

Biosecurity at the barn entrance – a critical control point

Biosecurity measures are in place to protect poultry flocks from transmissible infections – but how effective are they really? Researchers in Quebec and Ontario led teams in a two-part research study. Their aim was to evaluate biosecurity measures in lab and field conditions – including the contamination occurring when procedures are not followed properly, and the real impact of a good clean. Now, they're using their data to create training materials to share what they learned about sanitation and the risk of contamination at the entrance of barns.

Having biosecurity protocols may not be enough

Several years ago, Jean-Pierre Vaillancourt, professor, Research Group on the Epidemiology of Zoonoses and Public Health at the University of Montreal, led a research team that filmed nearly 3,000 barn entries and exits at 24 farms in Quebec. The analysis of the collected footage revealed an estimated biosecurity compliance of approximately 35 to 37%.

"In Canada we have only two biosecurity requirements coast-to-coast: We are supposed to change our boots when we enter a poultry barn and sign a logbook," says Vaillancourt. "We discovered half the time people didn't know how to properly change boots to go from one zone to the next, and only a third of barn entries got recorded in a logbook."

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In reviewing footage for boot-changing compliance, the researchers identified three basic types of errors. Some people didn't change boots at all. Others did change their boots but didn't change them as they transitioned from one zone to the next. For example, they would take plastic boots, put them over their shoes, and step where they had

been standing before. And the third error occurred when others managed to move into the zone that is considered clean and then change their boots, which in the process contaminated the "clean" zone with the boots they were wearing when they came from outside.



Jean-Pierre Vaillancourt

What's the impact of contamination?

"I wanted to work with real pathogens to see how they spread, and we were able to modify an *E. coli* so it could produce bioluminescence," says Vaillancourt. "We did a series of experiments and came up with images showing that when a site is contaminated with contaminated boots, a person can contaminate at least 10 metres into the room."

The power of a good clean

For the second part of the project, Ontario researchers set out to investigate how pathogen loads are affected by current barn sanitation procedures recommended by the poultry industry. A research team from the University of Guelph led by Dr. Michele Guerin, associate professor, Department of Population Medicine, tested for the presence or concentration of three pathogens in Ontario broiler chicken barns, before and after a clean-out.

"We were interested in learning how regular sanitation practices on farms impact the presence or absence of *Salmonella* and *Clostridium perfringens*, and the concentration of *E. coli*," says Guerin.

Some producers did a 'dry clean' (cleaning without water). Others did a dry clean followed by a 'wet clean,' which usually includes water and some form of detergent. And others did a full disinfection that includes dry cleaning and wet cleaning followed by application of a disinfecting agent. Guerin notes producers were encouraged to do whatever they normally did, and complete a short questionnaire about their cleaning practices and production schedule.

Her team visited 36 farms three times. The first visit came after the litter had been removed from the barn but before any cleaning had been done (pre-sanitation), serving as the baseline. Her team returned two days and six days after clean-out to test for the presence or concentration of the three pathogens (post-sanitation), swabbing four different areas per floor per visit. They submitted the swabs to the Animal Health Laboratory at the University of Guelph.

“With all three pathogens, we found the presence or concentration was lower in the post-sanitation samples compared to the pre-sanitation, or baseline samples,” says Guerin. “Statistically, there were no differences between the two- and six-day post-sanitation samples.”

Worth noting, Guerin says that the presence of *C. perfringens*, the causative agent of necrotic enteritis, was higher among disinfected barns than dry-cleaned barns. She says it's a good reminder for producers to discuss the disease challenges they have in their flocks with their veterinarian.

For all three pathogens, the presence or concentration was higher on wooden floors than concrete floors. It's a point worth considering when it comes to new builds, says Guerin.

“In Canada our buildings are mainly made of wood, with cement floors. When you do a good washing and cleaning, you will reduce contamination, but wood is not as easy to decontaminate,” Vaillancourt says.

The presence of *C. perfringens* – the causative agent of necrotic enteritis – was higher among disinfected barns than dry-cleaned barns.

Barn entrance design matters

Vaillancourt's team is also developing recommendations for designing barn entrances that allow workers to easily wash and disinfect. That includes having the proper drain – ideally two, if there are two zones. Access to water is important too, and access to warm water is ideal – not just for cleaning purposes, but to eliminate human error as well.

New tech may reinforce good habits

Today, Vaillancourt's work takes him to locations outside of Canada, including France, Italy, Senegal, Côte-d'Ivoire and Ethiopia. He is collaborating and learning about new ways to provide dramatic feedback for people who don't follow procedures.

In one project, he is continuing to work with Dr. Manon Racicot, in the Department of Pathology and Microbiology at the University of Montreal, who he collaborated with on earlier biosecurity research. They are adapting technology used in hospitals in France to alert users when something isn't right. The researchers obtained consent from seven farm workers to put microchips inside their farm boots, and connected the system to hand sanitizer dispensers. If a worker crosses a zone and the sanitizer is not activated, the system signals an alarm. It also detects when the boots are on the wrong side of the line.

Training should review the basics

In Canada, many provinces have biosecurity training programs, but there has been little assessment of how effective they are. For the next phase of research, Vaillancourt's team has reviewed biosecurity training materials available across Canada and internationally, and he has identified some gaps. They are developing training material regarding the risk of contamination at the entrance of barns, but more tests are required – that work will take place in 2020.

“We are trying to get people to wash their hands, change their boots and put on coveralls. If people would actually do that correctly, we would see a dramatic reduction in disease outbreaks of many kinds all over the world,” Vaillancourt says.

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