

Aerobic exercise, an anti-metastasis shield

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An Israeli study reports that intense exercise increases the use of glucose by the organs of the body and at the same time deprives cancer cells of this essential nutrient for the formation of metastases.

A very large number of studies have shown that physical exercise reduces the development and recurrence of several types of cancer, including those most commonly diagnosed in North America (breast, colon, prostate).

This preventative effect is likely a consequence of the many beneficial effects of exercise on human physiology, including decreased steroid hormone levels, improved immune response, decreased inflammation, and improved metabolism of glucose via improved insulin sensitivity.

These metabolic effects are particularly important given the enormous importance of glucose as an energy source for moving muscles.

COMPETITION FOR SUGAR

A recent study suggests that this greed of the muscles for glucose creates metabolic pressure on other organs of the body, in particular those which are privileged sites for several cancers to spread in the form of metastases (lungs, liver, lymph nodes) (1).

By examining in detail the variations in the metabolism of these cells by a cutting-edge biochemical approach, proteomics, the researchers found that high-intensity aerobic exercise increased the levels of several proteins specialized in the capture and use of glucose, at the same time increasing the energy consumed by these organs.

This adaptation is very interesting, insofar as we have known for several years that cancer cells are extremely dependent on a sustained energy supply to ensure their growth, very often in the form of glucose (what is called the Warburg effect).

It is therefore possible that the greater use of this glucose by the organs of the body following intense exercise leads to competition with cancer cells and may deprive them of an essential element for the establishment of metastatic colonies within of these organs.

ANTI-METASTASIS EXERCISE

Two main observations made by the group of researchers support this possibility. First, the analysis of a cohort of 3,000 people followed for twenty years revealed that those who regularly engaged in high-intensity aerobic physical activity (running, soccer, tennis, cross-country skiing) had a risk of developing metastatic cancer decreased by 72% compared to sedentary people.



This protection is much more pronounced than that observed in most studies for localized cancers (30-35%), suggesting that the metabolic adaptations induced by intense exercise could create a form of "anti-metastasis shield", particularly effective in preventing the progression of advanced forms of these diseases.

These results are confirmed in an animal model of melanoma, one of the cancers with the greatest metastatic potential.

The researchers observed that in mice subjected to an intense aerobic exercise protocol before injection of the cancer cells (high-speed carousel sessions 20 minutes a day, for 2 months), the presence of metastases in the lungs, lymph nodes lymph and liver was significantly reduced compared to sedentary mice.

This decrease was correlated with a greater use of glucose by the cells of these organs and a parallel decrease in the metabolism of cancer cells.

Overall, these results therefore indicate that high-intensity exercise reprograms the metabolism of all the cells of the body, creating at the same time a tumoral microenvironment resistant to the establishment of metastatic colonies which, it should be remembered, remain the main cause cancer-related mortality.

Another example showing that the many positive metabolic and physiological effects of physical exercise remain the main weapon at our disposal to prevent cancer.

- (1) Sheinboim D et al. An exercise-induced metabolic shield in distant organs blocks cancer progression and metastatic dissemination. *Cancer Res.* 2022 ; 82 : 4164-4178.