**Title: The Effect of UV Radiation on Survival of *Salmonella enterica* in Dried Manure Dust**

Ruth A. Oni[1], Manan Sharma[2], Shirley A. Micallef [3, 4], and Robert L. Buchanan[1, 4]

[1]Nutrition & Food Science Department, University of Maryland, College Park, MD, [2]Environmental Microbial and Food Safety Laboratory, USDA-ARS, Beltsville Area Research Center, Beltsville, MD, [3]Department of Plant Science and Landscape Architecture, University of Maryland, College Park, MD, and [4]Center for Food Safety and Security Systems, University of Maryland, College Park, MD

***Introduction****:* Animal manure has been shown to harbor *Salmonella enterica*, an enteric pathogen known to be resilient to environmental stresses such as desiccation and solar UV radiation. In farm settings, it has been observed that unintended aerosolization could occur when manure becomes dehydrated, resulting in the exposure of leafy crops to wind-driven manure dust. In order to appraise the risk contributed by aerosolized particulate manure to produce fields, it is important to determine whether these particles can act as a barrier to protect *Salmonella* from damaging effects of UV light.

***Purpose*****:** This study investigated the effect of UV radiation on the survival of *Salmonella* when present on dried manure particles.

***Method:*** *In vitro* survival under UV-A (365 nm) of *Salmonella* inoculated into manure dust and dispersed as a thin layer on a petri dish covered with filter paper was compared to exposure under similar conditions using a thin layer of cells that were directly applied to the test surface. The dust was obtained by dehydrating turkey manure to <5% moisture content and processing until particle sizes of approximately 125 μm were achieved.

***Results*****:** Analysis showed that the presence of manure particles significantly ($P < 0.05$) protected *Salmonella* from UV exposure. *Salmonella* cells exposed to UV in a control medium showed a 5 log decline within 80 min compared to the 1.5 log decrease in the manure dust matrix. This was in spite of the higher initial inoculum level of control samples (control inoculum $7.5 \times 10^{10}$ CFU/ml; dust inoculum $6.75 \times 10^{6}$ CFU/g).

***Significance*****:** These data suggest that manure dust particles can provide protection from lethal UV rays to *Salmonella* cells, thereby increasing the risk of edible-crop contamination in pre-harvest settings. The ability of manure dust matrix to shield *Salmonella* from damaging UV effects could increase this pathogen's survival on leafy greens during cultivation.

**Title: Survival of *Salmonella enterica* in Manure Dust on Spinach Leaves**

Ruth A. Oni[1], Manan Sharma[2], Shirley A. Micallef [3, 4], and Robert L. Buchanan[1, 4]

[1]Nutrition & Food Science Department, University of Maryland, College Park, MD, [2]Environmental Microbial and Food Safety Laboratory, USDA-ARS, Beltsville Area Research Center, Beltsville, MD, [3]Department of Plant Science and Landscape Architecture, University of Maryland, College Park, MD, and [4]Center for Food Safety and Security Systems, University of Maryland, College Park, MD

***Introduction:*** Microbiological safety of fresh produce has attracted a lot of attention in the past three decades due to pathogen contamination along the farm to fork continuum resulting in outbreaks. Although animal manure has been identified as a major pre-harvest pathogen source, there is little research on the potential role of airborne manure dust as a vehicle for pathogen transmission.

***Purpose:*** This study assessed the survival capabilities of *Salmonella* in dry turkey manure particles (of a size capable of being airborne) when present on spinach leaves, as well as effect of UV radiation on that survival.

***Methods:*** Turkey manure dust (125 μm) at 5% moisture level inoculated with a cocktail of *Salmonella* was lightly dusted onto spinach leaves under growth chamber conditions and survival monitored over 21 days. Effect of UV light on survival was factored into the experimental design such that the abaxial and adaxial sides of the leaves were compared for *Salmonella* survival. Treatment controls consisted of plants grown under UV filter. Outcomes were compared with trials where plants were inoculated with *Salmonella* via aerosol spray. Survival curves were generated and transformed data analyzed using SAS.

***Results:*** Under UV light, particulate manure dust significantly ($P < 0.05$) reduced *Salmonella* inactivation on spinach leaves. Deposition site on leaves also influenced survival as *Salmonella* survived preferentially ($P < 0.05$) on the abaxial surface. By day 7 post-inoculation, *Salmonella* cells in manure dust on leaves had achieved only a 2 log reduction, while population in control samples declined by approximately 5 logs. By day 14, recovery of viable *Salmonella* from abaxial and adaxial leaf surfaces was 33% (n=6) versus 0% respectively on XLD agar.

***Significance:*** This research supports the hypothesis that dust generated from poultry manure increases the likelihood that *Salmonella* can persist on leafy green surfaces, especially in arid areas where unintended aerosolization could frequently occur.