

BUGS, BEDDING AND THE COMPOSTING BEDDED-PACK BARN

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There has been a lot of interest in the composting bedded-pack barn, and with good reason. They provide a good option for smaller dairies wishing to expand or upgrade their dairy cattle housing as well as for larger herds who feel they need more comfortable special needs housing. It is apparent that when the composting bedded-pack is managed well, the cows are clean, comfortable, have fewer lameness problems and lower SCC, to say nothing about the reduced investment in building and manure storage costs. But like anything else, these apparent benefits are not the result of some magic, but rather consistent and careful management. Let's explore the "secrets" that make a composting bedded-pack successful.

What is a composting bedded-pack?

First, it is not a conventional bedded-pack where bedding (usually shavings, straw or corn stalks) is added periodically as a means of covering a soiled bedding surface. A composting bedded-pack is a deep bedded pack actively going through a rapid decaying composting process.

Experiences to date have shown that fine dusty wood shavings or sawdust is the bedding material of choice. Fine particles facilitate easier handling and mixing, and speed bacterial growth. It has been reported that straw and corn stalks may not work satisfactorily. Therefore, until more study has been done, we would only recommend the use of fine particulate wood shavings or sawdust.

To begin a composting bedded-pack, spread a large amount of wood sawdust or shavings a foot or more deep over the intended loafing area. You should provide 80 square feet per cow and this space should be well-ventilated, preferably a curtain-sided naturally ventilated barn. (See "Composting Bedded-Pack Barns in Minnesota" by Kevin Janni in the September 25th, 2004 issue of Dairy Star). **Once begun, the bedded-pack must be stirred (an adapted cultivator mounted on a skid steer works well) to the depth of 10-12 inches a minimum of two times every day. This is THE key management step.** Stirring the pack removes manure and urine from the surface and aerates the pack providing oxygen to speed microbial degradation of the pack. Fresh bedding is added every 18-40 days depending on the weather and the condition of the bedded surface. Generally hot and humid or wet weather requires more frequent application of fresh bedding. Producers using these barns say that when they see surface bedding sticking to the cows' legs or udders, it is time to apply fresh bedding.

What do we know about composting?

Composting is a natural biological process, carried out under aerobic conditions (requires oxygen). In this process, various microorganisms, including bacteria and fungi, break down organic matter into simpler substances. The effectiveness of the composting process is dependent upon the environmental conditions present within the composting

bedded pack (i.e. oxygen, temperature, moisture, amount organic matter, and the size and activity of microbial populations).

The essential elements required by the composting microorganisms are carbon, nitrogen, oxygen and moisture. If any of these elements are lacking, or if they are not provided in the proper proportion, the microorganisms will not flourish and will not provide adequate heat.

What effect does composting have on pathogens?

At present, there is no detailed research on the effect of composting on mastitis pathogens. Obviously we need to research this question. However, other studies do indicate that optimum composting conditions will have a detrimental effect on most pathogens. Therefore, we suspect that this is also true for mastitis pathogens.

Achieving high temperatures within the pack is important to killing pathogens and keeping the pack surface dry. Temperature is directly proportional to the biological activity within the composting bedded-pack. As the metabolic rate of the microbes accelerate, the temperature within the bedded-pack increases. Conversely, as the metabolic rate of the microbes decreases, the bedded-pack temperature decreases. Maintaining a temperature of 130°F or more for 3 to 4 days favors the destruction of weed seeds, fly larvae and pathogens. A composting process that operates at optimum performance will convert organic matter into stable compost that is odor and pathogen free, and a poor breeding substrate for flies and other insects. In addition, it will significantly reduce the volume and weight of organic waste as the composting process converts much of the biodegradable component to gaseous carbon dioxide.

If the bedded-pack is not aerated, it will become anaerobic causing the decomposition rate to significantly slow down and microflora to begin growing. Anaerobic decomposition does not reach the temperature necessary to kill pathogens and may also create unpleasant odors.

Bottom Line: Based on what we know today.

- **Bedding type** – Fine dusty sawdust is best. This is a contradiction to our advice given about freestall bedding management. We do not recommend fine dusty sawdust for freestalls because bacteria grow much faster thus increasing teat exposure. But remember, the freestall bedding is only mattress surface cover and is replaced daily. However, in the composting bedded-pack the goal is just the opposite, to create fast growth that increases temperatures sufficient to inactivate the pathogens. So far, experience has shown that other bedding types (straw or corn stalks) do not to work very well.
- **Aeration** – Stirring 2 times a day @ 10-12" depth is a MUST. This not only removes manure and urine from the bedding surface, it incorporates oxygen into the pack allowing a faster aerobic decomposition important to optimizing the composting process.
- **Ventilation** – To remove heat and maintain a dry bedding surface excellent ventilation is another MUST. Drying at the bedded surface will retard bacterial growth and keep cows cleaner since dry bedding does not stick to teat or leg surfaces.

- **Excellent cow prep** – Herds that are using the composting bedded-pack successfully have excellent pre-milking cow prep. This has been confirmed by low numbers of environmental pathogens in bulk tank culture results on these farms. It is good to always remember whatever bacteria is not removed from the teat surface prior to milking machine attachment not only will end up in the bulk tank milk but also runs the risk of being introduced into the teats when air slips (squeaking and squawking) occurs during milking; thus, establishing a new infection.

Compost barns and their management will be discussed in detail as part of the Minnesota Dairy Days programs in January 2005. Watch for the Minnesota Dairy Days information coming soon.

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