

# Efficacy of drySTART™ in reducing bacteria colonies and ammonia concentration in a dairy farm

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# Introduction:

The efficacy of drySTART in reducing bacteria counts in pig barns has been shown in different trials. Hurnik (2007) found 3 times significant reduction in bacteria counts in pig barn after using 300g/m<sup>2</sup> drySTART. Rosca (2007) also found significant reduction in germs in pig barns after treatment with 100g/m<sup>2</sup> drySTART. Mastitis is generally considered to be the second most economically important health problem in dairy herds after fertility. About 97% of all mastitis cases are "subclinical". While these cases do not involve visible changes to the quarter or the milk produced, they do result in lower milk production and an increased somatic cell count. Studies comparing housing systems tend to show slightly lower mastitis incidence in free stalls than in tie stalls or loose housing. Regardless of the system used, general cleanliness of the environment is a major factor in determining overall exposure to mastitis organisms<sup>1</sup>.

Both tie stalls and free stalls require regular attention and a proper bedding material to maintain a dry and clean udder. The perfect bedding material has yet to be discovered. Bedding with sand has been proven to be effective because bacteria don't grow as quickly as in organic bedding materials. The main disadvantage is that sand is extremely difficult to handle in most manure systems. Green, hard wood sawdust increases the incidence of mastitis caused by Klebsiella, a coliform organism. Adding lime to sawdust has not proven to be beneficial in reducing mastitis. Straw tends to harbor Strep bacteria when it becomes damp. With all bedding materials, controlling moisture in wet, soiled material is the key to controlling growth of bacteria in the bedding and to reducing mastitis infection.

A drySTART trial was conducted to test the efficacy of drySTART in reducing bacteria counts in a free stall dairy farm.

A laboratory trial demonstrated the efficacy of drySTART in reducing ammonia emission when it was added to an ammonia aqueous solution. Rosca and Diaz (2008) found a linear response, from 58 to 95%, in reduction of ammonia by using four 10 ml aliquots of 4% ammonia solution mixed with 1.0, 1.5, 2.0, 2.5 grams of drySTART in closed recipients. Ammonia volatilization from manure occurs at the surface of the liquid and air, and is a function of ammonia concentration in the slurry and surface area. To reduce ammonia emission from animal housing, frequent and complete removal of manure is effective<sup>2</sup>. Moreira found scraping had no effect on ammonia volatilization during the winter trial. An average of 17.7% of excreted ammonia was volatilized during the winter, equivalent to 265 and 248 g of ammonia lost/day/cow.<sup>3</sup> Scraping frequency of manure had little or no effect on ammonia loss from manure in a freestall barn. Nitrogen loss during the winter was less than half of the loss during the summer.

Aerial ammonia represents a significant hazard to workers in intensive livestock units. In the UK exposure of workers to ammonia is not supposed to exceed levels of 25-35 ppm for more than 10 minutes. When the level of ammonia exceeds 35 ppm, the worker is not allowed to be working in the building without a respirator<sup>4</sup>.

A trial was conducted at the beginning of March 2008, to test the capacity of drySTART to reduce ammonia in a dairy farm.

## Material and methods:

### Bacterial testing

Two areas of 450 m<sup>2</sup> (4844 square feet) and 270 m<sup>2</sup> (2906 square feet) were scraped from the old bedding, swapped and prepared for the new bedding ( fine wood shavings). Before the new bedding application, five 10 cm<sup>2</sup> spots were swabbed and swabs passed on plates with media culture of Columbia Blood agar with 5% sheep blood. Plates were incubated under a heat bulb at 35-37°C for 24 hours and picture of plates were taken.

After swabbing, both areas were treated with drySTART at 150 grams/m<sup>2</sup> by using a leaf blower. Then, both surfaces were covered with a layer of 15-20 cm of fine wood shaving.

24 Hours later, the same spots were swabbed again and plates were inseminated and incubated in the same manner as above mentioned. Pictures were taken and compared with the first ones.

### Ammonia testing

The ammonia test was conducted gradually: at the time of bedding removing , one day after drySTART treatment, and one week later. For this test strips of pHydriion Ammonia meter were used. Test strips are to determine ppm of ammonia in the air. We tear off a 1 inch strip of paper, wet it with one or two drops of distilled water, shake off excess water and expose the strips for 15 seconds in air being tested at the head level. Strips were compared with color chart. All results were recorded, compared and pictures were taken.

# Results and Discussion:

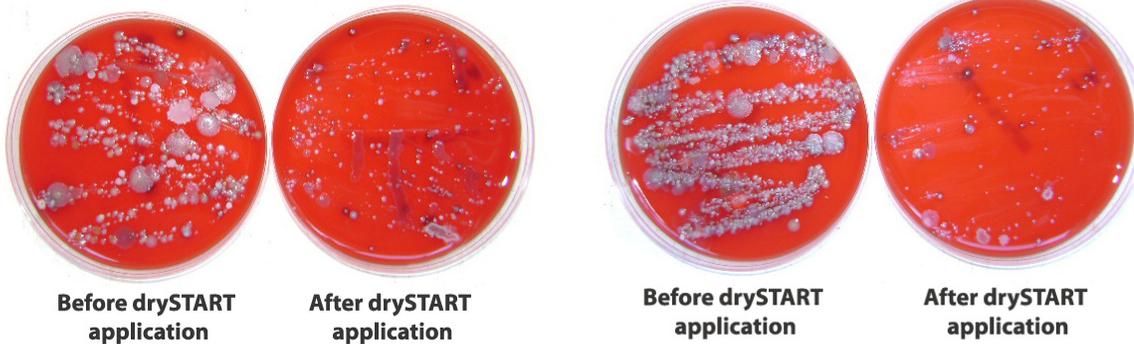
Using a leaf blower to apply drySTART was a good method of application. The whole surface was uniformly covered and the entire application took approximately 15 minutes to complete.



## Bacterial testing

Plates incubated before drySTART application had heavy growth colonies and we weren't able to count them. Pictures were taken instead to compare later with the other plates.

Plates incubated after applying drySTART were visibly lower in colonies. We compared plates by visual inspection and pictures taken. There was a significant difference between the plates. We should consider the fact that none of the surfaces were washed and disinfected. The bacterial load can not be significantly reduced if you only scrape and sweep the old bedding material. By using drySTART as a desiccant agent we were able to reduce bacterial colonies less than 24 hours after application.



## Ammonia testing

First ammonia test was done before drySTART was applied. Strips were compared with the color scale and read between 20 and 50 ppm.



Second test was done 24 hours later. There was a significant reduction in ammonia emission in the barn. The scale read between 0 and 5 ppm.



One week later we did the third ammonia test and the results were remarkable. A 5 ppm was the level of ammonia emission.



# Conclusions:

With the bacterial testing we were able to reduce significantly the bacterial load of the surfaces treated with drySTART, a desiccant product. Further study has to be done to demonstrate reduction of specific bacterial colonies involved in producing environmental mastitis or other diseases for which responsible pathogens are harbored in the bedding materials.

The ammonia test has demonstrated ammonia emission reduction similar with the in vitro ammonia test. As we mentioned in the introduction, not very much ammonia reduction can be done in the winter time as Moreira demonstrated in his study. Our study was able to demonstrate the opposite which makes drySTART a possible future product that will help in achieving and maintaining a reasonable ammonia level. Further testing has to be done to find out how long drySTART is active in maintaining a low level of ammonia in the barns.

Air emission from dairy systems is an area of active research. The “Rules for the Control the Ammonia from Dairy Farms” requires dairy farms that may emit more than 100 tons of ammonia per year from their facility to obtain a Permit by Rule. Dairymen will have to develop an annual plan that will account for at least 27 points of BPM (Best management Practices) implementation. Five points can be awarded if surface amendments are used on free stall scrape which could be liquid and dry chemical products that will bind or chemically target the conversion of urea to ammonia gas<sup>5</sup>. drySTART qualifies as a dry product under this scenario and may help in attaining BPM status. drySTART is a desiccant product developed to be used where there are damp and dirty floors, by helping to dry the environment and reduce the unpleasant ammonia odors in livestock bedding.

## References

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