Sanitizing Food Handling Surfaces by Electrostatically Deposited Antimicrobial Sprays

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***Abstract*— Foodborne pathogens (e.g., Salmonella, Listeria, E.coli O157:H7) in the USA annually cause ~ 76 million acute illnesses and 5 thousand deaths with an associated US$152 billion cost in healthcare, workplace losses, etc. Prior work has documented the efficacy of air-assisted, induction-charged (AAIC) electrostatic spraying of various chemical and biological pest-control agents during on-farm production and postharvest packing/shipping of food crops…typically reducing by half both the dispensed active ingredient and spray-mix volume. As a food-safety intervention strategy for sanitizing food processing and handling surfaces of various material composition and orientation, this current work investigates benefits of the AAIC electrostatic spray-application process characterized by: air-carrier energy (@ ~250 W per nozzle for 3-5 m/s carrier velocity) providing droplet transport and turbulent penetration within the target vicinity; and induction-charged droplets of con! ductive liquids (@ <100 mW per nozzle for ~7 mC/kg charge-to-mass on ~30 □m VMD spray) facilitating deposition onto relatively non-conductive target materials (e.g., PVC conveyer-belting and totes, waxed-paper cartons) which would present charge-dissipation problems using other droplet-charging processes (e.g., HVDC corona) requiring ionic current through well earthed targets. In a biosafety chamber spray mass-transfer efficiency onto test targets (via tracer fluorometry) and microbiological efficacy of deposited peracetic acid sanitizer (via enumerating bacterial CFU on inoculated targets) were evaluated for three spray-application methods. Significant results ($p<0.05$): Air-assisted induction-charged spray deposited 1.2-times more mass of A.I. than did air-assisted uncharged spray onto target frontside and 6.1-times more onto backside. Air-assisted induction-charged spray deposited 9.3-times more A.I. than did conventional hyd. spray onto frontside and 29.6-times more onto backside per unit mass of A.I. dispensed. Even at 56 % reduct ions in sanitizer A.I. dispensed, air-assisted induction-charged spray achieved equal or greater population reductions of Salmonella enterica on target frontside, backside, left-side, and right-side surfaces than did air-assisted uncharged spray or conventional hydraulic spray in all treatments.**