

Effects of gestation pens versus stalls and wet versus dry feed on air contaminants in swine production (Part 1).

Peter C. Raynor, Shannon Engelman, Darby Murphy, Gurumurthy Ramachandran, Jeffrey B. Bender & Bruce H. Alexander

Keypoints:

- Pollutant levels increased as ventilation rates decreased during the cold months.
- Pen housing lead to higher levels of NH₃, respirable dust, and endotoxin when compared to stalls.

Objective

Evolving production practices in the swine industry may alter the working environment. This research project characterized the influence of stall versus pen gestation housing on air contaminant concentrations.

Methods

Eight-hour time-weighted ammonia, hydrogen sulfide, respirable dust, respirable endotoxin, and carbon dioxide concentrations and temperature were measured regularly at stationary locations throughout a year in a facility with parallel gestation stall and open pen housing. Hazard indices were calculated using ammonia, hydrogen sulfide, and endotoxin concentrations and relevant occupational exposure limits. Statistical analyses were performed to assess the influence of time of year, housing, and feed on measured parameters.

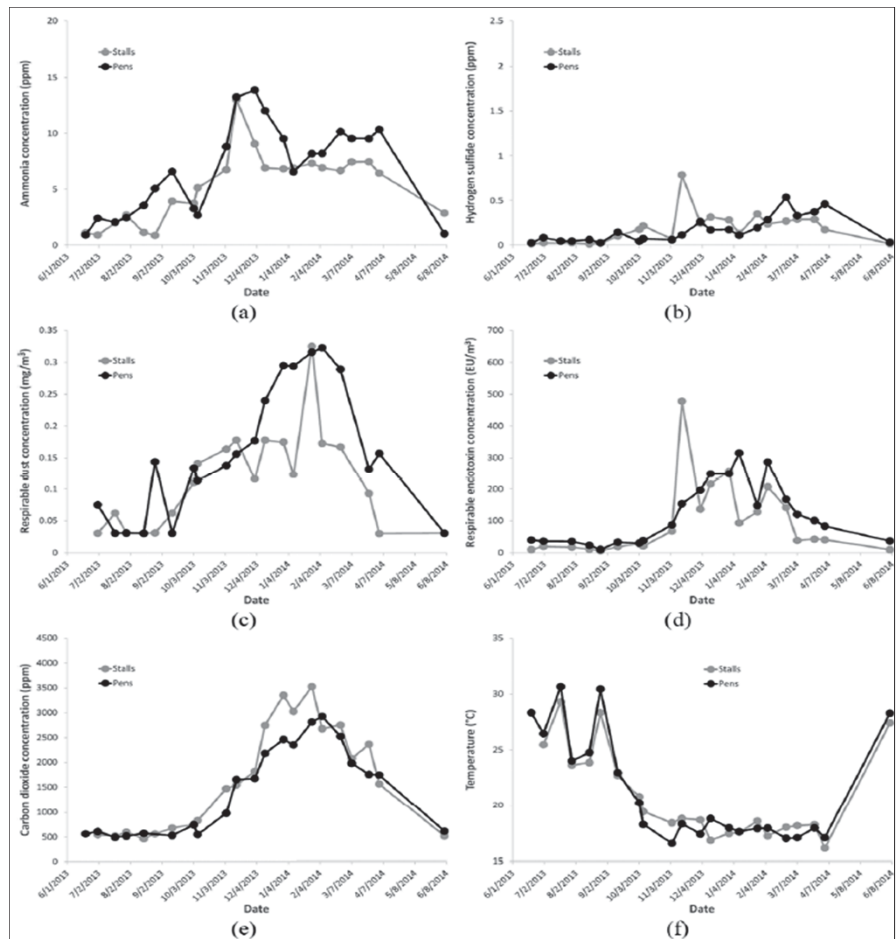
Results

Due to reductions in ventilation rates as outdoor temperatures decreased, season affected pollutant levels more than other factors. Concentrations were greater during the winter than summer (Figure 1). Ammonia, dust, and endotoxin were 25%, 43%, and 67% higher, respectively, on average, in the room with gestation pens than in the room with stalls. While individual contaminant concentrations were generally below regulatory limits, hazard index calculations suggest that the effects of combined exposures on respiratory health may pose a risk to farm workers. Additionally, elevated levels of respirable endotoxin and hydrogen sulfide were detected during power washing.

Conclusions

Ventilation changes in response to seasonal requirements influenced air contaminant concentrations more than production practices, especially housing type.

Figure 1. Measured values versus date in the gestation stall and pen rooms for (a) ammonia concentration, (b) hydrogen sulfide concentration, (c) respirable dust concentration, (d) respirable endotoxin concentration, (e) carbon dioxide concentration, and (f) temperature.



Paper: Peter C. Raynor, Shannon Engelman, Darby Murphy, Gurumurthy Ramachandran, Jeffrey B. Bender & Bruce H. Alexander (2017): Effects of gestation pens versus stalls and wet versus dry feed on air contaminants in swine production, *Journal of Agromedicine*, DOI: 10.1080/1059924X.2017.1387633

Find MSHMP Science Pages at: <https://z.umn.edu/SciencePages>