Research Core Evaluation: Air Quality Projects

The GPCAH is home to large animal feeding operations, which are associated with persistent respiratory symptoms that represent a lasting disease burden throughout the GPCAH nine-state region. Addressing inhalation hazards in swine confinement has been a priority topic for many cycles. In the 2016-22 cycle, researchers have developed and tested cost-effective devices to help reduce respiratory ailments among swine workers as well as reduce bioaerosol concentrations to lead to an improvement in both worker and pig health. This work built on previous study findings, as illustrated.

2006-2011 (O'Shaughnessy): NEEDS ASSESSMENT

CONFIRMED

Elevated levels of CO2, dust, and endotoxin in all aspects of swine farming



BUT...

- Low adoption of respirators unless mandatory
- Respirator use requires ongoing education
- · Respirator use does not prevent inhalation of gases



RECOMENDED

Respirator use among hog workers

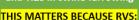




2011-2016 (Anthony): INDUSTRIAL FILTRATION

DEMONSTRATED

EFFICACY of Recirculating Ventilation System (RVS)) in reducing dust, CO2, endotoxin, NH3



- -Does NOT rely on voluntary respirator use -Does NOT negatively impact pig health
- -Is cost effective \$\$\$

RECOMMENDATION Vented Heaters



BUT...

BUT...

ductwork

- RVS not tested in commercial swine farms: "Will it work in real life?"
- Study did not develop a "product" for swine producers



Stage 1

Development

2016-2022 (Nonnenmann): FILTRATION + UVC DISINFECTION

DEVELOPED

A trailer-based RVS (tRVS) that integrates air filtration AND ultraviolet light (UVC) radiation

DEMONSTRATED

EFFICACY of tRVS in controlling dust <u>AND</u> bioaerosols

THIS MATTERS BECAUSE tRVS:

- Found to be effective in a commercial swine operation
- Reduces bioaerosols (in addition to dust), which improves
- BOTH worker and pig health, leading to cost savings for producers

tRVS: New duct work for air filtration (L) UVC treatment in duct work (R)

Next...(2022-2027): **Test miniaturized RVS** (+UVC) installed inside

External trailer-based

technology requires

complicated building

swine farms based on producer input

Stage 1,2,& 3 Development, Testing, & (2022-2027)

Evidence of research output adoption includes:

- Training: The project trained multiple health and safety professionals. For example, one postdoctoral researcher developed skills in industrial hygiene method development, equipment and sampling media preparation, field data collection, sample analyses, electronic data collection and analyses, and report writing.
- Partnerships and Presentations: The project strengthened collaborations with the National Pork Board and local swine producers. These relationships have facilitated input in new RVS designs and a focus on research questions most relevant to producers.
- Education and Outreach: The project findings were incorporated in the GPCAH Core Course curriculum for agricultural safety and health professionals. Workers were trained at the study site. Lessons learned to conduct this project included the development of new lab techniques for virus aerosolization, sampling, and infectivity assays, which were then used to informed hospital-based COVID research in 2020 and additional airborne virus studies now being conducted in other settings.

Stage 1 & 2 Development and Testing