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RESEARCH FACTS
RESEARCH & TECHNOLOGY DEVELOPMENT FOR THE CANADIAN BEEF INDUSTRY

Shiga-toxigenic E. coli persistence mechanisms and surface biofilm detection using near-infrared spectroscopy on beef processing facilities

Project Title:

Shiga-toxigenic E. coli persistence mechanisms and surface biofilm detection using near-infrared spectroscopy on beef processing facilities

Project Code:	FOS.04.18
Completed:	*In Progress. Results expected in March 2022.*

Researchers:

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Background

A great deal of food safety research has focused on E. coli O157:H7, even though it is only one of thousands of different Shiga toxin -producing E. coli (STEC). Although all are potentially harmful, they may differ in their ability to withstand sanitizers commonly used to clean meat processing equipment. They may also differ in their ability to form biofilms that enable bacteria to fasten themselves to surfaces and survive exposure to sanitizers, heat, steam, etc. The ability to form biofilms greatly increase the risk that bacteria will be able establish more permanent colonies in or on meat processing equipment or surfaces that can go on to contaminate beef. These biofilms can also be very difficult to remove and clean (e.g. dental plaque is a bacterial biofilm), or even detect.

Objectives

1. determine the capacity of different STEC to survive and transfer from single and multispecies biofilms (wet or dry) formed on different materials (stainless steel and polyurethane) and environmental conditions (at 15 and 25°C) onto fresh beef surfaces (adipose and lean tissue),

2. test the effectiveness of chemical sanitizers to eliminate wet and dry single and multispecies STEC biofilms, and

3. test the ability of near-infrared spectroscopy (NIRS) to detect STEC biofilms on beef processing equipment.

What they will do

These researchers are looking at whether 14 different human and cattle STECs can form biofilms in combination with at least eight other kinds of bacteria that are commonly found in packing plants on packing plant surfaces and that can transfer to beef. They will evaluate whether bacteria can resist different sanitizers. They will identify genes related to biofilm formation, then relate the whole genome sequences of biofilm forming strains to outbreak-associated strains to see if biofilm forming strains may be more (or less) responsible for STEC outbreaks. NIRS spectroscopy will be tested as a potential way to detect biofilms. If NIRS shows promise, they will do some field testing at a commercial beef processing facility.

Implications

This research will determine whether biofilm-producing STEC pose a greater risk to human health than STEC strains that don't produce biofilms. An ability to better detect biofilms will help beef packing and processing plants ensure that their sanitation practices are effective.

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