# New research may lead to better flu vaccine

February 27 2008

New research from a scientist at the University of Tennessee, Knoxville, has uncovered information that may someday lead to a better flu vaccine.

While the research is an early step toward a better vaccine, the findings from Mark Sangster, a professor of microbiology, track a little-understood immune system cell's response to an influenza infection and reveal new information about where it is most concentrated in the body.

By analyzing the formation of the cells, known as memory B cells, Sangster and his colleagues may better understand how to stimulate their production by vaccination.

"When we see how these cells are formed in response to a full-on infection of the flu, we get a picture of the gold standard of the immune response and protection," said Sangster, who co-authored the paper with graduate student Hye Mee Joo and postdoctoral researcher Yuxia He.

At the heart of the research, said Sangster, was learning where memory B cells reside after an infection of the flu, and how many are in each location. The cells are created when the immune system responds to infection, and act as a sort of "first responder," specially tailored to the specific type of virus that triggered their creation.

When the body is faced with the flu again, these cells quickly begin making antibodies that fight the flu virus.

"By knowing where these cells reside after an infection, we can learn what this means in how they may respond to subsequent exposure to the virus," said Sangster. "It gives us a standard that we can use to evaluate and tailor how the body responds to vaccines."

One finding that surprised Sangster was that the memory B cells were found in especially high concentrations in the lungs -- organs not usually associated with an immune response.

"What we found is that the lungs are a complex and potentially very useful reservoir of immunological memory," he said.

B memory cells are much less understood than their immunological cousins known as T cells. According to Sangster, technological developments have made it easier to study T cells, leaving B cell discoveries slower in coming.

The findings, published in this week's online version of the *Proceedings of the National Academy of Sciences*, lay important groundwork for future flu vaccine research, said Sangster.

Since vaccines use either weakened or dead copies of the flu virus to trigger the body's immune system into responding, the body's response to the virus in the vaccine is different and less powerful than its response to a full-on infection.

"With this understanding of memory B cell formation in response to a full-on infection, we have a model for vaccines in the response that they generate," Sangster said.

He said one of the next steps will be to look at any differences in how memory B cells are formed by vaccines given by injection versus those inhaled through the nose. He noted that those differences may provide

more clues about the significance of the pool of memory B cells in the lungs.

"The Holy Grail for all of this is to develop a vaccine that will protect against a wide range of subtypes and strains of the flu virus," said Sangster. "We're not there yet, but this knowledge is a step in that direction."

Source: University of Tennessee at Knoxville