Understanding E. coli mobility in humans may help control outbreaks

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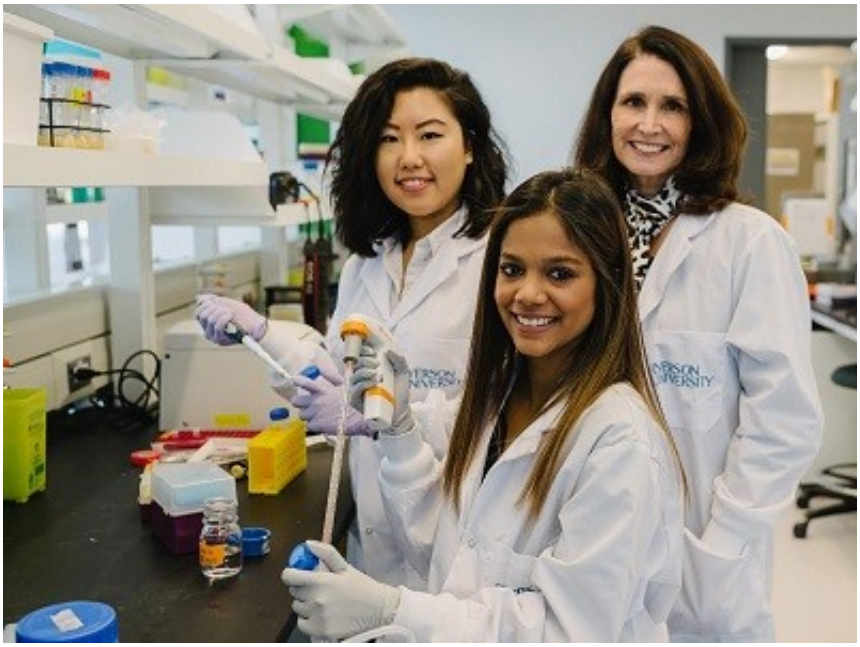

New research by co-authored by MSc student Jee In Kim (left), PhD student Tracy Lackraj (middle) and senior author Professor Debora Foster (right) in Ryerson's Microbial Pathogenesis Laboratory is helping to fight E. coli bacterial outbreaks. Credit: 3B Photography

Understanding how E. coli bacteria behave once inside a human host could be the key to fighting an outbreak, and potentially saving lives. This is the premise behind a new paper co-authored by Ryerson University MSc student Jee In Kim, and PhD student Tracy Lackraj in the Molecular Science Program. The research explores the impact of

exposing E. coli to different concentrations of short chain fatty acids to simulate the environment inside the human small and large intestines.

Escherichia coli, usually called E. coli, refers to a common group of bacteria present inside the human body and in the environment, particularly on many foods we eat. However certain strains, such as Enterohemorrhagic E. coli (EHEC) can cause severe foodborne illnesses such as abdominal cramps, bloody diarrhea, and kidney disease that can potentially lead to death. Outbreaks due to contaminated meat, produce and even water are very common, and in recent years, an average of 440 cases of EHEC infection are reported annually in Canada.

"EHEC is a significant worldwide health problem with no effective treatment," said Kim. "The key to understanding EHEC is to discover how it can survive in the human gastrointestinal tract, which includes many defense mechanisms, such as strong acids, specifically designed to kill bacteria. Once we better understand how EHEC senses and responds to a host's environmental signals and the mechanisms it uses to infect that host, we can use that knowledge to develop novel strategies to prevent and treat infections."

The researchers discovered that expression of EHEC's flagella, small whip-like appendages that enable movement, were increased in response to small intestinal short chain fatty acid mixtures, thereby enhancing the pathogen's transit toward the large intestine. Conversely, when EHEC was exposed to large intestinal short chain fatty acid mixtures, expression of EHEC's flagella were decreased, a result which could encourage colonization and infection in the large intestine.

"This research is important because it illustrates how EHEC can overcome the body's natural defenses, thereby making the host less able to fight off disease/infection," added Lackraj. "Now that we know how much the environment of the gut affects virulent bacteria, findings

suggest that these factors could also be used to predict those most susceptible to EHEC infection, and eventually help bolster people against getting sick—including changing their diets."

More information: Differential modulation of flagella expression in enterohaemorrhagic Escherichia coli O157: H7 by intestinal short-chain fatty acid mixes, *Microbiology* (2016). DOI: 10.1099/mic.0.000357

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