

A killer punch to infection: Cork scientists find new role for natural killer (NK) cells in gastrointestinal infections

Scientists at the Alimentary Pharmabiotic Centre (APC) in Cork have discovered that specialised immune cells known as natural killer (NK) cells act as regulators of gastrointestinal infections by reducing bacterial numbers and stimulating other immune cells. This research is published today (25 January 2013) in the February issue of the journal "*Infection and Immunity*", where it features in the front cover of the issue.

Bacterial gastroenteritis represent a significant health risk in developing countries and more recently also in western countries (usually from contaminated food). The attachment of the bacteria to the intestinal wall induces an immune response leading to the symptoms of gastroenteritis, including abdominal pain, cramps and diarrhoea.

Natural Killer (NK) cells are white blood cells which are known to have a critical function in immune surveillance against the development of tumours and viral infections, but until now, no role was known in bacterial gastroenteritis. So how do NK cells provide this protective function during gastrointestinal infection?

This research showed that mice lacking NK cells bacterial numbers were significantly higher and there was significant spread of infectious bacteria to other organs including the spleen, liver and kidneys.

"Our studies revealed that NK cells migrate to intestinal tissues during the early stages of infection. We also found that these NK cells were activated, producing a significant amount of immune modulating molecules. In addition, we found that in mice lacking NK cells, other immune populations important for fighting infection, such as B cells (antibody producers) and T cells were not recruited or activated within gut tissues. We also determined that NK cells were able to stimulate cells to produce factors that can kill pathogenic bacteria. An additional and intriguing finding was that that NK cells themselves are able to directly kill *C. rodentium* bacteria" said Silvia Melgar, senior researcher at the APC.

"Although NK cells stimulate the immune system, which leads to the pathology associated with gastrointestinal infection, they are also critical for reducing bacterial numbers. Importantly, NK cells prevent the bacteria spreading to other organs, which may ultimately lead to more severe disease e.g. septicaemia. NK cells therefore play a crucial protective role during enteric infection and may act as a 'global' controller of the immune response against *C.rodentium*" said Lindsay Hall, first author on the publication. Thus the authors have unravelled a novel mechanism to deliver a killer punch to infection-causing bacteria.

The study, funded by Science Foundation Ireland, was carried out by Lindsay Hall, Carola Murphy, Grainne Hurley, Aoife Quinlan, Fergus Shanahan, Silvia Melgar and Ken Nally at the Alimentary Pharmabiotic Centre. Dr Lindsay Hall is now is now a Lecturer in Gastrointestinal Science in the Norwich Medical School, University of East Anglia and a member of the Gut Health and Food Safety strategic research programme at the Institute for Food Research (IFR) in Norwich.

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Reference: [Natural Killer cells protect against mucosal and systemic infection with the enteric pathogen *Citrobacter rodentium*](#) Lindsay J Hall, Carola T Murphy, Grainne Hurley, Aoife Quinlan, Fergus Shanahan, Kenneth Nally and Silvia Melgar, *Infect Immun*. 2013 Feb;81(2):460-469 doi:10.1128/IAI.00953-12

Read Lindsay's Blog at : <http://blogs.ifr.ac.uk/ghfs/2013/01/new-role-nk/>

About the APC

The Alimentary Pharmabiotic Centre, (APC; <http://apc.ucc.ie>) is a research centre funded by Science Foundation Ireland and industry partners. The APC, a partnership between University College Cork, Teagasc, the Irish Agriculture and Food Development Authority, and the Cork Institute of Technology, focuses on research in gastrointestinal health. Pharmabiotic is a neologism devised by the APC to represent any material (including molecules and microbes) originating from the gut ecosystem that can be exploited for a health benefit, and includes probiotics, prebiotics, metabolites, and potential new anti-microbials and anti-inflammatories. The independent international ratings agency Thomson Reuters Science Watch global analysis, has ranked University College Cork at number 2 in the world for probiotics research, due primarily to publications from researchers in the Alimentary Pharmabiotic Centre (<http://sciencewatch.com/ana/st/probiotics/institution/>