

Magnesium may prime the immune system to fight cancer and infections

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- **Magnesium deficiency has links to a wide range of diseases.**
- **Researchers have now shown in mice how magnesium improves the ability of the immune system to eliminate infected and cancerous cells.**
- **Their analysis of data from clinical studies also suggests that low serum levels of the substance are associated with worse outcomes in cancer treatment.**
- **They plan to investigate the possible benefits of magnesium supplementation during cancer therapy in future clinical trials.**

Experts define [magnesium](#) as an “[essential macromineral](#),” meaning people need to consume it in relatively large amounts to remain healthy.

[Rich dietary sources](#)[Trusted Source](#) of the mineral include almonds, cashews, peanuts, and spinach. [Walnuts](#) also contain a particularly high amount of magnesium, with 100 grams containing 63% of the recommended daily allowance.

Adequate dietary intake of magnesium has associations with healthy bones, lower risk of type 2 diabetes, and better cardiovascular health.

The mineral also plays a key role in muscle contraction, nerve transmission, regulating blood pressure, and immunity.

Previous [research](#) has found that cancer spreads faster in mice on a low-magnesium diet. In addition, the animals have weaker immune defenses against influenza viruses.

However, there has been little research into exactly how magnesium supports healthy immune systems.

Scientists in Switzerland have now discovered that a type of immune cell, called a cytotoxic or “killer” T cell, can only eliminate cancerous or infected cells in the presence of magnesium.

Their study appears in [Cell](#).

Docking Site

The authors found that magnesium activates a protein called LFA-1 on the surface of cytotoxic T cells, which they use to lock on to their target cells.

“[I]n the inactive state, this docking site is in a bent conformation and thus cannot efficiently bind to infected or abnormal cells,” explains senior author [Dr. Christoph Hess, Ph.D.](#), from the University of Basel in Switzerland and the University of Cambridge in the United Kingdom.

“If magnesium is present in sufficient quantities in the vicinity of the T cells, it binds to LFA-1 and ensures that it remains in an extended — and therefore active — position,” he adds.

When the researchers analyzed data from past clinical trials of cancer immunotherapies, they found that low serum levels of magnesium were associated with more rapid disease progression and shorter survival.

“In light of our experimental data and the retrospective analyses we performed on two clinical trials, magnesium deficiency is very likely to be responsible for at least a proportion of the insufficient efficacy seen in cancer patients receiving immune therapy,” Dr. Hess told *Medical News Today*.

Magnesium and enzyme reactions

“The results don’t surprise me,” said [Taylor C. Wallace, Ph.D.](#), of the new study.

Dr. Wallace is senior fellow at the [Center for Magnesium Education & Research](#) in Hawaii, and adjunct professor in the [Department of Nutrition and Food Studies](#) at George Mason University in Fairfax, VA.

“Magnesium is involved with over 600 enzymatic reactions in the body, many of which are involved with immune system function,” he told *MNT*.

However, he questioned whether serum magnesium concentration, which scientists often use to measure an individual’s status with regard to the mineral, is a reliable marker.

He pointed out that in serum, most magnesium is bound to the protein albumin and, therefore, not as freely available for the body as another form known as blood ionized magnesium.

“How extracellular magnesium affects immunity is an exciting and promising area of science,” he told *MNT*.

“However, the research community needs to be concurrently assessing whole blood ionized magnesium (not common in research) to fully understand how diet [or] supplements can influence status,” he added.

Boosting magnesium in tumors

Dr. Hess and his colleagues are now looking at ways to boost the concentration of magnesium in the tumors of patients.

He said that they aim to test whether they can use tiny parcels of fat — either [lipid nanoparticles](#)[Trusted Source](#) or [liposomes](#) — filled with magnesium and coated with antibodies to improve the efficacy of immune therapy.

“In our paper, we show that this is a successful strategy in mice,” he added.

They will also test whether giving magnesium supplements — either in pills or injections — to individuals with cancer can improve outcomes with two immune therapies: [CAR T cell](#)[Trusted Source](#) and [PD1/PDL1](#)[Trusted Source](#) therapies.

“We have clinical trials in an advanced planning stage,” he said.

Their newly published study analyzed data on serum magnesium levels from previous clinical trials, so it was only able to establish an association rather than a causal link between magnesium and treatment outcomes.

It is also unknown whether regular magnesium intake, either through diet or supplements, can reduce the risk of developing cancer in healthy people.