

Title: Simultaneous treatment of swine odor and airborne pathogens by UV254 light -
NPB #07-091

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Scientific Abstract: A feasibility study was conducted, aiming to explore the effectiveness of UV light for simultaneous treatment of odor, odorous VOCs and airborne pathogen emissions from swine operations. Several operating parameters were tested in laboratory scale including: UV wavelength, presence of photocatalyst, the effects of UV dose, and the effects of air relative humidity and air temperature. Removal and conversion of odor, target gases responsible for causing swine odor such as odorous sulfur-containing volatile organic compounds (SVOCs), volatile fatty acids (VFAs), phenolics, ammonia, and airborne pathogens was tested. Up to 100% removal of odor, 100% of S-VOCs, 100% VFAs, and 100% phenolics, and up to 65% of ammonia was achieved with optimized UV treatment. Treatments involving 185 nm UV band and treatments involving the presence of photocatalyst (TiO₂) were more efficient in removal and conversion of odorous gases and odor in flowing air. There were no limitations to the shortest treatment time. The treatment efficiency was proportional to the UV dose. In addition, greater than 99% inactivation was achieved for both the swine influenza virus (SIV) and bovine viral diarrhea virus (BVDV) which were both highly susceptible to 254 nm UV inactivation. The estimate of the operational cost of treatment was based on measured emissions of several odorous VOCs from full scale, commercial swine farm ranges from \$0.15 to \$0.60 per finisher pig.

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