

Title: Particulate Matter in Swine Barns: Existing Knowledge and Research Needs

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Date Submitted: 11/8/2021

Scientific Abstract

Particulate matter (PM) represents an air quality management challenge for confined swine production systems. Because of the limited space and ventilation rate, PM can reach relatively high concentrations in swine barns. PM in swine barns possesses different physical, chemical, and biological characteristics than that in the atmosphere and other indoor environments. As a result, it exerts different environmental and health effects and creates some unique challenges regarding PM measurement and mitigation. Numerous efforts have been made to research PM in swine barns, generating massive data and information. However, the relevant review reports are sporadic. The latest one was published over 20 years ago (Pedersen et al., 2000). It was a mini-review and significant research progress has been made since then. This study aims to offer an updated comprehensive review of swine barn PM, focusing on publications after 1990. It covers various topics, including PM characteristics, sources, measurement methods, and in-barn mitigation technologies. Since PM in swine barns is of primarily biological origins, bioaerosols are reviewed in great detail in the report. Relevant topics include culturable bacterial/fungal counts, total bacterial/fungal counts, viruses, microbial community composition, antibiotic-resistant bacteria, antibiotic resistance genes, endotoxins, and (1→3)- β -D-glucans. For each topic, existing knowledge is summarized and discussed and knowledge gaps are identified. Overall, PM in swine barns is complicated in chemical and biological composition and highly variable in mass concentrations, size, and microbial abundance. Feed, feces, and skins constitute the major PM sources. Regarding in-barn PM mitigation, four technologies (oil/water sprinkling, ionization, alternation of feed and feeders, and recirculating air filtration) are dominant. However, none of them have been widely used in commercial barns. A collective discussion of major knowledge gaps and future research needs is offered at the end of the report.

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 This report has not been peer-reviewed.

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