

ENVIRONMENT

Title: Evaluate the representativeness of the NAEMS air emission data for swine operations in a changing industry
– NPB#18-208

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Scientific Abstract:

The air emission data from the National Air Emissions Monitoring Study (NAEMS) is used by the U.S. Environmental Protection Agency (USEPA) to determine the regulatory responsibilities of animal feeding operations and to develop emissions-estimating methodologies, and it was collected from 2007 to 2009. The goal of the project is to gather solid information for an evaluation of the representativeness of air emissions monitoring data collected from swine operations under NAEMS relative to emissions from the predominant swine production systems in use today and in the next few years, and to provide scientific evidences for an estimation of the nature and size of the changes in emissions today relative to the NAEMS results. The specific objectives include: (1) Identify and summarize the key changes in technological and management practices in the U.S. pork industry that could potentially affect air emissions from swine operations in the past decade, and the vision of trends in the next few years, through comprehensive literature review and survey; (2) Quantify the effects of operating conditions on air emissions from swine operations through systematic literature review and meta-analysis; and (3) Estimate the nature and size of the changes in emissions today relative to the NAEMS data. Over the past decade, feed conversion efficiency in the U.S. pork industry have improved continuously due to improved feed formulations, genetics and management practices. As a result, for the same amount of animal product, the manure amount and air emissions per unit of animal product are likely reduced by 18% from 2010 to 2019, and could further be reduced with further improvement in feed conversion efficiency. Increased DDGS content in the diets can result in higher odor and hydrogen sulfide (H₂S) emissions, but its effect on ammonia (NH₃) emission is uncertain. Development in watering technology makes thicker manure and thus can reduce NH₃ and odor emissions in swine houses. The NAEMS NH₃ emission rates for finishing swine houses with deep pit may still be representative in today's condition, but the NAEMS data on NH₃ emission rates for gestation houses or for pit recharge systems may overestimate emissions by 2 to 4 times higher. As DDGS are increasingly used in practice as a partial replacement for corn-soybean meal to reduce feed cost, the NAEMS H₂S emission rates for swine house may underestimate emissions in cases when DDGS diet are used. Emission measurement from lagoons/basins at swine operations have high uncertainties due to variety of environmental conditions and measurement technologies. Based on recent data in literature, The NAEMS emission rates for lagoons/basins at swine operations could overestimate NH₃ emissions by three times higher, and overestimate H₂S emissions by 7 to 11 times higher. Results from this project provided scientific evidences to assist the U.S. pork industry to participate in the discussion on its regulatory responsibilities with regarding to environmental restrictions.

These research results were submitted in fulfillment of checkoff-funded research projects. This report is published directly as submitted by the project's principal investigator. This report has not been peer-reviewed.

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