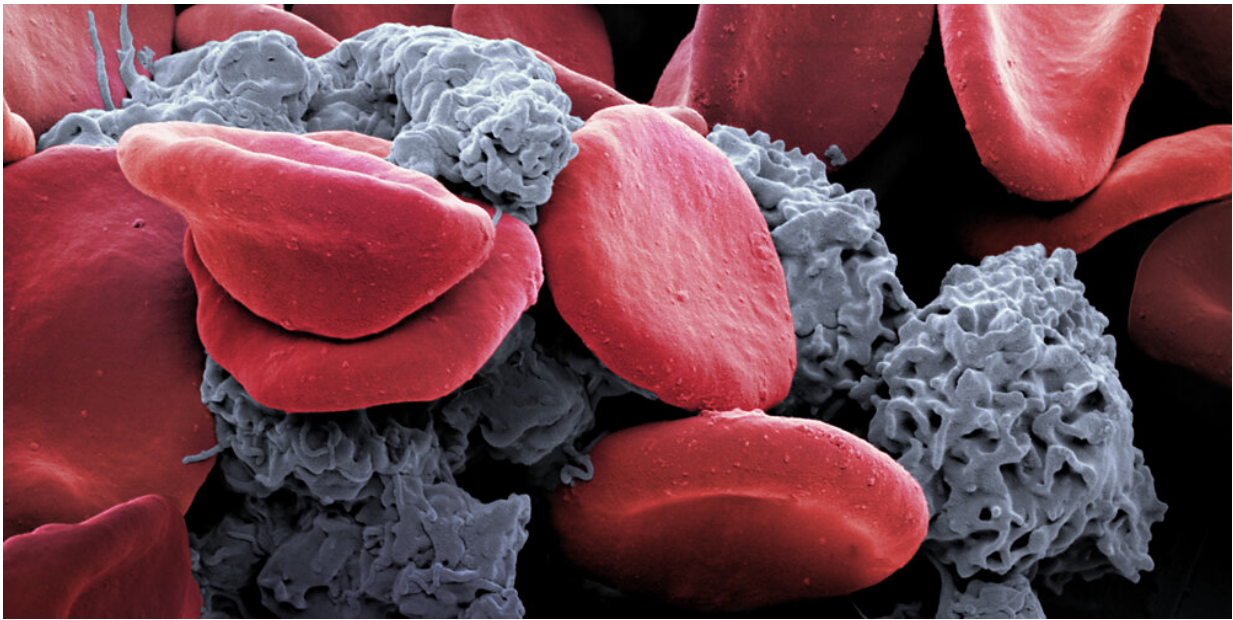


Physical exercise can relieve tumor-associated anemia

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Sports relieves cancer-induced anemia by reducing the destruction of red blood cells (red). Credit: Nano Imaging Lab SNI/Biozentrum, University of Basel

Many cancer patients suffer from anemia leaving them fatigued, weak, and an impaired ability to perform physical activity. Drugs only rarely alleviate this type of anemia. Researchers at the University of Basel have now been able to show what causes the anemia, and that physical exercise can improve this condition.

The two major symptoms of cancer are loss of muscle mass and a reduced hemoglobin level, leading to weight loss, fatigue, lethargy and reduced physical performance. Moreover, both symptoms—atrophy and [anemia](#)—prompt many patients to schedule a doctor's appointment, then resulting in the diagnosis of a tumor. Why cancer causes muscle atrophy and anemia is not yet understood, and treatment is currently difficult.

The fact that anemia leads to a decline of the overall state of health and can negatively affect the course of cancer therapy highlights the urgency to obtain insights into causes and potential remedies. In collaboration with the Department of Biomedicine at the University of Basel, the research group of Professor Christoph Handschin at the Biozentrum has now been able to show in a [mouse model](#) that cancer not only triggers a systemic inflammatory reaction, but also massively changes the handling of lipids and other metabolites in the body.

The body's fight is unsuccessful

These changes result in a tumor-related enhanced destruction of red [blood](#) cells. The study published in *Science Advances* shows that exercise normalizes these metabolic abnormalities and thereby reduces the anemia caused by cancer.

The body tries to counteract the degradation by increasing [red blood cell production](#) in the bone marrow and the spleen—without success. However, the increased production of blood cells is insufficient to prevent tumor-associated anemia. "We have now been able to clarify how [cancer](#) causes the degradation of red blood cells," says Christoph Handschin. "Cancer massively alters the metabolism of lipids and other compounds. This alters not only the red blood cells but also the macrophages, causing a sharp increase in red blood cells destruction by the macrophages." Macrophages are a type of white blood [cells](#) and part of the immune system.

Exercise normalizes metabolism and alleviates anemia

The research group attempted to normalize the metabolism by pharmacological means. However, none of the drugs could significantly improve the anemia. In contrast, however, the metabolism was regulated to such an extent by exercise that the anemia also decreased. Even the abnormal increase in red blood cell production could be reduced to a lower level. "Training was able to restore tumor-induced metabolic remodeling and inflammation sufficiently to blunt the excessive blood cell formation and destruction," explained Handschin.

This study provides novel insights into the development of tumor-associated anemia. The findings suggest that exercise is a useful therapy for [cancer patients](#), in order to counteract anemia and associated fatigue and lethargy and in turn to improve their general well-being and quality of life. This also leads to improved tolerance of radio- and chemotherapy, as has previously been established.

More information: Regula Furrer et al, Remodeling of metabolism and inflammation by exercise ameliorates tumor-associated anemia, *Science Advances* (2021). [DOI: 10.1126/sciadv.abi4852](https://doi.org/10.1126/sciadv.abi4852)

Provided by University of Basel

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