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Impact of Indoor and Pasture-based Management Program on Respiratory Function of Swine

Who cares and why?

A major cause of death and disability in the United States, chronic obstructive pulmonary disease (COPD), is most typically found among smokers. A less understood aspect of the disease is the 7% of its United States victims who are agricultural workers. They can develop COPD as a result of long-term exposure to animal production facilities containing dust that contributes to respiratory diseases. High-density, swine-production houses and other confined animal feeding operations are examples of such facilities.

Animal sciences researchers in the Respiratory Biology and Toxicology Laboratory at North Carolina Agricultural and Technical State University have made a key finding leading toward improving the treatment of COPD among agricultural workers.



What has the project done so far?

Using swine as a model, the N.C. A&T researchers are comparing pigs that were raised indoors with those raised outdoors, and have observed that pigs aren't as severely affected by the dust as humans. As they delved into the reasons why, their studies indicated that the swine respiratory system adapts to its environment. The study, *Airway Metrics, Anatomy and Growth Performance of Pigs Reared Indoors and Outdoors*, appeared in the American Journal of Animal and Veterinary Sciences in 2013. Subsequent publications in 2014 added new

information to this aspect of respiratory biology, including *Exposure to Swine Housing Dust Modulates Macrophage Morphology and Function*, which was published in the American Journal of Immunology and *A Biophysicochemical Analysis of Settled Livestock and Poultry Housing Dusts*, published in the American Journal of Agricultural and Biological Sciences.

This is the first time that pigs reared indoors and those raised outdoors have been observed to exhibit structural and cellular differences in their respiratory systems, according to Dr. Jenora Waterman, assistant professor of functional genomics in the Department of Animal Sciences at N.C. A&T, and principal investigator of the studies.

Impact Statement

Animal sciences researchers in Respiratory Biology and Toxicology Laboratory at North Carolina Agricultural and Technical State University have made a key finding leading toward improving the treatment of COPD among agricultural workers. This research has contributed new findings to the science of respiratory health, both for swine and potentially, for humans, which could lead to improved treatments of chronic obstructive pulmonary disease (COPD).

What research is needed?

The next steps are to study the structural and cellular differences between pigs reared outdoors and those raised indoors, and to identify potential biomarkers that could serve as diagnostic or prognostic markers of agriculture-related COPD in humans.

Researchers are also focused on the extent of environmental and genetic and protein influences on the pathology and physiology of agriculture-related respiratory diseases, as well as environmental toxicology, and other issues in cellular pathology.

Want to know more?

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Research in respiratory biology at N.C. A&T has been supported by: The Evans Allen and 1890 Capacity Building Grant programs within USDA's National Institute of Food and Agriculture (NIFA); the North Carolina Agromedicine Institute; the National Science Foundation's Louis Stokes Alliance for Minority Participation (LSAMP) program, and the Clinical and Translational Science Awards program of the National Institutes of Health, administered through the NC TraCS Institute at UNC Chapel Hill. The project addresses the NIFA priority, "**Food Security & Hunger**," in support of science to boost domestic agricultural production, improve capacity to meet the growing global food demand, and foster innovation in fighting hunger and food insecurity in vulnerable populations.

