Directing immune traffic -- signposts to the lung

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This is an aerial view of the Trudeau Institute's 42 acre campus. Credit: The Trudeau Institute

Inducing cellular immunity as a means to protect against influenza virus is the focus of several laboratories at the Trudeau Institute. Researchers here have recently identified two important signaling components required by the immune system that might allow us to pre-position our own virus-fighting T cells to the lungs, the site of initial infection.

In laboratories around the world, researchers are working diligently to gain the upper hand in the ongoing struggle against the influenza virus. In 2009, with the emergence of H1N1 as a global threat, the scientific community was reminded how destructive the virus can be and how quickly a threat of its type can be transported across oceans and vast landmasses.

Clearly a new strategy is required to protect against this elusive virus.

Current methods, which involve guesswork to determine the most likely strain and then setting about to develop a yearly vaccine, are both antiquated and time-consuming.

"It has become apparent that protective cellular immunity to viruses like influenza requires white blood cells to be pre-positioned in the lungs, the site of initial infection," says David L. Woodland, project leader and president of the institute. This approach has led to efforts to develop vaccines that persuade cells to localize in the respiratory tract. "That, however, has turned out to be difficult, because we don't fully understand the signals that direct immune cell migration to distinct locations in the body," Dr. Woodland added.

Woodland and colleagues have begun to shed light on this important question. They report in the current issue of the Journal of Experimental Medicine that two distinct signals are required to instruct virus-fighting white blood cells, known as T cells, to migrate into the lungs.

The first T cell is residual antigen (needed to stimulate antibodies) that remains in the lymph nodes for weeks after the initial infection has been cleared. The second is an "imprinting event" that instructs the T cells to specifically seek a target organ (in the case of flu, the lung). This imprinting event directs the T cells to where the original infectious agent entered the body and, importantly, where the cells need to go to fight future infections.

This new information has major implications for future vaccine research and could lead to the development of vaccines designed to promote immunity to respiratory infections.

Researchers are hopeful that, with further study, it may be possible to protect the population by prepositioning flu-fighting T cells in the lungs so they are in place when the body needs them.

Provided by Trudeau Institute