Frontline immune cells can travel for help

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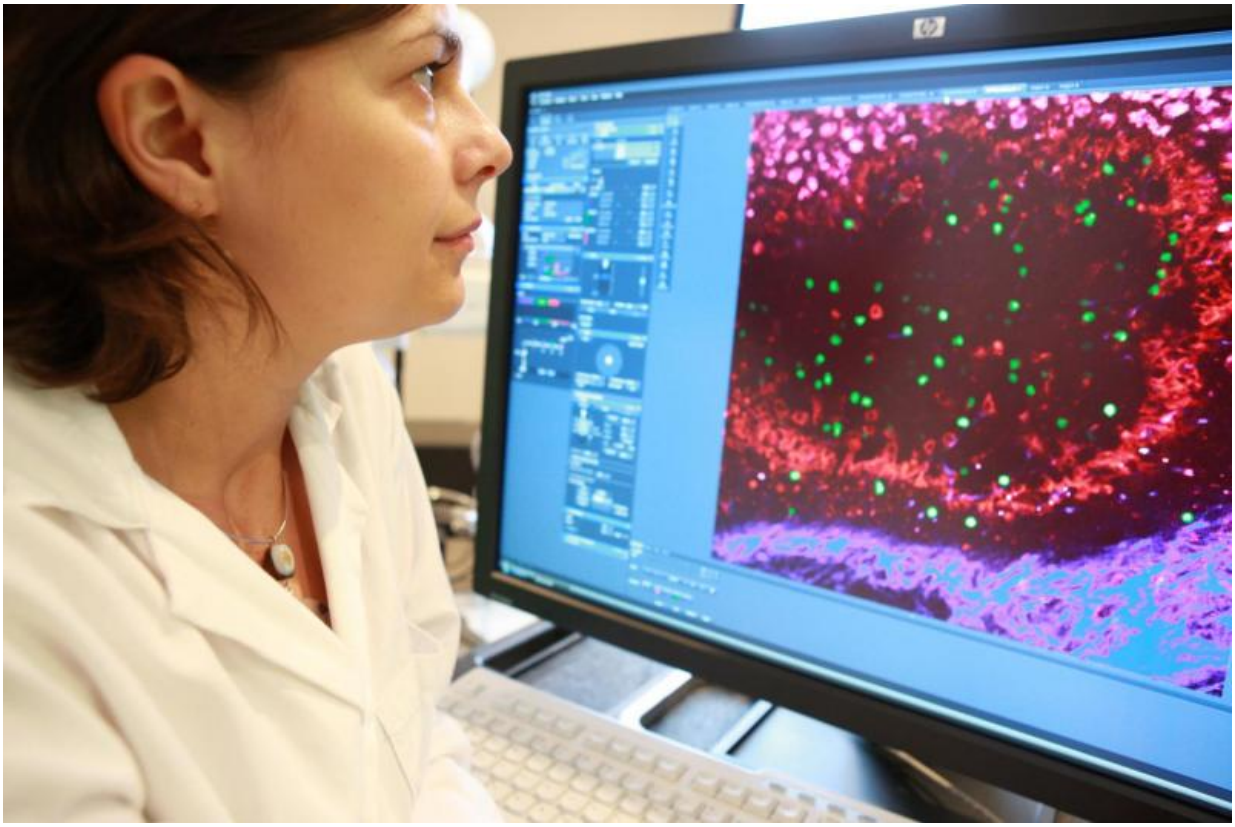

Tatyana Chtanova examines a two-photon microscope image of a lymph node. Credit: Garvan Institute of Medical Research. Photograph by Penelope Clay.

A new Australian study shows that cells which form the bulk of our fast-acting 'innate' immune system behave differently, depending on whether an injury is infected or not.

It is well known that paparazzi-like 'neutrophils' swarm to sites of injury within minutes to undertake damage control and kill invaders. Most have very short lives and self-destruct once their job is done.

Sydney researchers now demonstrate that in certain cases neutrophils can also enlist reinforcements in their fight against pathogens. If the injury is infected, neutrophils seek out accomplices from the slower-acting 'adaptive' immune system by travelling to the nearest lymph node, sometimes carrying a sample of bacteria, or other microbe. This helps prime other types of immune cell for attack.

Using a mouse model expressing photoconvertible proteins in neutrophils, Henry Hampton and Dr Tatyana Chtanova, from the Garvan Institute of Medical Research, showed that neutrophils undertake their journey to lymph nodes within 8 hours of infection. The findings are published today in *Nature Communications*.

To investigate different neutrophil responses, Hampton and Chtanova induced either sterile or bacterial inflammation on the ears of mice. Bright light shone on the site of inflammation changed the colour of 'recruited' neutrophils from green to red.

Cell-sorting technology picked up any colour-converted red neutrophils that had moved from the site of infection to lymph nodes. Two-photon microscopy revealed that neutrophils travelled via the lymphatic system, rather than the bloodstream.

"There have been indirect studies, and speculation, hinting at a downstream role for neutrophils. Thanks to our photoconvertible system, we're the first ones to label neutrophils and see what they actually do, apart from immediate damage control," said project leader Dr Tatyana Chtanova.

"Neutrophils together with T cells will try to clean up infection everywhere, including in the lymph node. Microbes from infection sites can migrate to the lymph node in the lymph stream, separately from neutrophils, so T cell recruitment by neutrophils may help prevent microbial spread.

"We can see that neutrophils bring microbes to the lymph node and that T cells proliferate as a result. While we have yet to identify the exact mechanisms that neutrophils use to communicate with T cells, we did uncover molecules involved in neutrophil migration from infected lesions to lymph nodes.

"In theory, this new finding could help us prevent microbes from exploiting neutrophils as Trojan horses to spread infection. It might also allow us to enhance neutrophil migration, and so generate a faster and more effective anti-microbial response.

"At the very least, the finding helps clarify an aspect of how the innate and adaptive arms of the immune system work together in the initial stages of infection."

More information: *Nature Communications*, www.nature.com/ncomms/2015/150 … full/ncomms8139.html

Provided by Garvan Institute of Medical Research

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