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Obesity impairs body's 'memory' of how to fight flu: study

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(PhysOrg.com) -- Obesity may limit the body's ability to develop immunity to influenza viruses, particularly secondary infections, by inhibiting the immune system's ability to "remember" how it fought off previous similar bouts of illness, according to new research from the University of North Carolina at Chapel Hill.

The results, published in the March 15, 2010, issue of *The Journal of Immunology*, support recent suggestions by the Centers for Disease Control and Prevention that obesity is as much a risk factor for H1N1 pandemic strains of flu as age (very young and very old) and compromised immunity.

Nutrition researchers in the UNC Gillings School of Global Public Health have shown that obese mice are not able to develop protective influenza-specific memory T cells. These cells are generated by the body during an initial influenza infection. They help protect against a second infection by targeting internal proteins common among most strains of influenza viruses. Leaner mice were able to develop the infection-fighting T cells and ward off a second bout of influenza.

"Our work suggests that obese people should be considered at high risk for infection," said Erik Karlsson, doctoral candidate in nutrition and lead author of the study.

The researchers infected lean and obese mice with a mild influenza virus . The lean mice had been fed a low-fat diet, and obese mice had been fed

a high-fat diet. When the mice recovered from the first bout of flu, they were infected a second time, with a larger dose of a more lethal influenza strain.

“We lost none of the lean mice, but 25 percent of obese mice died,” Karlsson said.

This research builds on a study published in *The Journal of Nutrition* in 2007. Melinda Beck, Ph.D., UNC professor of nutrition, is the senior author of both studies.

“In the first study, we compared the response of obese and lean mice to a primary influenza infection,” Beck said. “We found that obese mice had a significantly higher mortality rate than lean mice. In fact, 42 percent of obese mice died, while only 5.5 percent of lean mice died.”

During flu seasons, health-care practitioners often see obese patients who struggle more with influenza viruses than leaner patients. Some researchers and doctors have speculated that excess adipose tissue, or fat, constricts lung volume, or that obesity causes chronic inflammation, which influences the immune response.

However, Beck and her colleagues hypothesized the illness’ increased severity may be due to lower memory T cell defenses in obese patients.

“In a healthy individual, memory T cells would be produced during the initial influenza infection,” she said. “Those cells help protect the individual from a second infection. The response is different from a vaccine, which produces antibodies against a specific strain. The memory T cells target internal proteins common to all strains of the virus. But if the body can’t produce these T cells during a primary infection, then the individual has decreased protection from a second infection if the antibody response is not targeted towards the infecting

strain."

The new study, by Karlsson, Beck and Patricia Sheridan, Ph.D., UNC research assistant professor of nutrition, shows strong evidence that obesity restricts memory T cell function.

"This kind of novel research could influence public health by changing our views of what the risks factors of obesity are," Karlsson said. "The risks are potentially much more complicated than we've thought."

The next step in Beck's research on obesity effects on influenza is to examine vaccination. In collaboration with researchers in the UNC School of Medicine, Beck's laboratory is running a large National Institutes of Health-sponsored human clinical trial to test the efficacy of influenza vaccination in obese adults.

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More information: The Journal of Immunology Web site: www.jimmunol.org/

Provided by University of North Carolina at Chapel Hill