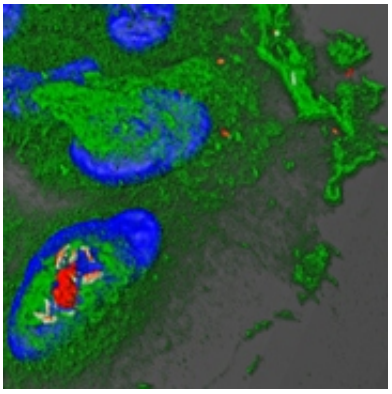
Oxygen radicals defend the intestine against gastroenteritis

August 21 2012



(Medical Xpress) -- The findings of new research from UCD Conway Institute and the National Children's Research Centre shows oxygen radicals are the first line of defence against gastroenteritis caused by Campylobacter organisms.

Oxygen free radicals, also known as reactive oxygen species (ROS), are well known to be important in killing bacteria that have been engulfed by phagocytes. However, what triggers their action and how they impact on pathogens on mucosal surfaces such as the intestine has been unclear until now.

For the first time, Conway Fellows, Professors Ulla Knaus and Billy

Bourke demonstrate that ROS interfere with the signalling process needed to produce the protective capsule around Campylobacter bacteria. Without this capsule, the bacteria are less capable of causing and sustaining infection.

“This study shows that the presence of Campylobacter on the surface lining of the intestine triggers the release of ROS by epithelial NADPH oxidise (Nox/Duox) enzymes. What is really exciting about our results is that the released ROS don't directly kill the pathogens, rather they disable fundamental bacterial processes necessary for pathogenicity”, says Professor Ulla Knaus, UCD School of Medicine Professor of Immunobiology and co-author of the article published in *Cell Host & Microbe*.

“Now that we have evidence that Nox/Duox enzymes activated by Campylobacter in the epithelial barrier are a first line defence against intestinal infection, the next obvious question we want to address is whether this defence mechanism is also active against other causes of gastroenteritis such as E. coli and Salmonella.”

Co-author, Professor Billy Bourke who is a consultant paediatric gastroenterologist in the National Children’s Research Centre & Our Lady’s Children’s Hospital, Crumlin and associate professor of paediatrics in UCD School of Medicine explains, “Infectious diarrhoea is one of the major killers of children worldwide, accounting for more than 20% of all deaths of children under the age of 5 years. Campylobacter infection in particular is the predominant pathogen seen in children.

So, while these experiments provide a novel insight into how the intestine responds to infection, as a clinician I am excited about the possibility of advancing this work so that ultimately we can treat or protect children against infection.”

This research, primarily funded by the National Children's Research Centre and Science Foundation Ireland, raises the possibility of manipulating or interfering with bacterial virulence by altering the redox or oxygenation status of the gut. Additionally, as the bacterial tyrosine kinases shown to be involved in the signalling process disrupted by ROS are different to their host counterparts, they might prove useful new antibiotic targets in the future.

More information: Corcionivoschi et al (2012) Mucosal Reactive Oxygen Species Decrease Virulence by Disrupting Campylobacter jejuni Phosphotyrosine Signaling. *Cell Host & Microbe* 12, 47–59, July 19, 2012 dx.doi.org/10.1016/j.chom.2012.05.018