Exercise can increase the number of immune cells in the bloodstream of cancer patients

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Exercise decreases the risk of cancer and reduces side effects of cancer treatments. In addition, it improves patients' quality of life and the prognosis of cancer patients. This is according to two new Finnish

studies.

"It was previously thought that cancer patients should just rest after a cancer diagnosis. Today, we have more and more researched information that exercise can even improve the prognosis of cancer. However, it is not yet fully known how exercise controls cancer," explains Research Assistant Tiia Koivula.

Previous preclinical studies have found that exercise affects the functioning of the immune system so that more immune cells are transferred to the tumor site and they become more active in destroying cancer cells. Two studies conducted at the Turku PET Center of the University of Turku in Finland aimed to find out whether a short exercise bout affects the mobilization of immune cells in cancer patients.

10 minutes of exercise were enough

The two studies involved 28 recently-diagnosed lymphoma and breast cancer patients. The lymphoma patients were between the ages of 20 and 69 and the breast cancer patients between the ages of 37 and 73. The studies were published in *Frontiers in Physiology* and *Scientific Reports* in January and April 2023.

During the study, the patients did a 10-minute exercise on bicycle. Blood samples were taken once before the exercise and twice after the exercise.

"The pedaling resistance was determined individually for each patient so that it corresponded to light or moderate physical activity. The most important goal was that the patients were able to pedal for 10 minutes straight without exhaustion, but so that their heart rate increased," Koivula says.

The researchers analyzed the number of several different immune cells, which are also known as white blood cells, from the blood samples and compared the numbers in samples before and after the exercise.

Exercise increased the number of immune cells capable of destroying cancer cells

During the exercise, cytotoxic T cells and natural killer cells increased in the bloodstream of lymphoma patients.

In breast cancer patients, the exercise also increased the total number of white blood cells, as well as the number of intermediate monocytes and B cells in addition to the cytotoxic T cells and natural killer cells. The change was quick and transient and, in most of the patients, the number of immune cells returned to a level corresponding to the resting value in the blood samples that were taken 30 minutes after the end of the exercise.

"It is especially interesting that we saw an increase in cytotoxic immune cells during the exercise in both patient groups. These immune cells are capable of destroying cancer cells," Koivula notes.

The researchers also found a link between the intensity of exercise and the change in the number of immune cells in both patient groups. The more the patients' heart rate and blood pressure increased, the more immune cells were transferred into the bloodstream.

"Although our results indicate that the higher the exercise intensity is, the more immune cells are transferred from their storage organs into the bloodstream, it is notable that also light or moderate intensity exercise lasting for only 10 minutes will cause an increase in the number of immune cells which are important for fighting cancer," Koivula says.

Koivula says that it is important for patients to find a physical exercise that they enjoy.

"Cancer treatments can make you tired and lower your motivation for exercise, which is why it is comforting to know that just 10 minutes of cycling or walking to a supermarket, for example, can be enough to boost the body's immune system."

Does exercise transfer immune cells to the tumor?

Tiia Koivula states that, based on the studies, it is not yet known where the immune cells enter the bloodstream and where they go after the exercise.

"Further research in cancer patients is needed to study whether the immune cells are transported to the tumor after the exercise, where they could destroy cancer cells. This has been shown to happen in preclinical studies, but research in cancer patients is still rather incomplete," Koivula says.

Cancer treatments often affect the immune defense by reducing the number of immune cells. When the immune system weakens, the boosting role of exercise can be especially important.

More information: Tiia Koivula et al, Acute exercise mobilizes CD8+ cytotoxic T cells and NK cells in lymphoma patients, *Frontiers in Physiology* (2023). DOI: 10.3389/fphys.2022.1078512

Tiia Koivula et al, The effect of acute exercise on circulating immune cells in newly diagnosed breast cancer patients, *Scientific Reports* (2023). DOI: 10.1038/s41598-023-33432-4

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