

Project Title: Evaluation of technologies, protocols, strategies and ideas for the biocontainment of infectious aerosols in response to emerging disease outbreaks

Project identification number: 21-109 SHIC

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Industry Summary:

Among all infectious agents, airborne pathogens are the most difficult to control and in today's agricultural settings, airborne animal diseases are the most difficult to contain. This is especially relevant for swine reared in confinement and in controlled ventilated environments where exhaust fans help transport particles from inside to outside of the facility. We conducted a review of technologies directed at removing or/and inactivating pathogens for their application to swine farms and found that only air filtration solely consisting of fibrous filters is an established and implemented technology. There are also industrially and medically implementable technologies named electrostatic precipitators and ultraviolet-C systems (both in-duct and upper room), that they are commonly implemented in other industries but are less prevalent in livestock management. Nonetheless, because they have demonstrated scalable performance in aerosol particle removal and/or bioaerosol inactivation, they merit discussion and consideration towards agricultural biosecurity. Lastly, there are emerging technologies, consisting of more recently developed technologies, typically at the laboratory or bench scale that have not been tested at the scales (building sizes and flow rates) required for agricultural biosecurity and are hence several developmental steps away from direct implementation. Lastly, there are protocols and practices ready to be used at the farm level (e.g. wind breaks, covering of fans, movement of infected animals to other sites, depopulation and reduced ventilation) that conceptually, could be employed in the face of a disease outbreak, but their direct impact on reducing the emission airborne pathogens needs to be evaluated and quantified.

Keywords: Biosecurity, biocontainment, swine, technologies, airborne