Not just a long-distance relationship: Immune cells in skin fight off infection better than the rest

April 7 2009

Scientists at the University of Melbourne have discovered the local action of immune cells in the skin, which could improve treatment of viral skin infections.

This work identifies previously unrecognised first-line defence mechanisms that are particularly important in barrier locations such as the skin and the gut, often used as portals of entry by viruses and bacteria.

Researchers examined two aspects of anti-viral immune responses by studying the cells involved in the initial stimulation of the immune response, and the cells that remember past infections to boost the response after reinfection. They did this by using a model infection with herpes simplex virus - a virus best known for causing cold sores but also associated with life threatening diseases in certain individuals and newborns.

The work was published in two articles in the advanced online March and April editions of the journal Nature Immunology.

The April article details findings on the function of the cells that trigger the initial immune response to viral infection - known as dendritic cells.

"Dendritic cells are like police patrolling our blood and tissues for

anything unusual. There are many different types of them, so we wanted to examine how they differ in their function," said Dr Sammy Bedoui, from the University of Melbourne's Department of Microbiology and Immunology, who is the lead author on the April paper.

Using an animal model of skin infection with the cold sore virus, researchers showed for the first time that a particular type of dendritic cells was responsible for triggering the immune response. These cells do this by presenting virus particles to Killer T cells, which triggers a cascade of immune responses to tackle infection.

The results could not only provide help in the treatment of viral skin infections, but also of auto-immune diseases of the skin such as psoriasis, where dendritic cells trigger the immune system to attack the body's own cells.

The March paper focuses on the stage after infection has subsided, where some cells retain the ability to recognize the shape of the virus or bacteria - understandably called memory T cells.

Again using the animal model of infection with the cold sore virus, researchers found that memory T cells in the skin provide local immunity against pathogens.

"Because the cells are located at the site of infection, they can respond instantly, much faster than other immune cells that have to travel via the blood to the site," said Dr Thomas Gebhardt from the University of Melbourne's Department of Microbiology and Immunology, who is the lead author on the March paper.

"This debunks previous thought that immunity by T cells only occurs at longer distances throughout the body."

Skin-resident memory T cells provide efficient and long-lasting immunity against skin reinfection with the same virus, resulting in better antiviral protection in skin areas harbouring elevated numbers of these cells.

It is proposed that the generation of large numbers of resident memory cells in these organs represents an important goal for future vaccination strategies.

"Vaccines are of interest because we want to prevent the infection taking hold in the first place," said Dr Gebhardt.

"This is especially important with the cold sore virus because while the immune response is developing against the initial infection, the virus can hide away in our nerve cells. The virus then remains dormant until the immune system is weakened by stress and the dreaded cold sore returns."

Source: University of Melbourne