



Occupational Hazards in Pork Production Associated with Production Practices



PROJECT PERSONNEL

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MAJOR FINDINGS AND OUTCOMES OF THE PROJECT:

- ✓ Ammonia, respirable dust, and respirable endotoxin concentrations were **significantly higher on average** in the pen room, while Carbon dioxide was higher in the stall room.
- ✓ All the biogases being studied, ammonia, hydrogen sulfide, and carbon dioxide, were **below recommended** levels. Respirable dust concentrations were also below the recommended limits.
- ✓ Respirable endotoxin levels (a toxin released from bacterial cell walls which can cause disease) **exceeded** the Dutch Expert Committee on Occupational Standards proposed exposure limits from late autumn and to early spring.
- ✓ Respirable endotoxin concentrations were **5 times greater** in the wet feed room vs. the dry feed room, resulting in the hazard index being 3 times as high in the wet feed room vs. the dry feed room.
- ✓ Researchers estimated the risk posed by multiple exposures through a hazard index. The hazard index was **50% higher** in the pen room compared to the stall room.
- ✓ Hydrogen sulfide concentration was **2.39 times higher** during power-washing (0.55 ppm compared to 0.23 ppm for control samples).
- ✓ The **3,156 injuries** evaluated resulted in almost **32,000 total** days of lost work and cost over 12.7 million dollars
- ✓ Animal interaction injuries, needlestick injuries, and knee injuries represented **37.5, 5.2, and 10.4 percent** of the total injuries.
- ✓ These findings and resulting recommendations were shared with the National Pork Board to inform practices in swine production facilities that support the safety of workers and animals.



PROJECT BACKGROUND

Occupational hazards will always be a concern for those working in agriculture. As farms continue to change and evolve, it's important to understand the risks and costs to both employees and producers in these environments. This study was designed to look at air quality and injury risks across different types of swine production facilities. With the knowledge gained from identifying specific risks and the costs associated with them, changes can be made at the farm level to improve both the safety of workers and animals.

The study was designed to accomplish the following objectives:

- Evaluate how practices in pork production facilities with varying levels of animal confinement are related to worker health as indicated by concentration of airborne contaminants, including respirable dust, biogases, and endotoxins.
- Characterize the burden of injury and potential high risk types of injuries in pork production companies.

The project was divided into two main activities to measure how airborne contaminants are related to different production practices. Two sub-studies were conducted; one to compare contaminant levels in relation to sow housing and feeding methods, and another to evaluate potential risk associated with power washing done to decontaminate facilities as part of biosecurity protocols.

RESEARCH BRIEF:

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According to the findings, animal health workers, swine farm owners, farmworkers, visitors should be aware of the following:

- Airborne contaminant levels can vary by the activity being performed by farm workers, type of production facility, and feed type utilized within the facility
- While this study found airborne contaminant levels to be under regulatory thresholds, employees should be regularly trained on the proper use of respiratory protection and other personal protective equipment (PPE)

IN CONCLUSION

Injury poses a significant risk to those working in swine production facilities and can result in significant financial and labor costs. Companies and workers in these systems should be aware of these risks and follow animal handling and treatment protocols to reduce the risk of injury to both workers and animals. In addition, airborne contaminant levels can vary depending on a number of factors, and different facilities may be exposed to varying levels of exposure. **Facilities should ensure that employees use PPE correctly and facilities are maintained to reduce airborne contaminant exposure.** These results are correlational and more research is needed to confirm these findings using prospectively designed studies.



WHAT'S NEXT? WHAT ARE THE POSSIBLE SOLUTIONS OR RECOMMENDATIONS?

This project and its findings have served as a foundation for additional UMASH research projects that are working to understand and prevent occupational hazards in animal agriculture.

1. The **Assessing and Preventing Occupational Injuries in Animal Agriculture** project is collecting data to develop injury prevention and control protocols for producers, managers, and insurance loss control professionals.
2. The **Optimizing Assessment of Virus-Containing Particles in Animal Agriculture** project is developing a viral aerosol sampler to measure worker exposures to live airborne influenza viruses in animal agriculture facilities.
3. The **Longitudinal Study of Infectious Disease Risks at the Human-Swine Interface** is characterizing health risks

attributable to pig exposure for zoonotic pathogens that are endemic in the US swine industry (i.e., livestock associated *S. aureus*, influenza A viruses, and hepatitis E virus). This project has also prompted an additional research proposal to define the job-associated risk factors that influence worker microbiomes within livestock production facilities.



WHAT DOES IT MEAN FOR AGRICULTURAL HEALTH AND SAFETY?

These studies demonstrate the potential for airborne contaminants to vary by swine production facility type and activities performed by workers. While the study facility was below safety thresholds, this may not be true for all facilities. **Precautions and modifications may be needed for safe work conditions in other barns.** Further work is needed to examine the impact of power washing on Hydrogen sulfide levels.

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