RESEARCH ABSTRACT

ENVIRONMENT

Title: Characterization of VOCs and particulates from swine finishing facilities – **NPB #03-149**

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Abstract

Emissions from animal feeding operations have been a prominent topic in Iowa for a number of years, particularly during 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 and August during the 2002 and 2003 project years. During 2002, samples were collected from two breeding and gestation facilities utilizing aerated earthen storage structures and from five deep-pit finishing facilities. During 2003, two nursery sites, three breeding and gestation operations (sow sites) and 8 finishing sites were studied. 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 and ammonia 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. 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 contribute to differences in analyte concentrations to a much greater extent than production phase differences (breeding and gestation versus finishing and/or nursery production). Equations to develop downwind concentrations of all measured compounds were developed. The equations take into account temperature and humidity and are based on the concentrations at the source (ie., building or berm) that were observed in this study. All equations were compound specific. Results indicate that climatic variables, while included, were not as important to predictive capability as was source concentration or distance downwind. Prediction equations for odor, hydrogen sulfide and the volatile fatty acids, a specific group of the analyzed gases, were reasonably capable of estimating downwind concentrations, accounting for as much as 64% of the response variation. From the collected data an odor prediction equation was developed based on the measured gases. Approximately 50% of the variation observed in odor could be accounted for by the developed equation. In addition, specific gases were individually correlated to odor to determine if any, individually, could serve as a surrogate for odor. While hydrogen sulfide and ammonia were the two best indicators, each only accounted for approximately 25% of the odor response.