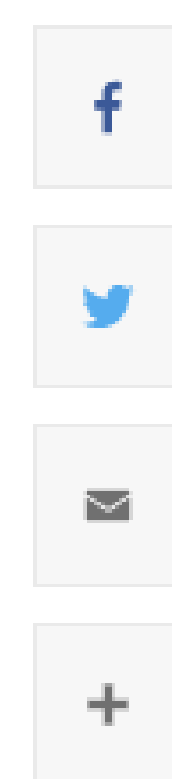


Researchers look to gut microbiome to improve bone health

By [David Nutt](#)

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A Cornell-led collaboration has been awarded a five-year, \$3.6 million grant from the National Institutes of Health to explore the ways that the gut microbiome – that mass of microorganisms inside us all – impacts bone quality. Their findings could potentially lead to the creation of a microbiome-based therapeutic for improving bone health.

The Cornell team is led by principal investigator [Christopher J. Hernandez](#), professor in the Sibley School of Mechanical and Aerospace Engineering, in collaboration with researchers at Tufts University and Rensselaer Polytechnic Institute.

Hernandez came to the gut microbiome in a roundabout way. His research originally focused purely on the biomechanics of bone and orthopedics until seven years ago, when he began to wonder about the outsized influence the gut microbiome has on the body.

“It’s influencing all these different organs,” Hernandez said. “There are recognized relationships between the gut microbiome and diabetes, aging, and some inflammatory disorders. And of course, all of those are associated with osteoporosis and fragility. So I figured there must be some relationship with bone.”

The gut is a crowded place, packed with up to a 1,000 different species of microorganisms. While the bacteria may fluctuate, the overall population remains relatively consistent over time. Early data suggests that a likely mechanism linking this microbial community to bone is vitamin K.

Produced predominantly by the gut microbiome, vitamin K is a necessary component for the function of the protein osteocalcin, which helps glue together the minerals that give bone its mechanical properties, Hernandez said.

Hernandez turned to researchers Sarah Booth and Kyla Shea at the Jean Mayer USDA Human Nutrition Research Center on Aging at Tufts University, who are studying how gut microbes form different types of vitamin K, and Deepak Vashishth, a professor of biomedical engineering at Rensselaer and a leading expert in osteocalcin.

While most researchers and pharmaceutical companies focus on improving bone health and performance by making bone material denser, this project takes a different tack.

“Our data is not suggesting a change in density. It’s suggesting that the gut microbiome is actually regulating the bone material itself and can weaken it,” Hernandez said. “We also have some early evidence to suggest that it can make it stronger too, depending on what gut microbe is involved in changing the bone matrix. And so we’re excited about that because it’s a novel way of improving the bone.”

A therapeutic treatment that targets the gut microbiome would be long-lasting and self-sustaining, so people suffering from osteoporosis, for example, wouldn’t need to take daily pills or injections.

Among the doctoral students in Hernandez’s lab who helped lead the [preliminary research](#) was Marysol Luna, Ph.D. ’20, who, Hernandez noted, was the [first Latina](#) to earn a Ph.D. in mechanical engineering in the Sibley School of Mechanical and Aerospace Engineering.

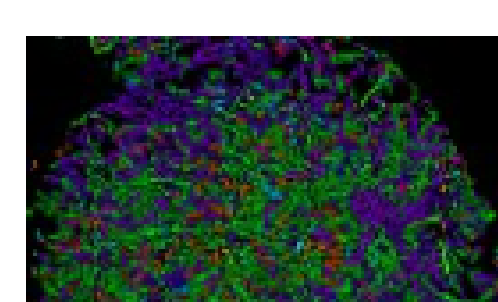
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