

Control of gas emissions and growth and transmission of disease-causing microorganisms in swine operations using nanoparticles

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ABSTRACT The effectiveness of selected nanoparticles in reducing gas (ammonia, hydrogen sulphide, methane and carbon dioxide) emissions and levels of disease-causing microorganisms during actual production operations and as part of room sanitation procedures between batches of animals was investigated in two fully instrumented and identical environmental chambers at the Prairie Swine Centre barn facility in Saskatoon. In evaluating the effectiveness of nanoparticles during pig rearing period, a ventilation air recirculation system was installed in each chamber; one chamber was installed with a filter loaded with nanoparticles while the other chamber had only a filter with no nanoparticles. After each 30-day room trial with 8 grower pigs, the chambers were pressure-washed and sanitized. During sanitation, one chamber was applied with the conventional chemical disinfectant (Control) normally used in commercial barns while the other chamber was disinfected by spraying a liquid solution with nanoparticles (Treatment). The effect of nanoparticles on ammonia, hydrogen sulphide and greenhouse gases such as methane and carbon dioxide as well as on the levels of microorganisms in the air (bioaerosols) and on plastic, metal and concrete surfaces will be discussed. The impact of the treatment on potential transmission of disease-causing microorganisms as indicated by microbial loads at the ventilation inlet and exhaust streams as well as in the outgoing manure will also be presented. Furthermore, the effect of nanoparticles on pig performance and overall production cost will be discussed.

Keywords: bioaerosols, ammonia, hydrogen sulphide, methane, carbon dioxide

