Multi-Species Research Summary

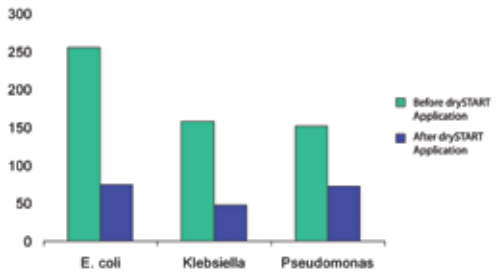
Bacteria Reduction - Swine Application

Research conducted at Atlantic Swine Research Center demonstrated the benefits of using drySTART in pig facilities. This study showed the antibacterial nature of drySTART by reducing the amount of germs by 3 times.

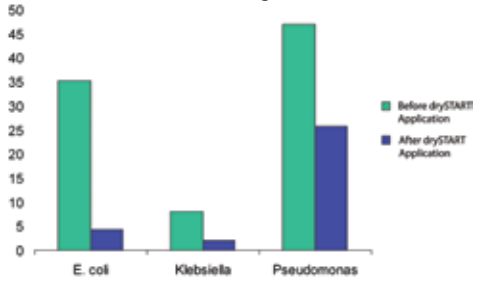
In order to determine how applicable the study by Dr. Hurnik would be on Ontario swine farms, three more studies were conducted using drySTART. Two of the studies included two types of farrowing rooms: one, a continuous flow and the other an all in all out system. The third trial was conducted in a research nursery.

The application methods used included a flour sifter or a leaf blower, depending on the type of the room. Twenty four hours after the initial samples were taken the same spots were swabbed and the plates incubated using the same method. Visual recording of total number of colonies was conducted and the results were compared.

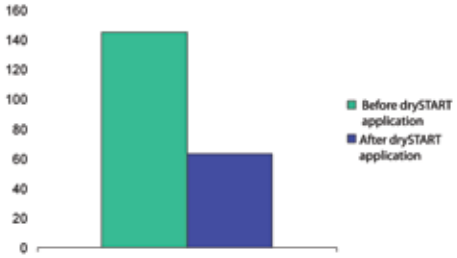
Trial # 1: Continuous flow Farrowing room (Average Bacterial Colonies)



Trial # 2: All in All out Farrowing room (Average Bacterial Colonies)



Trial # 3: Kenpal Research Nursery (Average Bacterial Colonies)



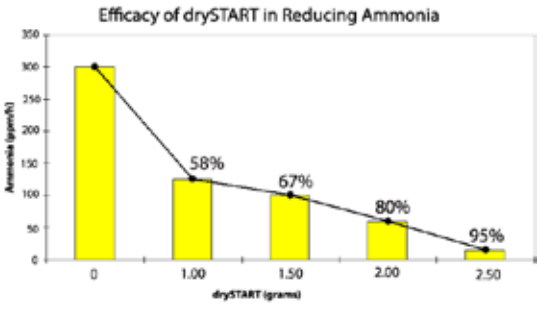
The Results:

Location	Reduction in Bacterial Colonies
Continuous FlowFarrowing Room	68%
All In All Out Farrowing Room	64%
Kenpal Research Nursery	57%

Ammonia Reduction - Swine Application

Physical characteristics of drySTART make it a good candidate to be used in reducing ammonia concentrations in closed environments. An in vitro trial was conducted to test the efficacy of drySTART in reducing ammonia concentrations.

Adding 1 g drySTART reduced ammonia emission by 58%, 1.5 g drySTART reduced ammonia emission by 67%, 2 g drySTART reduced ammonia emission by 80%, and 2.5 g drySTART reduced ammonia emission by 95%. These results clearly show that drySTART could reduce ammonia emissions in a closed atmosphere.



Bacteria Reduction - Dairy Application

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[1].

Both tie stalls and free stalls require regular attention and a proper bedding material to maintain a dry and clean udder. 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.

Free stall barn after drySTART application.

There was a significant reduction in the bacterial load of the surfaces treated with drySTART. 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.

Ammonia Reduction - Dairy Application

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.

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[4].

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

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

The 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 a third ammonia test was done and the results were remarkable. Even after one week the level of ammonia emission was still at a 5 ppm level.

The ammonia test has demonstrated ammonia emission reduction similar with the in vitro swine 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.

Bacteria Reduction - Poultry Application

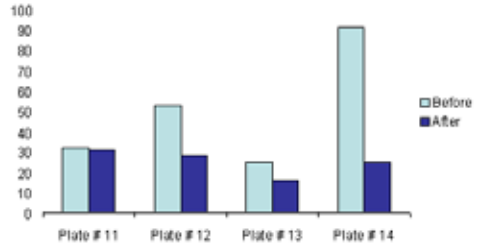
Overall, chickens in the treated barn performed better in all parameters studied. There was 3,310 kg more live weight of chickens shipped from the treated barn, there were 218 less birds lost, which corresponds to a 1.97% reduction of mortality (Table 1).

Although the data in Table 1 may demonstrate improved performance in the treated barn vs. the control barn, further, more controlled, research needs to be completed to validate these results.

Table 1

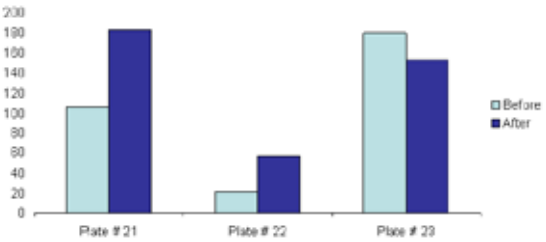
Parameters	drySTART Treated Barn	Control Barn
Weight shipped	40,970	37,660
Birds lost	1,006	1,224
Mortality	9.06%	11.03%
Average bird weight	4.061 kg	3.816 kg
Average daily gain	76.63	71.99
Margin/bird	$2.17	$1.86
Feed conversion	2.065	2.254
Feed cost/gain	$0.72	$0.75

Poultry Barn - Bacterial Colonies Barn #1



Bacterial colonies were reduced by 50.25 % after drySTART application

Poultry Barn - Bacterial Colonies Barn #2



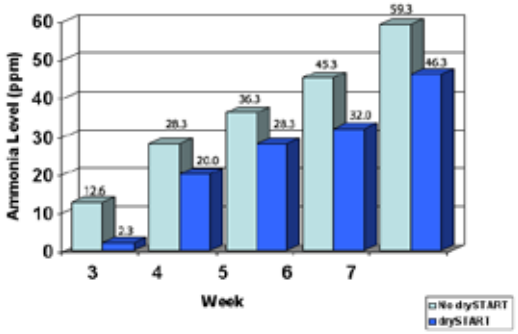
In the untreated barn bacterial colonies increased by 27.69 % on the second day of testing

Bacterial counts were reduced through the application of drySTART. It may also be logical to conclude that any reductions in bacterial counts may contribute to help improve productivity, but further research needs to be completed to validate this.

Ammonia Reduction - Poultry Application

Ammonia emissions from litter during broiler production can be a major stressor that will result in reduced economic performance, increased susceptibility to diseases, and increased mortality. To be competitive by maintaining production levels and healthy birds, one of the requirements is good air quality. The primary role of the ventilation and heating system is to obtain acceptable levels of moisture, gas, dust and odors. During the cold season, the ventilation system is insufficient to maintain ideal indoor air quality condition[1] . Birds exposed to high level of ammonia have a decreased ability to positively respond to a disease challenge[2]. Generally, it is recommended to maintain the ammonia levels in poultry barns at less than 25 ppm (parts per million) but the ammonia concentration in commercial broiler barns commonly exceeds 50 ppm.

Poultry barn ammonia measurements (Figure 1)



Measurement at 3 weeks after treatment

No Treatment drySTART Treated

81.7% lower ammonia in drySTART treated barn

Weeks in the barn	No drySTART used (Mean)	drySTART treatment (Mean)	Ammonia Reduction
Week 3	12.6 ppm	2.3 ppm	81.70%
Week 4	28.3 ppm	20 ppm	29.30%
Week 5	36.3 ppm	28.3 ppm	22.03%
Week 6	45.3 ppm	32 ppm	29.35%
Week 7	59.3 ppm	46.3 ppm	21.92%

Bacteria Reduction - Livestock Transportation Application

Transportation of breeding animals, slaughter of feeder pigs, poultry or beef is one high-risk activity for potential introduction of diseases in the herds. Ensuring cleanliness and good hygiene during transportation is one of the most important steps when delivering livestock. Trailers and load-outs should be dry before next use. Ideally, trailers should sit overnight before being used for the next load.

Drying continues to be a major problem in the biosecurity chain because it is time consuming. Usually, operators leave washed trucks to dry for one night or sometimes for three days before loading the next group of animals. Under extreme conditions such as cold weather or wet seasons, extended time for dryness is expensive.

Livestock transportation trucks before (left) and after (middle and right) drySTART application. By simply using drySTART, the surfaces were covered entirely including corners and other wet spots where most pathogens like to thrive.

There was a significant reduction in bacterial colonies two hours after the application of drySTART. A gradual decrease in bacterial colonies was observed on the plates incubated two, three, or four hours after drySTART treatment. Because the bacterial colonies on the plates inseminated right after washing were too many to be counted we weren't able to compare the number of colonies on the plates incubated before and after the application of drySTART, but the picture (right) shows a visual difference when the plates are compared.

The results obtained in this study are important, as they show it is possible that drySTART helps in drying surfaces and in reducing bacterial contamination of full-size pig trailers under practical constraints.

Before drySTART Treatment

After drySTART Treatment