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Evaluation of Biosecurity Measures on a Commercial Swine Operation Using Glo Germ Powder as a Visible Learning Aid

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Summary

Glo germ, a fluorescent powder, was used to determine the efficacy of common biosecurity practices to prevent the powder from spreading to other areas within a commercial swine farm. The areas tested included an entry bench, the shower where all incoming personnel are required to shower upon farm entry and exit, the clean area following the shower, and inside the barn, which acted as the control with no biosecurity procedures in place given it is fully contained within the broader biosecurity measures of the facility. Pictures, from a standard iPhone, were taken before and after student and personnel movement to observe any differences in Glo Germ coverage. The percentage of Glo Germ coverage in the before and after pictures was evaluated once by 47 untrained panelists and averaged for each location and time point. The control area with no biosecurity measures in the barn had significantly more Glo Germ coverage than the other three locations ($P < 0.0001$). There was no evidence of a difference in Glo Germ coverage between the entry bench, shower floor, or clean side of shower ($P > 0.05$). In conclusion, the use of Glo Germ was successfully able to emulate disease entry into the farm and can be used as a learning aid to demonstrate the efficacy of entry benches, clean/dirty lines, and showers.

Introduction

Farm biosecurity is an integral part in maintaining optimal health status of swine. Proper use of entry benches, clean/dirty lines, and showers can reduce the risk of pathogen introduction into swine farms. Farms with higher biosecurity scores were found to have higher numbers of pigs weaned per sow per year and decreased preweaning mortality compared to those farms with lower biosecurity scores.[3] Unfortunately, the positive effects of farm biosecurity are difficult to visualize and the diligence of employees to maintain the biosecurity standards may wane, especially during periods of high health. Teaching aids can be used to demonstrate pathogen entry and

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[3] Sasaki Y., A. Furutani, T. Furuichi, Y. Hayakawa, S. Ishizeki, R. Kano, F. Koike, M. Miyashita, Y. Mizukami, Y. Watanabe, S. Otake. 2020. Development of a biosecurity assessment tool and the assessment of biosecurity levels by this tool on Japanese commercial swine farms. Prev. Vet. Med. 175:104848. doi:10.1016/j.prevetmed.2019.104848.

flow into a farm without risking the health of the herd. Glo Germ[4] is an inexpensive, fluorescent powder which can be used as a visual aid to track the movements of individuals throughout a system. Previous research has used Glo Germ to demonstrate poultry producers' ability to wash hands, scrub boots in a boot bath, and doff coveralls, which revealed any potential gaps in their current hygiene practices.[5] The objective of this study was to use Glo Germ in different areas of the Kansas State University Swine Teaching and Research Center (KSTRC) to evaluate the efficacy of biosecurity measures to prevent the spread of Glo Germ.

Materials and Methods

The Kansas State University Institutional Review Board approved the protocol used in this experiment. The study was conducted concurrently with the spring 2021 Swine Undergraduate Research class (UGR).

Four different locations at the KSTRC were photographed weekly for 7 weeks to provide an assessment of the efficacy of the biosecurity measures to prevent movement of the Glo Germ powder. All pictures were taken on a standard iPhone mounted onto a PVC frame with attached blacklights which could be transported to each location. These locations were 1) the clean side of the entry bench, 2) the flooring within the shower, 3) the clean side of the locker room after completing the required shower, and 4) within the barn (control – no biosecurity measure). Glo Germ was spread in areas preceding the clean areas such as outside the entry door, the dirty side of the locker room, and the feed room used in the barn. The clean areas were cleared of any remaining Glo Germ from the prior week in the evening before the UGR's weigh day (the heaviest traffic day) and pictures were taken of these areas to serve as "before" pictures. Following student movement, "after" pictures were taken of the same areas. These before and after pictures were blindly evaluated by 47 untrained panelists to determine the amount of Glo Germ coverage visible within each picture; each picture was assessed once per panelist (n = 47). The differences between the before and after pictures were averaged across all the panelists. These average differences would represent the increased amount of Glo Germ visible between the before and after pictures.

Statistical analysis

Data were analyzed using a linear model fit using the GLIMMIX procedure of SAS, v. 9.4 (SAS Institute Inc., Cary, NC). Location on a given day was the experimental unit, and data were analyzed as the average change in panelist-assigned Glo Germ coverage between the before and after traffic images at each location on each day of evaluation. Location was considered a fixed effect in the statistical model. Least squares means are reported using a Tukey multiple comparison adjustment.

Results and Discussion

The control location had a significantly increased Glo Germ coverage compared to the three other locations ($P < 0.0001$). On average the three locations with biosecurity measures in place did not have an increased Glo Germ coverage greater than 1% following movement of students through the three locations. The average difference in

[4] Glo Germ Company, Moab, UT.

[5] Julien D., S. Thomson. 2011. Interactive methods to educate and engage poultry producers on the importance of practicing on-farm biosecurity. J. Agric. Ext. Rural. Dev. 3:137-140.

Glo Germ coverage of the control, however, was 19.5% across the 7 weeks (Figure 1). There was no evidence of a difference in Glo Germ coverage between the entry bench, shower floor, or clean side of shower ($P > 0.05$).

Visual evidence of a biosecurity breach was evident during week 2 of this experiment. Figure 2a is a picture of the floor of the clean side of the locker room prior to any student and personnel movement. Figure 2b is a picture of the same area after student and personnel movement. The increased amount of Glo Germ visible is evidence of someone walking through the Glo Germ on the dirty side of the shower, stepping through the shower without washing, and immediately stepping onto the clean side of the locker room. In contrast, Figure 2c shows the same location from week 3 with no visible Glo Germ after all student and personnel successfully showered through and stopped the spread of Glo Germ.

In conclusion, using entry benches and showers helped to stop the spread of Glo Germ throughout the office of the farm, but not using biosecurity measures allowed the Glo Germ to be tracked throughout the barns. The use of Glo Germ is an effective and easy way to demonstrate the efficacy of practical biosecurity measures when used as a visual learning aid.

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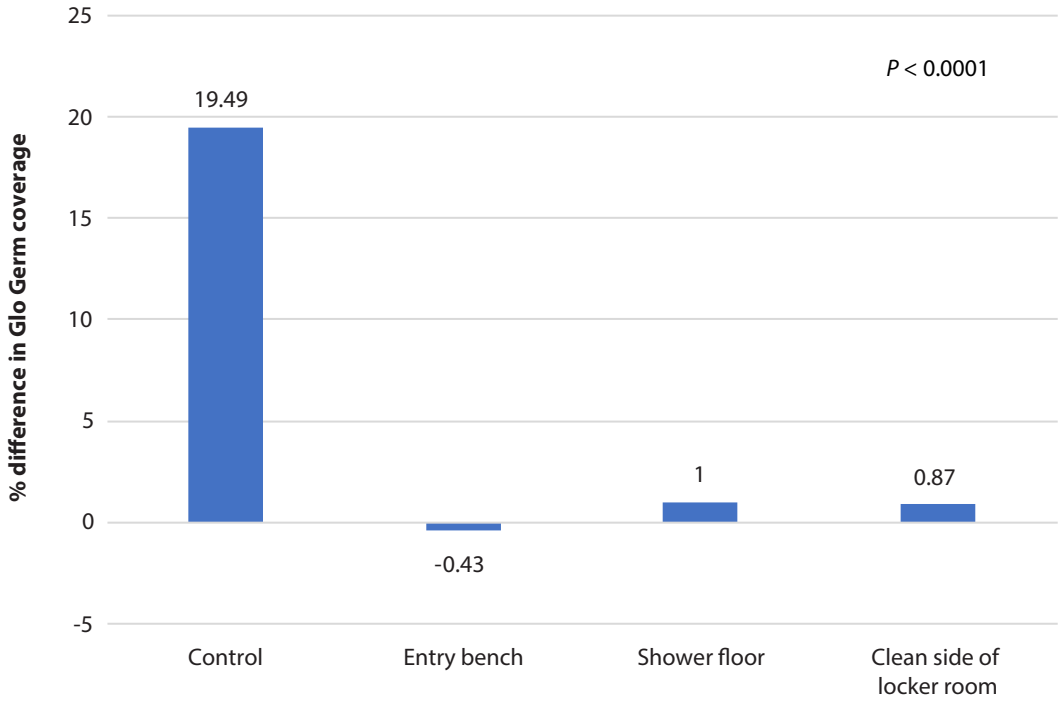

Figure 1. The percent difference in Glo Germ coverage after increased people traffic through a control area with no biosecurity measures, compared to three locations utilizing biosecurity measures. Means with differing superscripts differ significantly ($P < 0.05$).

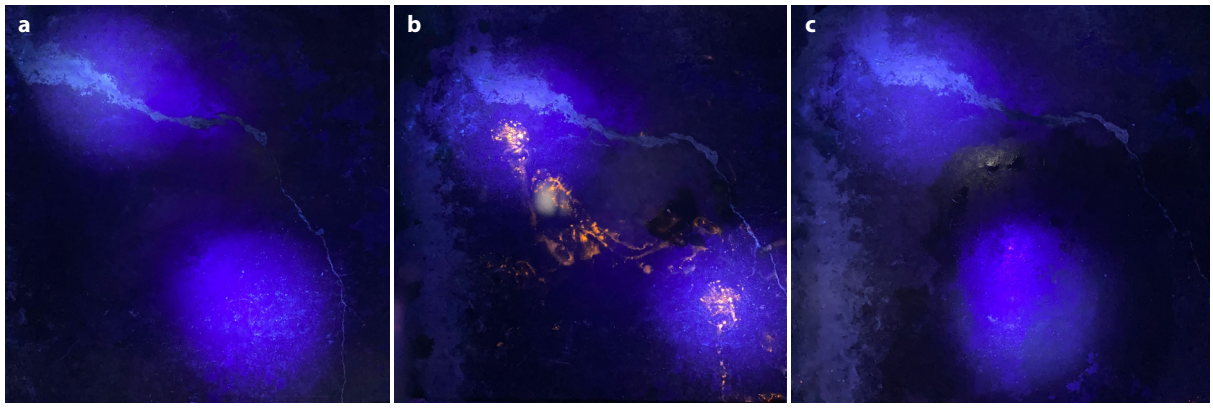

Figure 2a. Clean side of the locker room before student and personnel movement in week 2.
2b. Clean side of the locker room after student and personnel movement in week 2.
2c. Clean side of the locker room after student and personnel movement in week 3.