

## ENVIRONMENT

**Title:** Employing environmental mitigation technology and/or practices: Treating swine odor and improving air quality with black light - #18-089 IPPA

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**Scientific Abstract:** We have been perfecting the UV technology for the swine industry, starting from benchtop lab-scale and moving towards full-scale, farm-scale proven applications. The ultimate goal is reducing gaseous emissions from barns to the atmosphere, improving the air quality inside the barns, improving workers' safety, improving average daily gains (ADG) and feed conversion efficiency (FCE), and reducing the pathogen load with UV light.

In this research, we investigated the UV light treatment to mitigate gaseous emissions at the pilot- and farm-scale. Specifically, we tested the UV-A (non-toxic 367 nm wavelength, a.k.a. ‘black light’) photocatalysis at a mobile laboratory-scale capable of treating ~500-2,000 CFMs of barn exhaust air.

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The targeted gaseous emissions of barn exhaust air were reduced up to:

- 40% reduction of odor
- 32~66% reduction of key compounds responsible for downwind odor, i.e., dimethyl disulfide, isobutyric acid, butanoic acid, p-cresol, indole, and skatole
- 41% reduction of hydrogen sulfide (H<sub>2</sub>S)
- 100% reduction of ozone (O<sub>3</sub>)
- 13% reduction of nitrous oxide (N<sub>2</sub>O)
- 21% generation of carbon dioxide (CO<sub>2</sub>)
- No reduction of airborne particulate matter (PM).

The % reduction of odorous targeted gases depended on the UV dose, UV wavelength, and PM concentration in the air, as illustrated in the Final Report. The cost of UV treatment was comparable or better to available mitigation technologies for at least a few selected targeted odorous compounds based on the initial economic analyses based on the removal of each targeted gas from barn exhaust. There are a few recommended next logical steps towards farm-proven applications. These include full-scale trials of UV treatment to (a) improve air quality inside the barn, (b) potentially reduce the pathogen load, and (c) improve ADG and FCE. Overall, UV treatment technology is technically capable and competitive with other technologies to comprehensively reduce gaseous emissions.