Since the 1980s, hog production in the United States has been characterized by a shift from small, independently owned operations to large, vertically integrated operations often referred to as industrial hog operations (IHOs). This change in production practices has been especially pronounced in North Carolina, with the majority of IHOs concentrated in the eastern part of the state. Prophylactic use of antibiotics for growth promotion and disease prevention in these operations may contribute to the selection of antibiotic-resistant (ABR) bacteria in and around IHOs. A growing body of literature has documented the emergence of ABR Staphylococcus aureus that is unique to livestock sources; and carriage of these ABR S. aureus strains have been documented in hogs and IHO workers. Yet, research regarding dissemination of these bacteria to the off-farm environment is lacking. Important questions also remain regarding potential community exposures and the effects of IHO worker exposure on household members, especially among children who may have enhanced susceptibility to S. aureus infection.

To better understand transmission routes of ABR S. aureus originating from IHOs in NC, we investigated 1) the presence of ABR S. aureus in surface water proximal to IHO spray fields; 2) associations between occupational exposure to IHOs and ABR S. aureus carriage in adult workers and their child (<7 yr old) household members; and 3) associations between work-related activities of IHO workers and ABR S. aureus carriage in adult workers and their child household members. Study results document the presence of ABR S. aureus in surface water near IHO spray fields. We also observed a higher prevalence of ABR S. aureus among IHO workers and their child household members than among community referent participants. Interestingly, carriage of S. aureus strains characteristic of the IHO environment was observed in community referent participants, albeit at lower rates than in occupationally exposed households. Among IHO households, mask use at work appeared to mitigate carriage in workers and adult workers bringing protective gear home was associated with ABR S. aureus carriage in children. These results suggest that ABR S. aureus can disseminate from IHOs through occupational and environmental routes of transmission.

Committee:

Jill Stewart, Ph.D. (Advisor)
Rebecca Fry, Ph.D.
Mark Sobsey, Ph.D.
Christopher D. Heaney, Ph.D. (Department of Environmental Health Sciences, Johns Hopkins University)
Melissa Miller, Ph.D. (Department of Pathology and Laboratory Medicine, UNC-CH School of Medicine)