

Study: Obesity limits effectiveness of flu vaccines

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People carrying extra pounds may need extra protection from influenza.

New research from the University of North Carolina at Chapel Hill shows that [obesity](#) may make annual flu shots less effective.

The findings, published online Oct. 25, 2011, in the [International Journal of Obesity](#), provide evidence explaining a phenomenon that was noticed for the first time during the 2009 H1N1 [flu outbreak](#): that obesity is associated with an impaired immune response to the [influenza vaccination](#) in humans.

"These results suggest that overweight and obese people would be more likely than healthy weight people to experience flu illness following exposure to the flu virus," said Melinda Beck, Ph.D., professor and associate chair of nutrition at the UNC Gillings School of Global Public Health and senior author of the study.

"Previous studies have indicated the possibility that obesity might impair the human body's ability to fight flu viruses. These new findings seem to give us a reason why obese people were more susceptible to influenza illness during the H1N1 pandemic compared to healthy weight people."

The study reports for the first time that influenza vaccine antibody levels decline significantly in obese people compared to healthy weight individuals. What's more, responses of CD8+ T cells (a type of white blood cell that plays a key role in the body's immune system) are

defective in heavier people.

Researchers studied people at a UNC clinic who had been vaccinated in late 2009 with inactivated trivalent influenza vaccine, the common [flu vaccine](#) for that fall and winter season. Although obese, overweight and healthy weight individuals all developed antibodies to [flu viruses](#) within the first month after vaccination, the antibody levels in the blood declined more rapidly in obese and [overweight individuals](#) over time.

About 50 percent of obese participants had a four-fold decrease in antibody levels at 11 months compared to one month post vaccination. However, less than 25 percent of healthy weight participants had a four-fold decrease in [antibody levels](#).

Also, when study participants' blood samples were tested in the lab and exposed to a [flu virus](#) 11 months after vaccination, about 75 percent of healthy weight people's CD8+ T cells still expressed interferon- γ , an infection-fighting protein. However, only about 25 percent of obese patients' cells responded by producing the protein.

When vaccination fails to prevent flu infection, people must rely in part on their CD8+ T cells to limit the spread and severity of infection, said Patricia Sheridan, Ph.D., research assistant professor of nutrition and an author on the paper.

"If antibody titers are not maintained over time in the obese individuals and memory CD+ T cell function is impaired, they may be greater risk of becoming ill from influenza," Sheridan said.

Heather Paich, a doctoral student in Beck's lab, added: "The findings also suggest overweight and obese people are more likely to become sicker and have more complications. That's because influenza-specific CD8+ T cells do not protect against infection, but instead act to limit the

disease's progression and severity of disease."

In 2005, Beck and her colleagues reported that obesity in mice impaired the animals' ability to fight influenza infections and increased the percent dying from influenza, compared to lean mice with the same infections. In 2010, her team showed that obesity seemed to limit the mice's ability to develop immunity to influenza, suggesting vaccines may not be as effective in obese and overweight as in [healthy weight](#) humans. Also, the fatality rate was higher in obese mice – none of the lean mice died, but 25 percent of the obese mice died.

"This latest study shows that obese people may have a similar impaired response to influenza vaccines as our mouse models did to influenza virus," Beck said. "We need to continue to study the effect of obesity on the ability to fight virus infections. Influenza is a serious public health threat, killing up to half a million people a year worldwide. As rates of obesity continue to rise, the number of deaths from the flu could rise too. We need to better understand this problem and to look for solutions."

More information: www.nature.com/ijo/index.html

Provided by University of North Carolina School of Medicine

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