Gut microbes may partner with a protein to regulate vitamin D

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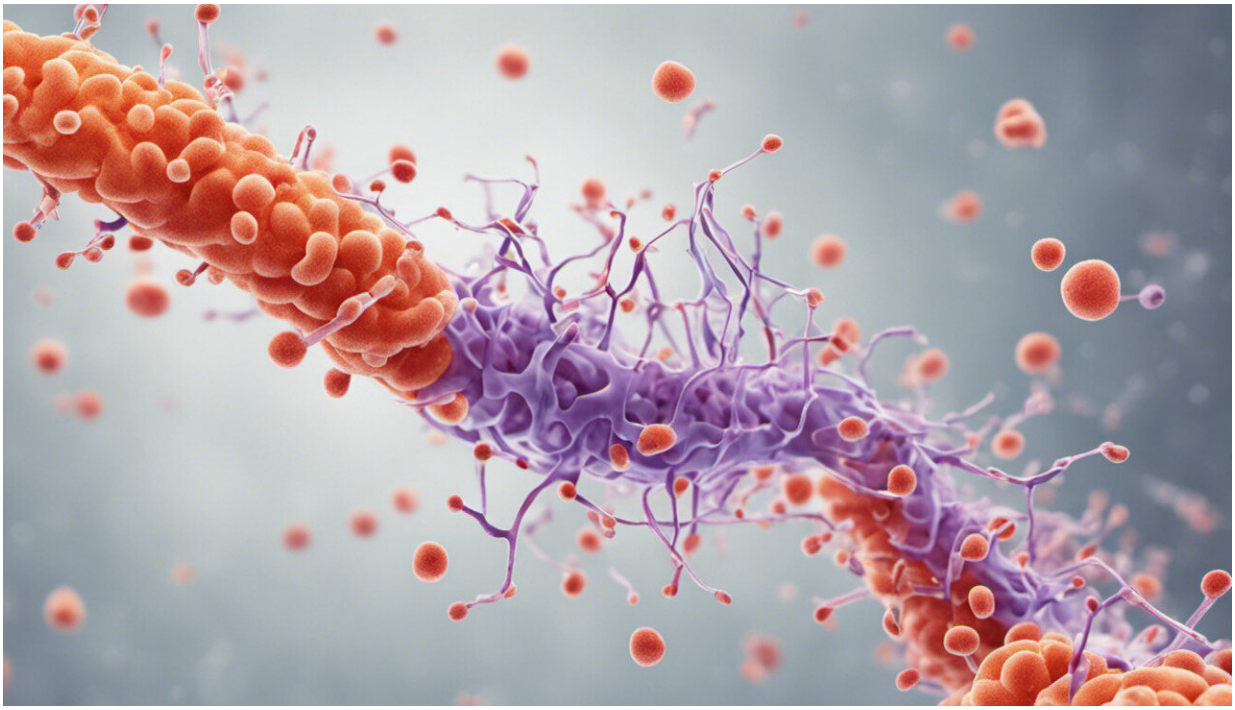

Credit: AI-generated image (disclaimer)

A collection of bacteria in the gut may use a cell-signaling protein to help regulate vitamin D, a key nutrient that, among other benefits, is involved with building and maintaining bones, according to a team of researchers.

In a study on mice, researchers found that microbiota—a community of microorganisms in the gut that can help digest food and maintain immune function—may regulate the metabolism of endocrine vitamin D through a protein called fibroblast growth factor 23, or FGF 23, said Margherita T. Cantorna, distinguished professor of molecular immunology in Penn State's College of Agricultural Sciences. FGF 23 is a protein that sends signals to activate receptors located on the outside surface of cells.

Cantorna said it has been known that the amount of vitamin D in the gut can influence the microbiota.

"When you don't have enough vitamin D, the types of microbes in your gut change," said Cantorna. "Before we did this work, we started to think that this might be a two-way street and that the microbiota may also have an effect on how much vitamin D you had available and how it was utilized by a person."

The researchers used germ-free mice for the study. They measured the levels of different types of vitamin D in the mice at different times as the researchers introduced microbes into their systems during a two-week period.

According to the researchers, the germ-free mice began with low levels of three types of vitamin D—25hydroxy vitamin D, 24,25 dihydroxy vitamin D and 1,25 dihydroxy vitamin D—and with low levels of calcium and high levels of FGF 23 in the bloodstream. After the microbiota were introduced, the mice gradually reached normal vitamin D and calcium levels. The researchers also observed an initial drop in FGF 23 levels before vitamin D normalized.

The researchers, who reported their findings in a recent issue of Frontiers in Immunology, added that the length of time it took to

reestablish vitamin D levels indicated that regulation was an indirect, multi-step process. It suggests that the microbiota does not work directly on increasing vitamin D levels, but instead may be inducing inflammation, which shuts off FGF23 and, in turn, causes a rise in vitamin D levels.

People can acquire vitamin D as part of their diet, often by consuming dairy products and through food fortified with the vitamin. Vitamin D can also be produced in the skin through exposure to ultraviolet light, usually sunlight.

Acquiring vitamin D through sunlight is problematic, however.

"The amount of vitamin D that you make in your skin with sunshine exposure is extremely variable," said Cantorna. "Obviously, you have to go out in the sun, so in some seasons you might not make any; darker skin makes less; and you make less as you age, so it's very difficult to regulate how much you're making in your skin. And there's also skin cancer. Really, for most people, the best way to get vitamin D is to eat it, or eat foods that are fortified with vitamin D."

Cantorna said that this is only a preliminary step and a lot of work must be completed before researchers can say conclusively whether the findings on the microbiota and vitamin D may apply to humans.

"The changes in the microbiota might affect how much vitamin D a person can metabolize, or how the body metabolizes vitamin D, so there are implications, but it's still early and that remains to be seen," said Cantorna.

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