditions to full colonization, you can spawn to bulk outdoors if you want to. When you go to the Stamets seminars, you'll see Paul build a straw log or other project outside in the open air and it works fine. However, you can bet your ass the spawn wasn't produced outdoors in the open air.
Learn to be sterile where sterility is called for, and be clean where being clean is called for and you'll be fine. I live in a 40 year old condo building in a very damp climate and my entire building is infested with black mold, and it has wall to wall carpeting. It's unhealthy for us and we're trying to sell the damn thing so we can move, but every project I've done has been done in this mold infested place, yet I can grow successfully by following the advice given above, and even filmed my video DVD here, doing lab work and growing a dozen or more species from spores to the fruiting/harvest stage. Several of my terrariums sit within 18" of a wall that has black mold growing on it, yet it NEVER grows on my cakes.
For sterile work, surgical gloves are a must, surgical mask is a must(dust masks are for carpenters, not surgeons), a still air glovebox or laminar flow hood is a must. A closed, draft free room is a must especially if you're using a flowhood, and spray the air with oust at least two or three times before starting the flowhood. I let the flowhood run for at least an hour in that closed and oust sprayed room before beginning work, which gives me time to shower, wash my hair and brush my teeth, use mouthwash, etc.
Once your spawn jars are fully colonized, you can scratch your butt while you inoculate the coir if you want. Bacteria isn't a contaminant of bulk substrates. The important thing is to learn when it's important to be sterile. If someone else is doing your sterile work for you, then don't brag about how dirty you can be and get away with it. Anybody can be dirty and get away with it under those conditions.

STERILE AIR - There are up to 600,000 contaminants per cubic foot of air in a normal room. That's a lot of little nasties to stick to your needle or the top of your jar where it will get pushed into the substrate when you inject. A room also has normal circulation and all those nasties are moving around. You can see this on a bright day when the sun is shining in through a window. You'll see the larger of these dust particles, but there are hundreds of times that many smaller ones that you can't see. A still air box stops the movement of these particles, greatly reducing the chances they'll get on your jar lid or needle. You can also improve your chances by washing the glovebox and leaving the sides and bottom wet. The moisture will attract the dust/contaminants and then they'll stick, leaving the air within, not only still, but with much less contaminants floating. You don't want a filter and fan on a glovebox. The only suitable filters for mycology are several inches thick and require a plenum behind them to build static pressure, which gives the laminar flow. If you used a filter/fan in a glovebox, the turbulence would defeat the purpose. Where a glovebox really shines is when doing agar work or grain to grain transfers. They're not as good as a laminar flow hood by any means, but they're far better than open, turbulent air. Water or peroxide. A wet surface will make the contaminants adhere to it and stick, rather than floating into your jars.

STERILE - Opinions are like something else every one has, so unless somebody wishes to quote some scientific texts to back up claims, let's not be spreading flames over our opinions. I can easily see how water

10,000 feet below the surface of the earth can heat to well over 100C without boiling. After all, think of the weight(pressure) a 10,000 feet deep well of water will exert on the water at the bottom. That's a lot more pressure then the walls of our PC's can contain. However, I doubt seriously the walls of an oven bag can exert that much pressure. There's no way to get every molecule of air out of a bag of coir or manure, even if it soaks in water for a month. In addition, even if it did, you'd be handling a bomb when you open the microwave. My background is engineering, not chemistry, so we should wait for one of the member chemists to chime in. The overall point is mute though, because sterilized substrates are much more likely to contaminate than pasteurized substrates. One shouldn't heat substrate or casing material above about 170F, or the chances of contamination are increased rather than decreased.

STERILE SYRINGES - Flaming needles is to prevent cross contamination between jars. Syringes should always be boiled before re-use. This isn't a tek, it's simply stating what has been said over and over again for years. There is also no need or reason to PC a syringe. Plastic doesn't harbor bacterial endospores, so anything that might be on a syringe will be killed off by simply boiling. You still need to flame the needle between jars. As hyphae pointed out, you certainly don't need a separate syringe for each jar.

STERILE PROCEDURE - Nobody should ever recommend inoculations in open air, especially new growers that got started in the hobby during the winter when natural contaminant counts are low. In addition, the breath of the cultivator is the biggest source of bacterial contamination, and dust masks stop zero exhaled bacteria from reaching the work area. Dust masks are intended to stop the individual from inhaling large particles such as dust and dirt when mowing the lawn, but surgical masks are called for when doing mycology work. A surgical mask is designed to protect a patient from the surgeons exhaled bacteria, which is what we want to accomplish when doing sterile work.

STERILIZING - Actually, that's a terrible idea and I cringe everytime I see it repeated. 'Sterilization' is never complete, but only gives a window of opportunity to get the grains colonized. Wait until the jars return to room temperature, and then inoculate. Glass is an insulator, so if they were even slightly warm on the outside of the glass, your spores are probably cooked and doomed. It never pays to be in a hurry in this hobby. Waiting twelve hours to inoculate is the proper thing to do, and you don't gain anything by doing it sooner.

BOILING/STERILIZING SYRINGES - Boiling water IS enough to sterilize a syringe. Plastic does not harbor bacterial endospores, and fungi like trichoderma and cobweb are killed by temperatures far below boiling. I fill a pot with water and drop the syringe in. After the water has boiled for ten minutes, pull the syringe out and suck in the boiling water, swish it around and squirt it out. Do this a few times. The syringe will be sterile enough for mycology, I assure you. I've done it this way for years.

STERILE - I'd suggest an alcohol lamp to sterilize so you won't be anywhere near your kitchen during inoculations. Kitchens are full of molds and mold producing/carrying foods such as bread and cheese, vegetables, fruits, etc., not to mention all the bacteria that lives and breeds in the sink drain and in all those hard to reach to clean spaces. There's no need to wipe with alcohol after flaming the syringe. Wait two or three seconds and inject. Work in a glovebox of course.

STERILE INOCULATION - Swabbing the needle with alcohol does nothing for the contaminants that have become lodged in the interior of the needle. In addition, look at a needle under a microscope. There's many little holes and imperfections on the surface that alcohol is very likely to miss and thus the contaminant molds or bacteria survive. Always flame before first use, and flame again between each jar to prevent cross-contamination.

STERILIZING NEEDLE FOR INOCULATION - A bic lighter is fine. A butane type lighter is hotter and won't leave carbon on the needle, but as long as you get it red hot it's fine. Allow to cool for 2 seconds and use. The needle will still be hot, but not red hot, and the first half drop of solution will cool it off safely, allowing the rest to flow cleanly. Use a glovebox.

NEEDLE STERILIZATION - The problem is the alcohol doesn't penetrate to the inside of the needle. I suggest flaming the needle red hot, then using the first couple of drops from the syringe to cool it down. That way, you know the inside and outside of the needle are sterile. In other words, heat it red hot, then allow to cool for only a few seconds and use.

STERILIZING NEEDLE - If you flame sterilize, anything you do afterward will only make the needle 'dirtier'. Why not just flame and use? Forget the alcohol after flaming. There is no need to cool down the needle. Just use hot and let the first drop or two of solution cool the needle, so the rest can flow contaminant free.

STERILE - Alcohol does NOTHING to prevent the contaminants that are inside the needle being injected into the grains. The size of the interior of a needle to a contaminant is comparative to the size of a human in a subway tunnel. Needles should always be flame sterilized.

STERILE - Spraying Lysol into the air is a waste of a good surface disinfectant. It does no good whatsoever. Use Oust to clean the air, Lysol or plain iso alcohol to clean tabletops. Other than that, it should be OK. Keep your cotton filter dry at all times or it will mold.

STERILE - If you fail to flame between jars, you can easily cross-contaminate between them. Flame between each and every jar. Alcohol is good for the surface of the jars and tabletops, but flaming is the way to sterilize a needle or scalpel, inoculating loop, etc.

STERILIZING NEEDLE - 70% is more effective at killing organisms than 91%, but in my opinion, syringe needles should be flame sterilized. Alcohol on a cotton wad will do nothing for contaminants on the inside of the needle.

STERILIZATION - Sterilization kills all life forms. After sterilization, you need to keep the substrate under sterile conditions until fully colonized or it will contaminate. That's why we use filter patch bags or jars with filters.

STERILE PRINTS - There is always going to be a few contaminant spores on every print. There's no way to avoid them unless we grew on sterilized substrates in a hyperbaric chamber.

STERILE PROCEDURE - If you're not gloved up, wash like a surgeon with good soap, preferably something with exfoliant properties, and use hand sanitizer.

STERILE PROCEDURE - Alcohol your gloves and tyvek wrist sleeves, spawn jars, flame and alcohol transfer tools, scalpels, etc.

FLAMING SYRINGE NEEDLE - If you flame between each jar, you eliminate the possibility of cross contamination.

PASTEURIZATION - Pasteurization should not be longer than 90 minutes or too many of the beneficial organisms will be killed off, thus leaving the substrate open for contaminants later. Water is a much better conductor of heat than air, thus water or steam pasteurization the preferred method. Water or steam will conduct heat into the substrate fastest, thus allowing you to more precisely control the total amount of time at pasteurization temperature.

PASTEURIZATION DISCUSSION - Pasteurization of substrates doesn't take a few seconds. It takes an hour. The idea is to kill all of the mold spores, and some of the bacteria. The surviving bacteria keep the substrate 'alive', thus reducing the chances of molds forming. A few bacteria in a substrate will also improve fruiting, and some species simply will not fruit on a sterile substrate.

PASTERUIZATION - You'll want to get your material to the proper moisture content before loading into bags or jars. Let the substrate sit for half an hour, and then re-adjust to field capacity. Oven bags are for cooking turkeys in the oven. They're not suitable for stovetop pasteurization, so use jars or filter patch bags, which don't need to be sealed first.

PASTEURIZATION - Pasteurization only kills fungal spores, leaving the beneficial bacteria intact. After pasteurization, the substrate need not be kept sterile, so it's suitable for bulk substrates such as straw and manure that are too big for filtered jars.

PASTERUIZATION - You'd have an easier time if you divided it up into several smaller bags or jars rather than one large one. You want to maintain 140F to 160F in the center of the bag for one hour for pasturization.

PASTERUIZING - You should pasteurize the coir. Some, including me have used it unpasteurized with success, but additives such as compost and/or manure definitely need to be pasteurized, so just do it.

PASTERUIZATION - Open water pasteurization sucks, at least put it in a quart jar. Reason being, because it loses nutrients and the screws up the water content.

PASTERUIZATION - I can pasterize in a Crock Pot IF I can watch and control the temp!

PRESSURE COOKER - POINT OF A PRESSURE COOKER....IN GENERAL: Canning and cooking foods faster/ with less nutrition loss.....MYCOLOGY: Makes it so you don't lose juices and all in roasts and stuff too. Steam steralization at temps higher then boiling water can exhibit.

BEST PC BULK - If you are going to give it a SERIOUS go. All American PC is BEST PC EVER. Bigger the better. Build (at least) a GLOVE BOX. Better yet a HEPA FILTERED FLOW HOOD. FIND HORSE MANURE. Learn WBS & G2G. Learn PH of casing is important.

LEAVING JARS AFTER STERILIZATION - Leaving unsterilized grains in a closed jar is a breeding ground for contaminants. The more contaminants you have in a jar, the more are likely to survive the 'sterilization' process.

GLOVEBOX STILL AIR BOX - You rarely see the old hands using any sort of 'positve pressure' box. A glove box need not be sterile or have sterile air. There is absolutely no way that a dust mask or even a vacuum cleaner hepa filter on a sterlite container with a computer fan is going to deliver better performance than a simple container with two holes cut for your arms, but otherwise closed up.
What you want in a glove box is to have zero air movement. You can lightly mist the inside air of the box with plain water, and this will attract whatever contaminants are floating around in the box to the water droplets, where they will fall by gravity to the bottom of your glovebox. After that, simply do your work wearing latex gloves. I use tyvek sleeves on my wrists, pulled down over the surgical gloves. Wash the gloves with alcohol before working. I have nothing at all attached to the glovebox. Just two 4" holes for my arms to stick through. The loose fitting sleeves seal around the holes well enough, and allows me to pull my hands in and out with ease to use my alcohol torch. (I don't like to use the flame inside the box due to excessive heat) My success rate with the glovebox described above is equal to that of my laminar flow hood. I prefer the flowhood because it's easier to work in front of and you have more room to move around.
The problem with having a fan on your glovebox is it will cause turbulence inside the box, which will keep any contaminants in suspension where they are actually more likely to land on your project than without a fan. Best of luck.
A fan is the worst possible thing you can do to a glovebox. There is also no need to spray lysol or oust in a GB. Wipe it with a damp cloth and go to work. There is nothing sterile about a glovebox. STILL air is what you want.

STERILE TECHNIQUE GLOVEBOX - You can also cut the holes so they're fairly snug around your arms, then just wear latex gloves. Be sure to wash your hands and arms first, then put on a freshly laundered long sleeve shirt to cover the skin on your arms.(dead skin cells flake off all the time and they'll have bacteria) Remember, a glovebox does not have to be totally airtight or sterile. It only serves as a place for you to open or inoculate jars or Petri dishes in a draft free environment. I haven't used attached gloves in years because they're such a pain in the butt to work in. Latex gloves give you really good control. Of course, do your glovebox work in a very clean room with no fans or air conditioners etc running.

GLOVEBOX/STILL AIR BOX - If your box is draft free, then you can skip the mask and hairnet. Most of us use simple rubbermaid totes for gloveboxes, so breathing near the lid could get bacteria inside, so watch for that and either tape the seal or use a surgical mask. The air in the room doesn't need to be sterile by any means. As long as the glovebox has still air and you've sprayed inside with water, you'll be fine. Don't use flammable stuff in your glovebox. You can mist it with your regular mister with plain water, and whatever contaminants land on the floor or back and side walls, will stick there due to adhesion.

GLOVEBOX/STILL AIR BOX - The problem working bare armed is that several thousand dead skin cells per hour fall off each arm. That is a fact of human metabolism. In fact, the overwhelming majority of 'dust' in a

house or on the furniture is actually dead skin cells. If you work bare armed, those skin cells that flake off your arms now have a chance to fall by simple gravity into a jar or Petri dish. With a freshly laundered long sleeved shirt, the shirt will catch the majority of those dead skin cells, thus protecting your project. The shirt does NOT need to be sterile, so please stop confusing the subject with this silly arguing.

GLOVEBOX VS AIR FILTER - A glovebox can never rival a flowhood, although one can certainly screw up a glovebox by placing fans and filters on it.
A still air glovebox can be used with the same success rate as a laminar flow hood, but is much more cramped to work in. A flowhood gives you a sterile work space that is big enough for your elbows to move around in.

GLOVEBOX - This is why I recommend soap and water only to clean a glovebox. Lysol and alcohol are both surface disinfectants, and you don't dump spores or mycelium on the floor of the glovebox anyway so they are of no use. Since all a glovebox does is prevent drafts that would blow contamination into your work, soap and water is all that is required to clean them.

GLOVEBOX - Glovebox Hands down beats oven box, too many contaminants in your oven also theres moving air coming in and out of it because it can't be closed unless you can fit inside it :p.

GLOVEBOX - Gloveboxes need not be sterile, and I never use lysol, etc., in mine. Fruiting chambers also need not be sterile.

STILL AIR BOX - I just use soap and water to clean the inside.

TIMERS - Cheap timers won't have the switching capacity to run an air conditioner. You'll need to get an intermatic timer in the metal box from an electrical supply. Sometimes you can get them at lowes or home depot, but make sure they have the 'amp' rating that matches or exceeds the nameplate 'amps' on your AC.

BOOKS - The Journal of Medicinal Mushrooms has as it's editor in chief, Mr. Solomon Wasser, and on the editorial board, another 'lay' person, Mr. Gaston Guzman. Perhaps you've heard of those two?
The issue I'm holding in my hand has articles from such 'lay persons and hobbyists' as Paul Stamets, Christopher Hobbs, John Holliday, Gaston Guzman, Toshihiro Hashimoto, Soloman Wasser, Gregory Plontnikoff, Daniel Winkler and others too numorous to mention.
I feel strongly on a board focused on mycology we should concentrate on mycology and not vulgarity, however, feel free to call it whatever you wish.

BOOKS - I'd recommend both of Paul's cultivation books. The Mushroom Cultivator for a good basic mycology course, and Growing Gourmet and Medicinal Mushrooms for some more advanced tips, correction of a few mistakes in TMC, and detailed descriptions and pictures of common contaminants. These are mushroom growing books, not specifically psilocybe growing books. Those I've seen that only show how to grow cubes are lame and inaccurate at best.

DAMAGED FRUITS - Anytime a spot forms on a cap from damage, it's there forever. It won't 'heal'. The fuzz on the stem is fine, and doesn't mean humidity is too high. It seems to happen with some strains/substrains. Look closely at what you see. Think about when you hit your own body on something and it bruises. The color you see is your actual skin color. That's bruising. Now think about when you get a bad scrape or cut and if forms a scab. The scab sits above your skin as a separate layer. A scab on your body corresponds to mold on your substrate. The mold will be a layer above the substrate.

DISTILLED WATER - Everybody knows about the pure distilled water in a clean, smooth container being able to be superheated slightly above 100C and remain liquid. There's dozens of demonstrations on youtube and others. However, coir or anything else mixed with water can NOT be heated above 100C without the water changing state to a gas. It doesn't matter if there's any air above the water or not.

EXPERIENCE - I found this "dust" of *Bacillus thuringiensis* for begetables. It was not labeled for fungus gnats, and it was not the substrate of this species indicated for controlling fungus gnats. It was really for chewing caterpillars, etc. It's called "Dipel 150 Dust." Five bucks for a pound. The values for treating soil are absurd (too low for me to apply to a casing) so I took a tea-straining teaspoon (one of those latch-and-strain teaspoons) and put it down in the container the bacillus dust and clipped it shut against the side of the container (while

still inside) then brought it out and shook it over my casings. There was a layer of this dust that sort of looked like a fine, white snow. I applied this once, then a couple of days later again, then about a week later again. I applied it 3 or 4 times, and, as the bacillus thuringiensis propagated and interfered with the life cycle of the fungus gnats, the adult population began to wane. Over the course of around a month, I've gone from gnat-body-littered stickytape traps changed once a week or so, to, no visible adult gnats in the terrarium. It appears this particular product, though it takes a few weeks, will effectively disrupt and wipe out the fungus gnat life cycles on casings.

EXPERIENCE OF ROGERRABBIT - 36 years. In 1971, I brought home a cow pie that had cubes growing on it because I could see 'mushroom roots' covering the whole bottom of the patty. I mixed it into my compost pile and forgot all about it until the fall rains came when I found hundreds of cubes all around the base of the compost pile. I've been hooked ever since. It actually took me well over a year to learn that mushrooms don't have roots. There were no books on cultivation at the time, and of course no internet. The Dallas, Texas public library was my only source of information. I finally found Alexander Smith's field guide to western mushrooms in the mid 70's, and learned a lot about mushrooms from that, even though it's not a cultivation book.

FIRE FANG - Actinomycetis. It will also grow on coffee grinds if you store them for any length of time.

GNATS/FLIES INFO - They love the fruit bowls and anything else sweet. They're attracted to the smell of the mycelium, but they don't usually breed in our projects. They rarely cause much problem unless they're there by the thousands. I've never had a single contaminant that I could blame on them and I live in fruit fly/gnat heaven. Normally, they breed in your houseplant soil and then fly out to your mycelium to feed. Fruit flies have about a 20 to 30 day life span. They go from egg to larva to adult flies. The adult stage is about 7 to 10 days of the span & in that time, 1 adult can lay about 700 to 800 eggs. The flies do not lay eggs at temperatures below 54 F (12 C) or above 91 F (33 C).

HALF GALLON - Half gallon jars often go anaerobic in the centers. It's also harder for the CO_2 to escape the larger jars. Personally, I don't use anything larger than quarts, even though I have five or six cases of half gallon jars in storage. Try leaving the jars laying on their sides. Next grow, I'd suggest quarts for grains. In addition, the larger the container, the drier you make the grains. You'll use about 20% less water(per measure of grain) with half gallons than you'd use with quarts.

LAUNDRY BASKET TEK DISCUSSION - By Visions method if I remember correctly, you're not supposed to mist the sides. Let them dry out, and the dry straw serves as the contamination barrier. He poured water down from the top. I do it a bit different by placing in a bag or large tote with holes cut into it for gas exchange. This keeps the CO_2 levels higher during colonization, which actually prevents the mycelium from turning as much of the substrate carbon into CO_2, which reduces the size of the substrate greatly. About a week after full colonization, I introduce to the normal fruiting conditions of high humidity and lots of air exchange. I don't fruit them in open air unless it's the rainy season outdoors, in which case I set them on the back porch to fruit. You can see a short, low resolution preview video of the way I do it on my website.

LABELING - My system is to list the date first, parent species second, then strain third, and then each transfer beginning with the letter 'A' and going through the alphabet. Assume the species is Reishi, and the strain is my 'sheriff' (sherrif strain got its name because a dumbass sheriff gave me a bogus ticket the day I cloned it, but that's another story). A swipe of spores made today on agar would be labeled 042607RS. Assuming three days from now I make a series of transfers of the first mycelium to germinate from spores, they would be labeled 042907RS A1, B1, C1, D1, etc. As the strains differentiate, the next series of transfers would be labeled (date)RS-A1-A, (date)RS-A1-B, etc. From the second original dish, the second set of transfers would be (date)RS-B1-A, (date)RS-B1-B, etc and right on down the list. It's important to be consistant with your system all the way to fruiting because when you find that awesome fruiting strain three months from now, you want to be able to go back to the original dish in the refrigerator that corresponds to the fruiting tray, pull it out and make a master culture slant from it. That way, you preserve the genetics of a great strain from a very early time in its life before many cell divisions have occured.

LEARNING - Agreed. My bitch is that when people move to edibles/medicinals they have to un-learn all their bad habits, essentially starting the learning curve all over again. With cubes, they'll fruit on just about anything, regardless of how you prepare the substrate, so they're like learning to ride a bike with training

wheels. However, if you don't learn to ride without those training wheels, you'll look awfully silly someday when you grow up and have to bolt them on your harley. That's why I suggest pasteurization of bulk substrates and casing material. However, this has all been covered before, so do a few searches and you'll find all you ever wanted to know from both sides of this coin.

LOOKING FOR A MICROSCOPE - If you want good pics, get ready to spend some bucks. I've got a few cheapies that just sit on the shelf, and never get used anymore. You won't get quality for less than $1,000 and that's the low end. A decent C-mount microscope camera is going to cost $2,000 just for the camera. In fact, the camera will cost more than the scope. You can pick up a pretty good scope for $1,000 whether you want zoom or light microscope. I actually use my zoom more than the light in mycology. The zoom microscope is great for looking at mycelium on Petri dishes, gills on mushrooms, and other stuff like that. If you want to see on the cellular level, you'll need a light microscope and a box of slides and covers. I had a whole section on microscopy filmed for my video, but had to cut it out because there just wasn't enough room on the 2 dvd set for it. Perhaps it will fit into one of the future releases. I'm already working on the next one. Stereo microscopes are for looking at something from the top. The lens and the light are on the same side of the object you're viewing. Stereo microscopes are for looking at gems, coins, bugs, and mycelium on a Petri dish to examine for contaminants, etc. A zoom microscope is a stereo microscope with an adjustment to vary the magnification without changing lenses. Maximum magnification with stereo-zoom and zoom microscopes is usually around 20X to 30X. I have a pretty high end zoom microscope that goes to 50X, but the field of view at that magnification is pretty darn small, defeating the purpose of using a stereo microscope in the first place. A light microscope has the light on the opposite side of the lens from the object you're viewing, thus you see the light that shines through the object. Laboratory and medical microscopes are the light type. If you want to examine the internal structure of spores, or view mycelium to look for the number of nuclei in each cell or to look for clamp connections, you'll want a light microscope. If you order a stereo microscope, be sure to get LED lights, even if they're more expensive. Coin collectors and jewelers can use the cheaper halogen that seems to be standard on stereo microscopes, but the heat will cook your mycelium, and if you look at something inside a Petri dish, the dish fogs up in three or four seconds from the heat, blocking your view. There's some pictures taken with a light microscope on my website on the introduction to mycology page http://www.mushroomvideos.com/1811640.html along with the mushroom gill shots which were taken with a zoom microscope, and the basidia pictures at the bottom of the page were taken with a scanning electron microscope. The pictures of verm and perlite in this thread:
http://www.shroomery.org/forums/showflat.php/Number/6610766#Post6610766 were taken with a stereo zoom microscope.

MUSHROOM FARMER - I know the owners of several local mushroom farms in my area and every single one of them got their start with growing magic mushrooms, then went into the legal business. They're business people and hard workers, but far from prudes. Just put down that you have experience and cautiously decline to talk about species during the interview and they'll get the point, but at the same time know you're being discrete. None of them will hire someone who brags about psilocybes because that could bring heat on them. That said, most of the jobs at mushroom farms are just labor. There's lots of compost to turn, trucks and tractors/forklifts to drive and floors to sweep and high pressure wash. Unless you get a job in the 'lab' it isn't going to be much to do with mushrooms unless you're a picker, and in that case you have to learn to work very fast, which is darned hard work, and stops being fun after the first fifteen minutes.

MUSHROOMS FALLING OVER - It's substrain related. Very good tendency in my opinion, because little damage is done to the casing layer when they fall over or are picked.

MYTH - Early mushroom growers followed on the agaricus farmers knowledge and grew their mycelium in the dark and had good results. Therefore, the wrote that mycelium should be 'incubated in total darkness' and that myth is being repeated thirty years later, even though it is just plain wrong.

MYTHS - Myth: If you can see the tray, it has enough light.
Reality: Bullshit. Bright, high frequency light is much better. Natural daylight fluorescent or metal halide will give the best pinsets.
Myth: You only need a few minutes of light per day.
Reality: Bullshit. 12/12 has been proved for years and years to be many times better.
You don't find the experienced growers making those silly statements. Fluorescent light.

NOOB SPEACH - Sure, you can half-ass the light and still get a crop. You can half-ass a substrate and still get a crop. You can half-ass a fruiting chamber and still get a crop. You can half-ass on air exchange and still get a crop. You can half-ass on humidity and still get a crop. However, if you skimp on all of them, you get nothing. If you work hard on every aspect of growing, you'll get spectacular results. That's why those of us who know try to advise on the best ways to get the results most of us are looking for.

NITROGEN - Don't use urea. If you feel you need a nitrogen boost, use chicken manure, but at no more than 5% of the total bulk substrate. Make sure the chicken manure has cured in the sun for at least a week or two and has zero smell. Otherwise, spread it out on cardboard in the sun until it's dry and odor free.

NITROGEN ONLY WHEN COMPOSTED - Don't use blood meal because it doesn't do much good unless it's been composted in a pile. Fish emulsion does no good at all. Remember, mushrooms are not plants and need to eat their food to get energy. They don't get energy from the sun, so fertilizers are useless.

NEMATODES - One needs to be careful handling nematodes and growing mushrooms. Many species are death to fungi, while other types of fungi can trap and kill the harmful nematodes.

PAN CYANS - Grow them exactly like cubes, except use a thinner substrate of horse or cow manure no more than 2 inches thick, and a 1/4" peat based casing layer. Other than that, don't do anything different. They're not as cold temperature tolerant as cubes, so try to keep fruiting conditions in the 75F to 85F range. They usually take a few days to a week longer to pin than cubes as well. Shotgun terrarium will work fine. I don't like them anymore. The trip always seemed a bit on the dark side, not pleasant at all in my experience. Good luck.

PENIS ENVY - PE's don't pin well unless you do strain isolations and find a really good fruiting isolate. What you have is about average pinset for multispore inoculation.

POPCORN - Colonizing twice as fast isn't necessarily a good thing. If the mycelium is starving, it will search for food. Since the vermiculite is inert, it won't find it. We see the same thing when people use popcorn for spawn. The jars colonize twice as fast as rye, but have only half or less as much mycelium per jar. There is no advantage.

PSILO - As we know, when mushrooms grow, they don't grow by cell division. The cells expand as they engorge with water. A small pin has all the cells it will have as a large mushroom. That's why a small fruit has nearly as much actives as a much larger fruit. The larger fruit is engorged with water, thus it's less potent by weight. That's a fact. Five grams of small mushrooms are far more potent than a single five gram fruit. That's also a fact. The picture of fahtsters above is in the pinning stage. Only a few of the caps have started to tear the veils. The picture from 24 hours later is on my video, and they're quite a bit larger. All bs aside, you don't compare the size of fruits from a four to six inch deep substrate to fruits from a half pint cake. This argument will be going on long after we're all dead and buried. I just won't have people trashing teks because they're unable to pull off grows with them. Ask any long-time grower who has used all methods, and most will tell you for large amounts of fruits, go with bulk substrates such as manure or coir. However, most of us aren't into selling mushrooms, and a few cakes are more than enough for personal use. There is no difference in potency between mushrooms from cakes and from bulk substrates, unless one lets the fruits from the bulk substrate get very large, at which time they're considerably weaker. Think of it like a balloon. If you blow it up bigger, you don't increase the amount of rubber in it.

SCLEROTIA - Sclerotia is a much better experience, and the taste doesn't gag you at all. I've found mexicana to be much more like acid than mushrooms. It's a cleaner trip, without the body numbing that makes it hard to move or communicate with cubensis. I've also found sclerotia to be a much more spiritual trip than cubes. In addition, it's shorter lasting, so it's not out of the question to do on a weeknight, when you have to be at work the next day. They're my favorite, along with ps cyans. I use rye berries, but they're simple as pie to clean up. Simply take a stone in your hands and rub the grains off with your fingers. The texture is similar to nuts, and the mushroom taste is mild and not unpleasant at all.

SPEACH - You want your grain master to be fully colonized, then bang it a few times against a fully inflated tire to separate the kernels. With the kernels separated, you can carefully pour the loosened grains from the

master to the receiving jar. Be sure your receiving jars have been prepared no more than 2/3 full, so that you can pour a tablespoon or two worth of grains from the master without overfilling the receiving jar. No jar should be filled more than 3/4 full after the g2g transfer, because you need room to shake it later.
Hopefully, you have a flow hood, but whether you're using a flowhood or glove box, try to get the transfer done within just a few seconds to limit the amount of time the lid is off each receiving jar. With time and practice you'll develop a technique where you twist the master jar as you pour so the grains will flow out smoothly.
Don't be distracted by the pictures of Paul doing g2g with bare hands. I cringe everytime I see those. Wear latex gloves and wipe them down with alcohol after putting them on. Also, wipe down the exterior of the master and receiving jars with alcohol before the transfer to limit the chances of contaminants from the exterior finding a way inside.

SPIDERS - Don't kill the spiders. They eat fungus gnats that WILL cause you problems. A grow chamber need not be sealed up, nor sterile. You want air exchange to prevent trich and cobweb, so naturally the gnats will get in, and so will the spiders. Spiders are our friends.

STORING REFRIGERATOR - Often, a grower puts a tray in the refrigerator, and a few days later gets pins. Thus, the connection is made that the drop in temperatures caused the pinning. It makes sense right? However, what if he had a tray that he exposed to a ten degree temperature rise and a few days later he got pins? Could he not make the same case that the increase in temperature caused the pinning? In fact, this is what happens in nature. A summer rain(thunderstorm) comes, which 'dunks' the substrate, and then when the sun comes out, the mushrooms pop up very fast, often in 80's and 90's degree temperature. One could make a very good case that in nature, it's the increase in temperature that stimulates the pinset. It's a survival mechanism. They need to spread spores before the mycelium dries out again. I've done both of the above scenarios dozens, if not hundreds of times to get to the bottom of this. That's the reason I say what I do that temperature drop does not play a part in the pinning strategy of tropical species. In fact, some of the best pinsets came when fruiting conditions were five degrees or more warmer than colonization temperature. Cold shocking is the signal that fall fruiting mycelium needs to begin producing fruits. Shiitake, P. cyanescens, P. nameko, etc., to name a few require a cold shock to fruit. Cubensis, H. ulmarium, Pan Cyanescens, etc., do not require a cold shock. The above is not to discourage experimenting in any way. However, get your ducks in a row, and have many duplicate projects made exactly the same way, and spawned, colonized, cased, etc., exactly the same way, and then cold shock some, and increase temps on others. Keep controls that fruit in exactly the temperature they colonize in. From my experience, if you do the above, your results will vary. Sometimes the cold shocked tray will fruit sooner, but other times later, often much later. Ditto for the other parameters. This is what has led me to my conclusions. The other pinning triggers of full colonization, increased air exchange, and near 100% humidity far outweigh temperature considerations. Good luck to all. Experimenting is how we learn. I store master slants in the refrigerator for years at a time. I've never had one single invitro mushroom from a tropical species ever form in a slant. Cause and effect can be tricky sometimes. For example, if you get drunk as snot and drive, you're more likely to get in a car accident. However, what if you have a cup of coffee in the morning and then get in an accident while sober? Did the coffee cause the accident, or was it just 'your time'? My experience says a tray that fruits after being put in the refrigerator was about to fruit anyway. The fridge probably delayed it by a day or so in fact. There used to be a mindset that mycelium could compare to weed, where (in the case of weed) changing the photo period would signal a change from vegetative growth to flowering. It was thought that a temp drop would change mycelium from vegetative growth to fruiting. However, after many side-by-side tests, I've personally ruled out such a phenomena, so I pass that info along. Feel free to experiment to either prove or disprove the above. In no way do I consider my experiences the last word on the subject. Mushroom cultivation, especially when compared to crop farming, is in its infancy and we're still learning.

STORAGE MYCOLOGY - Or, spend $99 and buy a dorm type refrigerator brand new, and never put anything but mycology projects and unopened cans/bottles of beer in it.

STIR BARS - Latex tubing can be used over magnetic bars in order to lower the noise of the magnet.

SUGARS - Dextrose and Karo are pretty much the same thing, Glucose.

TEMPERATURE - Water boils at 212F/100C. You can't boil at 300F without a LOT of pressure. It doesn't matter how hot your stove is or how rapidly the water is boiling, it will be at 212F/100C.

TERRA SORB WATER CRYSTALS - Terra-Sorb Terra-Sorb is a "water crystal" made from a synthetic polymer related to super glue. This brand is made from potassium and there are others made from sodium. The crystals can absorb 400 times their weight in water, and then release it slowly back into their surroundings. They have been tested and shown to be non-toxic and environmentally benign. They have been used in mushroom cultivation and shown to not incorporate themselves into the fruit at all. Over time they will just break down to carbon dioxide and water. They drastically reduce the need for misting a casing and in some instances will eliminate the need all together depending on the fruiting chamber. Just looking for anyone's experience first hand with this product. It is not a secret that it works or exists and given it's ability I would think many others before me would have tried it.

THE WAY IN - Mutlispore innoc, day six.
5 squirts, 1 each corner, 1 down center, about 2.5 cc per jar.
agar is GREAT, because you can tell if any culture is contam'ed - or not.
Liquid Culture (LC)is fastest - I ever had.
Matter of fact, once tried LC straight into pasturized compost substrate, supplemented with 25% PC'ed bulk WBS.
Worked GREAT (but, must have very aseptic enviro to incubate in).

TROPICAL SPECIES - It's well known that cold damages tropical species and thus they should never be 'cold shocked'.

BETTER, FASTER, CHEAPER.....TRUE STORY - You cannot get

VOCABULARY - Spawn: Noun form: Grains, brf, etc., fully colonized with mushroom mycelium.
Spawn: Verb form: To mix the above defined colonized grains into a substrate.
Substrate: Manure, compost, coir, coffee grinds, etc. Substrate is the food the mushroom mycelium eats. In the case of brf cakes, the brf is both the spawn and the substrate.
Casing: The non-nutritious, moisture-holding layer we place on top of a substrate as a water reservoir to supply the substrate with the extra moisture it needs to support the developing flush of mushrooms.
Patching: Applying a small amount of casing material over the mycelium that is poking through the casing layer. This allows that mycelium to continue growing, while waiting for more mycelium to reach the surface of the non-patched areas. This results in a more even pinset.

WHAT IS - A pf jar for example is a substrate when fruited directly from the cake. However, a pf jar is spawn when used to inoculate manure or straw, etc.
Rye is a spawn when used to inoculate manure or straw, etc., but is a substrate when cased with peat-verm or verm-coir, although coir is better suited as a substrate than a casing material. If you mix the rye in as an inoculant, it's spawn, but if you lay it in a tray and apply a casing layer over the top of it, the rye becomes the substrate.
A bulk substrate is a large amount of material that supports mushroom growth that you spawn your mycelium into. Bulk substrates can be manure, straw, coir, worm castings, coffee grinds, etc. Grains can spawn to a bulk substrate, or serve as the substrate, but are never considered a 'bulk' substrate.

WHAT IS SPAWN - Spawn as a noun is the grains or other material such as brf cakes that are fully colonized with mushroom mycelium.
Spawn as a verb is the act of placing those fully colonized grains into another uncolonized substrate for the purposes of expanding mycelium mass.
Spawn as an adjective is used to qualify a noun. Thus when used as "the spawned substrate", substrate is the noun and spawned is the adjective form of the word spawn.

HARVESTING

HARVESTING - When harvesting your trying to get good food grade. Fruiting in the low 70's is perfect which benefits by giving better fruit quality. Harvesting your mushrooms should be easy on the casing and gentle. Gentle twist & pull is best. Object is to MINIMIZE casing cover damage. But, getting out clumps of shrooms, often leaves divots. Which you patch. Try not to leave any broken stem. Because that exposed tissue invites contaminates & rot. Better to have a divot in casing, which can be patched. Rather than leave torn stem tissue

exposed. Good practice to pick those big fuckers, they take the uumph out of the rest of the flush. With practice, you'll develop a technique for twisting and pulling the mature fruits off that does very little damage. You can even hold a fork or spoon on the casing layer next to fruits you're picking to help hold the casing in place. Food quality is best just prior to the veil tearing. They just seem to go down easier, without that 'make you puke' horrible taste. When Picking A Flush: Remove the aborts, but leave any healthy looking pins. They'll start growing when you pick the present flush. You pick the fruits as they're ready. There is no reason to pick them all at once. You don't pick pins/primordia because they're required for the next flush. Air Dry! Then Put In Dehydrator They'll shrink a lot and let you put more into the dehydrator.

HARVESTING - Food quality is important. If you gag on every bite, then sit during your come-up time trying not to puke, it's no fun. There is no increase in the number of cells in a mushroom after the veil tears, therefore no new active compounds are made. The cells that are already there simply fill up with water. That means the actives that are in a freshly opened cap are the same actives that are in a huge, umbrella shaped, black spore covered cap, but you have to eat more to get them. When we say there is little to no loss of potency, that's what we mean. None was lost, but none was gained either. Only mass was gained, thus you gag more for the same amount. That's what I mean by poor food quality. As for developing allergies, mine have all come in the last few years as I've researched many species. I often have a few hundred jars and up to several hundred spawn bags going at any one time. This has been my full time job since I've been working on my dvd. I quit my job over a year ago, so I've been exposed to a lot of mushroom spores in that time. All of them legal edibles, by the way. The worst for causing allergic reactions is Hypsizygus ulmarium, but cubensis spores will clog up a humidifier filter in no time, and ruin the motor bushings as well. Cube spores will also foul hygrometers, and if you have a computer in the room with your grow, it will destroy the cooling fans, and if they get into the hard drive, will destroy it as well.

HARVESTING - Removing large chunks of substrate is from carelessness. You can easily back up the substrate with two fingers of one hand while twisting and pulling with the other. If the fruits are very well attached, simply do what the commercial farms do and cut the base off with a knife, then remove the stump later. Cut the stem off right at the substrate level and leave the stump there. Remember, mushroom tissue is mycelium. Anything below the substrate level doesn't need to be removed anyway. The strength of the mushroom/substrate connection is strain related, not casing/no-casing related. I have an isolated strain that the fruits fall over and unhook themselves from the substrate just as the veil tears, whether cased or not. That quality comes in really handy when I'm on an outside job working long hours.

AFTER A FLUSH HARVESTING - After picking a flush, allow the substrate to 'rest' for several days to a week. Let it dry out somewhat during this time. A substrate will not flush again right away. After the 'rest period', give it an overnight soak to bring the moisture content back up and place into fruiting conditions. Dunking right away is counterproductive because the mycelium is dormant for a few days and the dunk only supplies moisture to the contaminant molds that might be present, then it dries out before that moisture is actually needed for the next flush. Never leave a substrate that is flushing without air exchange. It will suffocate and die.

AFTER HARVEST - After harvest, it's a good idea to fill any divots created by picking with fresh casing material. Don't wait for it to colonize, because it rarely will. Don't re-case. Trays can be soaked for a few hours under running water. Just let the faucet fill up the tray and gently run over the sides and down the drain. Use jars of water or rocks to hold the substrate from floating. After four or five hours, most substrates will be re-hydrated. I like to wait up to a week after picking a flush before doing the above. During this rest time, allow the substrate to dry out a bit, and then soak as above and return to fruiting conditions.

DRYING - If you choose to use desiccant, it's best to fan or air dry for a couple of days first. When you use desiccant, be sure to have the desiccant lifted off the floor of the tupperware or other container, so that moisture that drips from the fruits can run through the desiccant to the bottom of the container to collect. This will prevent the premature saturation of your desiccant layer.If the fruits are for use within a few days or so, just leave them in front of a fan until then. Dehydrators and desiccant are mainly for when you wish to package them up for later and need to make sure they're especially dry to prevent molding.

HARVESTING - Pick all the mushroom tissue when you pick a flush. Don't leave pieces behind. You can fill the divots with fresh casing material but don't recase the whole thing because it won't colonize anyway. Your

mycelium has already gone from colonization mode into fruiting mode. I like to let a cased substrate sit for a week after picking to 'rest'. The reason is that they rarely flush right away anyway, so by letting it sit for a few days to a week, then watering heavily or dunking, you get an immediate second flush. If you water it heavily right after picking, it just sits there wet, which can encourage molds.

HARVESTING - Do NOT pick all the pins from the casing layer. Often, pins for the first two or three flushes are set at time of first flush. Picking them ruins future flushes. You can't pick individual fruits from a cluster without using a knife. Simply grab and gently twist the whole cluster, and it will come off as one piece. Be careful that you don't also pull up a large chunk of your casing layer.

HARVESTING - Mushrooms that are picked small and immature will be more potent by weight than they would be if allowed to fully mature, and that's a fact. As the cells engorge with water, there's no evidence that they increase in potency as well. The 'veil tearing' is just a signpost along the way that indicates a good time to pick. It has nothing in and of itself to do with potency.

AFTER FLUSH - After picking a flush, it's a good idea to let the substrate sit idle for a week, and even to allow it to dry out a bit. After a week, soak it for six to twelve hours under water to re-hydrate. We refer to this as 'dunking'. After the soak, place it back into fruiting conditions, and the second flush usually pops fairly quick, provided the substrate has no contamination.

AFTER HARVEST - Nothing is set in stone, it's just something I've observed with lots of species. Most don't flush again for several days anyway, so during the time, let the substrate rest, and then give a soak to rehydrate and set back into fruiting. It more closely simulates natural the environment they evolved in, and helps to send out a stronger flush.

STORING - Cracker dry, then stored in vacuum sealed bags with oxygen absorber and food grade silica gel packets in each one. They'll keep for many years without degradation that way. I recently opened some from 1996, and there was NO degradation that could be detected after ten years of room temperature storage.

CASING AFTER HARVEST - Patching the divots is the right move, but the new casing material will not colonize, so don't wait for it to. After picking, I suggest letting the substrate sit untouched and dry for a week to recover, and then soaking for a few hours to rehydrate, then return to fruiting conditions.

HARVEST - You can pick individual mature fruits from a cluster by cutting them off just above the base with a sharp knife. Don't wiggle or otherwise stress the rest of the cluster. The aborts will sit there just fine until the remainder of the cluster is ready to harvest.

HARVESTING - The most bang for the buck comes from small fruits, prior to veil tearing. Even pins are great, and that's why you hear about aborts being so good. It's not because they aborted, but because they're at peak potency/gram at the pinning stage.

HARVESTING - With practice, you'll develop a technique for twisting and pulling the mature fruits off that does very little damage. You can even hold a fork or spoon on the casing layer next to fruits you're picking to help hold the casing in place.

DRYING FRUITS - I've never used a dehydrator. Lay your fruits on a piece of cardboard and put a large box fan in front of them. When dry, transfer to Tupperware with desiccant for 24 hours to finish up, and then seal in vacuum pac bags.

AFTER HARVEST/CASING - Fill in the divots with fresh casing material. Don't scratch or re-case the whole thing. The mycelium is in fruiting mode so won't colonize any casing material you add now.

HARVESTING - You pick the fruits as they're ready. There is no reason to pick them all at once. You don't pick pins/primordia because they're required for the next flush.

HARVESTING - When Picking A Flush: Remove the aborts, but leave any healthy looking pins. They'll start growing when you pick the present flush.

HARVEST - I prefer to pick just prior to the veil tearing. They just seem to go down easier, without that 'make you puke' horrible taste.

HARVESTING - Air Dry! Then Put In Dehydrator They'll shrink a lot and let you put more into the dehydrator.

HARVESTING - Good practice to pick those big fuckers, they take the uumph out of the rest of the flush.

DONE! I WANT THIS TO DISPUTE ANY BAD CULT ADVICE EVEN THOUGH THEIR ARE SOME MISINFORMATION OF SENTENCES AND OUTDATED INFO SO CHOOSE WISELY. PLEASE NO RATINGS. THIS IS SOMETHING I DID AND TOOK 3 MONTHS IN THE PROCESS.