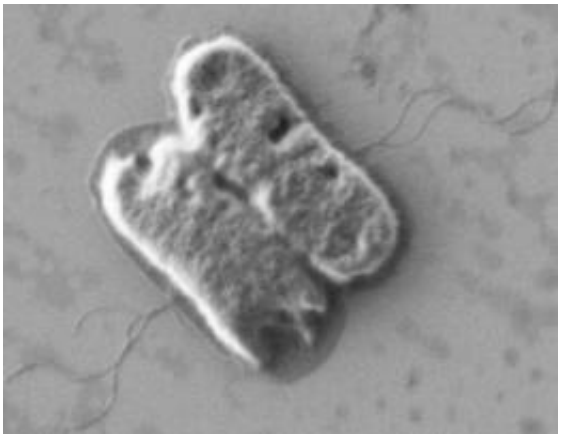
Bile sends mixed signals to E. coli

March 30 2010



Bile salts send 'mixed' signals to E. coli O157:H7 bacteria. Credit: Steve Hamner

Bile secretions in the small intestine send signals to disease-causing gut bacteria allowing them to change their behaviour to maximise their chances of surviving, says Dr Steve Hamner, presenting his work at the Society for General Microbiology's spring meeting in Edinburgh today. The findings could allow us to better protect food from contamination by these harmful bacteria, as well as understand how they manage to cause disease.

Bile is secreted into the small intestine and exerts an antibacterial effect by disrupting bacterial membranes and damaging bacterial DNA. While bile is a human defence mechanism, Dr Hamner and colleagues from Montana State University and the University of New England found that some bacteria such as Escherichia coli O157:H7 - an important food-

borne pathogen - have evolved to use the signal to their advantage. These bacteria use the presence of bile as a signal to tell them that they are in the intestine which allows them to adapt and prepare to cause disease.

Dr Hamner's team found that bile causes the bacteria to switch on genes needed to increase iron uptake. "This is useful in iron-scare environments - such as the small intestine - as iron is an essential nutrient for bacterial growth. By increasing its chances of absorbing iron, the bacterium is maximising its survival chances," he explained.

E. coli O157:H7 primarily infects the large intestine and this study provides one explanation why this is the case. "We found that bile causes the bacteria to turn off genes that promote tight attachment to host cells. Bile may effectively prevent these bacteria from latching onto the epithelial cells that line the small intestine," suggested Dr Hamner. As bacteria move further down the digestive tract towards the large intestine, the concentration of bile decreases. "The reduced concentration of bile in the large intestine may then be a signal for the bacteria to switch on their ability to attach to epithelial cells and to prepare to secrete toxins," he said.

Studying the conditions that make these bacteria more likely to attach themselves to cells could help reduce outbreaks of food poisoning. "By learning how the bacteria attach to food surfaces such as spinach leaves or to host tissues such as the lining of the intestine, we hope to better be able to protect food sources from contamination by these bacteria. Studying how these bacteria interact with hosts such as humans or cows could teach us how to interfere with the way that these bacteria cause disease," said Dr Hamner.

Provided by Society for General Microbiology