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Link found between gut bacteria, successful joint replacement

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Having healthy gut flora—the trillions of bacteria housed in our intestines—could lower the risk of infection following knee and hip replacement surgeries, while an unhealthy intestinal flora may increase the risk of infection.

Over 1 million Americans opt for a knee or hip replacement each year. Infection of an artificial hip or knee is a rare, but debilitating complication. A study by researchers at Cornell's College of Engineering and the Hospital for Special Surgery (HSS) published July 8 in the journal *Clinical Orthopaedics and Related Research* shows gut microbiome health influences the risk of infection. The study of mice is a first step toward understanding the implications for humans.

"This research is in early stages, but if it pans out in humans, it's possible we could change or fix the patient's gut microbiome before they go in for hip or knee replacement and that could further reduce the risk of infection," said Christopher Hernandez, associate professor in the Sibley School of Mechanical and Aerospace Engineering and the Meinig School of Biomedical Engineering, and the paper's first author.

To prevent infection, surgeons take multiple precautions during surgery. As a result, infections following joint replacement surgeries are rare, affecting only 1% of patients who have procedures. However, infections are the No. 1 reason for replacing an artificial knee and the No. 3 cause for replacing an artificial hip.

In the study, the researchers used mice fitted with tiny artificial knees developed by co-authors Dr. Alberto Carli and Dr. Mathias Bostrom, both surgeon scientists at HSS in New York who are also faculty at Weill Cornell Medicine. The Cornell-HSS Program in Biomechanics has linked researchers at HSS with those at Cornell's College of Engineering for over 40 years, resulting in multiple advancements in joint replacement technology.

The mouse knee replacement was originally developed to improve implant design and to study how bone grows into these implants. Carli then advanced the model to study infections.

In normal mice, immune system markers in the bloodstream rise during an infection, as the body responds. But in the study, these markers did not rise in mice with unhealthy microbiomes that also developed infections. The results suggest that mice with unhealthy microbiomes may have compromised immune systems.

In the future, the researchers will investigate whether patients could be prepped ahead of surgery with emerging microbiome-based therapies or a readily available one, such as a regimen of probiotics.

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