Cross-contamination risks in dry environments

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Summary

Cross-contamination of foodborne pathogens from food contact surfaces to produce during harvest and postharvest handling poses a significant potential food safety risk. Despite significant progress in understanding cross-contamination risk factors in facilities that use water, there are significant gaps in knowledge regarding factors that influence cross-contamination in dry environments. The research aims to develop a comprehensive understanding of cross-contamination risk factors during dry handling and processing of fresh produce, using onions and peaches as model commodities. The data will be used to develop a quantitative risk model for diverse food contact surfaces with the goal of reducing cross-contamination risks in dry packing facilities.

Objectives

1. Quantify transfer coefficients of bacteria from inoculated dry food contact surfaces, including various plastics and stainless steel, to model fresh produce (e.g., onion).
2. Develop a quantitative risk model for cross-contamination.

Methods

Survival of bacteria (*Salmonella* and surrogate organism *Enterococcus faecium*) on food contact surfaces:
An onion packinghouse scenario will form the basis of these studies. A range of materials with differing surface characteristics (e.g., old and new conveyor belts, rollers, and packing table surfaces), and different levels of organic matter will serve as model food contact surfaces.

Transfer of bacteria from contaminated food contact surfaces to onions:
Contact time and force will be controlled using a texture analyzer (**Figure 1**). The contact surfaces will be inoculated with bacteria at different levels (10^3, 10^5, 10^7 CFU/cm^2), held under a range of conditions and times, and then exposed to the uncontaminated onion surface under controlled contact forces and times.

Results to Date

To date, the project focus has been on developing a standardized protocol for the bacterial transfer experiments, including inoculation, transfer rate measurement, and enumeration methods. For simplicity, an onion is considered a sphere and the contact area between the onion and the flat contact surface is a round shape of defined area (**Figure 2**). Representation of the platform using a texture analyzer to control the contact force (F), time, and frequency for bacterial transfer experiment is shown in **Figure 3**.

Benefits to the Industry

Successful completion of this project will aid the fresh produce industry by addressing gaps in knowledge, identifying high food safety risk surfaces and conditions, and providing important information to develop novel approaches to address cross-contamination challenges.

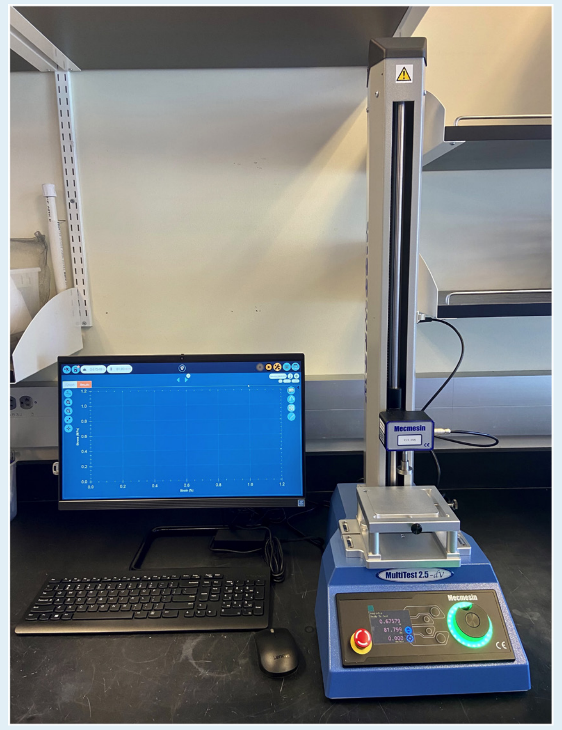

Figure 1. Texture analyzer platform (Mecmesin, MultiTest 2.5-dv, United Kingdom) applied in this project to control the contact force, frequency, and contact time during bacterial transfer from inoculated surfaces to the model food.

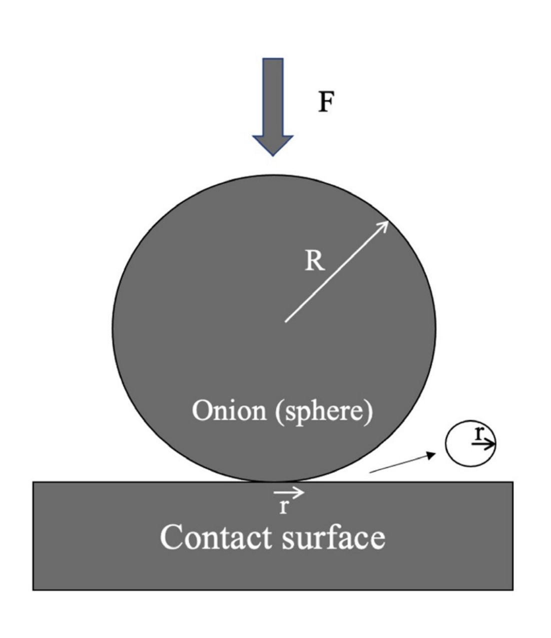

Figure 2. Illustration of the contact area between an onion (ideally, a sphere) in contact with a flat surface (conveyor belt or packing table) under applied force and time.

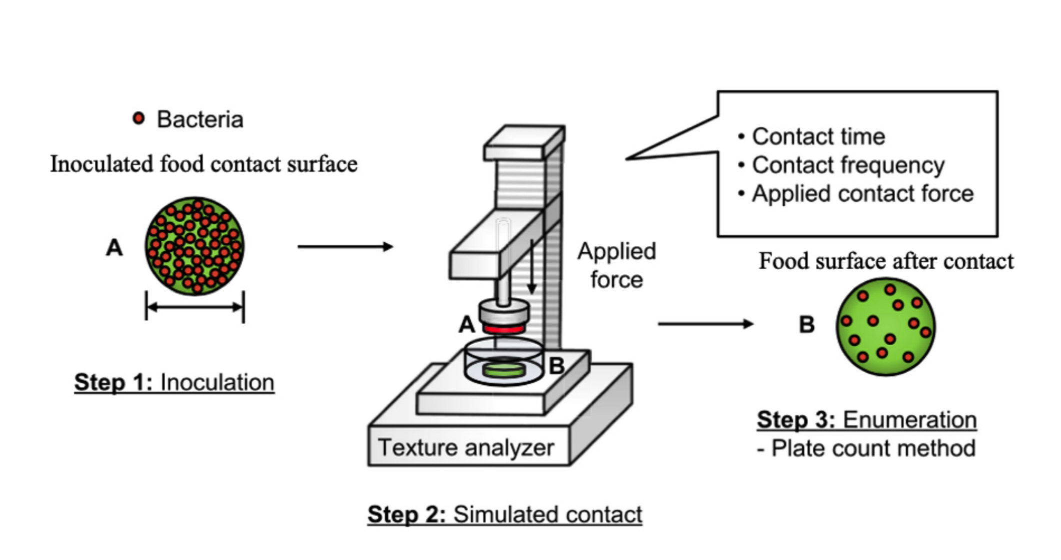

Figure 3. Schematic of an approach used for controlling contact time, frequency, and contact force during cross-contamination from a contaminated food contact surface (A) to the model produce (B).