

PORK SAFETY

Title: Characterization of VOCs and particulates from swine finishing facilities and relationship of these compounds to human health, **NPB #02-148**

Investigator: Wendy Powers

Institution: Iowa State University

Date Received: January 2003

Abstract: Emissions from animal feeding operations have been a prominent topic in Iowa for a number of years, particularly during 2002. The issue gained momentum at the federal level during that year as well, resulting in the release of a National Research Council report "Air Emissions from Animal Feeding Operations: Current Knowledge, Future Needs" in December 2002. To address the issue a study was initiated to determine 1) if phase of production influenced air composition and odor at the facility, 2) if operations of the same type and size differ in concentrations of the compounds of interest, 3) how concentrations of compounds change as they move downwind of a given site, and 4) how climatic factors influence the concentrations downwind. Air samples were collected or analyzed onsite twice weekly at each site for a 10-week period between May 2002 and August 2002 from two breeding and gestation facilities utilizing aerated earthen storage structures and from five deep-pit finishing facilities. Sites within a given production phase (sow or finishing facility) were matched for size of operation. Samples were collected immediately outside of a building or on the berm of the manure storage structure and at points downwind of the location (approximately 50, 100, and 200 m). Air was analyzed for hydrogen sulfide content (onsite), odor (collected samples in 10-L Tedlar bags), and composition (volatile fatty acids, phenols, indoles, alkanes in collected samples). During sampling, temperature, windspeed and direction, humidity and solar cover were recorded. Results indicate that differences between the sow sites and the finishing sites were limited to differences in butyric acid concentration, only. Site within a specific phase of production contributed to differences in concentrations of particulates, odor, hydrogen sulfide, butyric and valeric acids and all of the phenolic compounds quantified. The data suggest that the type of swine system had little effect on the concentrations of most of the monitored compounds as well as odor. However, the management practices of the site itself contributes to differences in analyte concentrations to a much greater extent than production phase differences (breeding and gestation versus finishing). Equations to develop downwind concentrations of all measured compounds were developed. The equations take into account temperature, humidity, and solar cover and are based on the concentrations at the source (ie., building or berm) that were observed in this study. Based on the data collected and the conditions represented in the current study, estimated hydrogen sulfide concentrations would be below 15 ppb at some point beyond 50 m downwind of the source. This estimate is using the statistically-adjusted average source concentration observed for all sites and all sampling events. Variation in source concentration did occur, however so on any given sampling day at any given site it is possible that 15 ppb would have been measured within 50 m of the source. Therefore, caution must be executed to avoid over-interpreting the results from this study.

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

For more information contact:

National Pork Board, P.O. Box 9114, Des Moines, Iowa USA

800-456-7675, Fax: 515-223-2646, E-Mail: porkboard@porkboard.org, Web: <http://www.porkboard.org/>