

## Exercise is great for immunity!

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*A very interesting and complex study published in the prestigious journal Nature shows that movement promotes the maturation of immune cells in the bone marrow, which creates a reservoir of lymphocytes ready to defend the body against attacks by microorganisms.*

Regular exercise has several positive effects on the immune system. For example, regular, moderate-intensity physical activity reduces chronic inflammation, promotes the circulation of cells involved in the response to pathogens, improves the activity of these immune cells, and slows the gradual loss of effectiveness of the immune system that occurs during aging.

This modulation of the immune system seems to have concrete impacts on the response to pathogens.

For example, a systematic review of 14 randomized clinical trials (1377 participants in total) found that the duration and severity of common respiratory infections like colds, flu, and sore throats were reduced in people who are physically active (1).

The impact of regular exercise on infections like COVID-19 has not yet been studied, but it can be surmised that improved immune efficiency, combined with the creation of a less inflammatory environment, could protect from more severe forms of the disease which are caused by an exaggerated inflammatory reaction (cytokine storm) which destroys lung cells and blood vessels.

### STIMULATE THE BONE MARROW

A study recently published in the prestigious *Nature* provides a better understanding, at the cellular and molecular levels, of this close link between exercise and immunity (2).

Researchers have found that during exercise, the mechanical forces exerted on the bones are detected by the blood vessels inside those bones at the periphery of the bone marrow. This mechanical signal has two different, but complementary effects:

1. On the one hand, there is stimulation of stem cells specialized in the production of new bone cells, which could explain why several studies have shown that exercise improves bone stiffness;
2. On the other hand, these bone stem cells simultaneously produce a factor that stimulates the growth of precursors of immature immune cells.

In response to movement, therefore, a reservoir of immature immune cells is formed which can be rapidly mobilized as B and T lymphocytes to neutralize infections.

These two populations of stem cells, both those responsible for the formation of new bone cells and the precursors of immune cells, decrease significantly during aging, and it is possible that this phenomenon



contributes to bone fragility and the reduction of immune efficiency often seen in the elderly.

On the other hand, the researchers observed that when the older animal models were subjected to sessions of regular exercise (exercise wheel placed in the cage of the mice), the populations of the two types of stem cells increased at the level of the bone marrow.

This mechanism could therefore explain why the effectiveness of the immune system is better preserved in older people who exercise regularly.

Regular physical exercise is therefore not only the best way to stay in good physical shape and prevent the development of a host of chronic diseases, whether it is cardiovascular disease, type 2 diabetes, several types of cancer or cognitive decline related to age.

The movement generated during exercise also stimulates the production of immune cells in the bone marrow, creating a niche of lymphocytes that can be recruited in the event of infection and participate in the elimination of the pathogen.

- (1) Grande AJ et al. Exercise versus no exercise for the occurrence, severity, and duration of acute respiratory infections. *Cochrane Database of Systematic Reviews* 2020, Issue 4. Art. No. : CD010596.
- (2) Shen B et al. A mechanosensitive peri-arteriolar niche for osteogenesis and lymphopoiesis. *Nature* (published online, February 24<sup>th</sup>, 2021)