

Moderate exercise improves immune response in breast cancer survivors

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A new study in breast cancer survivors has found that chemotherapy, while a critical part of breast cancer therapy, may also have some lasting dampening effects on natural immunity, but moderate fitness improvements can offer some protection against this effect.

Ohio State University researchers assessed participants' [immune](#)

[response](#) to a typhoid vaccine, which was used in the study to stimulate the [immune system](#) in the same way unfamiliar disease-causing bacteria or viruses do.

The study measured same-day changes in inflammatory proteins and white blood cells that occurred during the women's innate [immune response](#)—the first line of defense when an unrecognized substance invades the body. While all study participants produced the expected signs of inflammation after receiving the vaccine, three conditions led to a smaller response: previous chemo treatment, greater abdominal obesity (belly fat), and a low [fitness level](#).

The fitness-related findings, however, also showed that participants whose fitness level exceeded the average by just a bit—as measured by peak oxygen consumption during exercise—produced a significantly larger immune response.

"As a group, [breast cancer survivors](#), on average, have a lower level of fitness than their peers. In this study, women representing the average were in a low fitness category. Even within this group, moderate differences in fitness were associated with a better vaccine response," said lead author Janice Kiecolt-Glaser, director of the Institute for Behavioral Medicine Research (IBMR), professor of psychiatry in the College of Medicine and a member of the Comprehensive Cancer Center at Ohio State.

"It's important to tell breast cancer survivors, and others, that this doesn't mean you have to be at an Arnold Schwarzenegger level of fitness to benefit innate immunity. Relatively mild fitness can make a difference in response to a vaccine, and probably in response to an infection in real life."

The research is published in the journal *Brain, Behavior, and Immunity*.

Of the 158 postmenopausal participants, 108 had received chemo treatment between one and 10 years before the study began. Researchers assessed the women for central obesity based on abdominal fat composition and cardiorespiratory fitness level based on their maximum oxygen consumption while riding a stationary bike.

The uniform dose of the typhoid vaccine functioned as a model immune challenge, Kiecolt-Glaser said, which offered a window into how breast cancer survivors' innate immunity would respond to a viral or bacterial pathogen. Participants received either the vaccine or placebo over the course of two visits. As expected, the vaccine produced a significantly higher inflammatory response than the placebo.

To gauge the participants' natural immune response in the 7 1/2 hours after vaccination, researchers measured levels of two pro-[inflammatory proteins](#), IL-6 and IL-1Ra, and white blood cells in blood draws taken every 90 minutes and compared them to pre-vaccination levels.

"We are born with innate immunity. As soon as you inject something that's foreign, you're going to stimulate these responses," said study co-author John Sheridan, associate director of the IBMR and professor of biosciences in Ohio State's College of Dentistry. "You need that inflammatory response, which is associated with immediate protection, to ultimately generate the other forms of the adaptive immune response.

"Anything that knocks down the early proinflammatory response puts you at risk for delayed development of adaptive immunity."

The adaptive immune response is specific to invading pathogens and is carried out by neutralizing antibodies and specialized white blood cells called T cells and B cells.

After controlling for participants' baseline differences in inflammatory

markers, the results showed past chemo treatment, greater abdominal obesity and lower fitness were associated with lower IL-6 and white blood cell responses. Prior chemo had the strongest effect—generating 44% and 35% lower levels of IL-6 and [white blood cells](#), respectively, than levels produced by participants who did not receive chemo. This effect was consistent, regardless of how long ago the women had undergone treatment.

More promising, however, were results showing that a fitness level just slightly above the average increased IL-6 and the white blood cell count by at least 33%.

Kiecolt-Glaser said the study has important public health implications: greater awareness that innate immunity against infections may be reduced in breast cancer survivors even 10 years out from chemo treatment, and the health upside for just about anybody to engaging in a daily walk—or even sitting less.

"The paper gives us more data in terms of why cancer survivors may have additional risks," she said. "And the findings send a clear message of just how important physical activity and minimizing belly fat is for robust immune function among breast cancer survivors, and particularly for those who received chemotherapy."

Kiecolt-Glaser also said that routine vaccinations, as recommended by a physician, are important for maximizing protective immunity in breast cancer survivors.

"Chemotherapy is life-saving for so many [breast cancer patients](#), but there is a trade-off with some long-term side effects," said Dr. Peter Shields, deputy director of the Comprehensive Cancer Center. "While we do not know if the immune effects in this study translate to actual later illness, exercise is an important antidote."

More information: Janice K. Kiecolt-Glaser et al, Breast cancer survivors' typhoid vaccine responses: Chemotherapy, obesity, and fitness make a difference, *Brain, Behavior, and Immunity* (2022). [DOI: 10.1016/j.bbi.2022.03.019](https://doi.org/10.1016/j.bbi.2022.03.019)

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