Study reveals gut microbes may help protect people having a bone marrow transplant

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Researchers at Memorial Sloan Kettering Cancer Center (MSK) reported results from a new study that looks at the likelihood of complications for people undergoing bone marrow transplants (BMTs). The observational study found that people with lower gut microbiota diversity before having a transplant appear to be at higher risk for developing

complications. These findings further support evidence that the connection between microbiota and outcomes starts before people begin the transplantation process. These findings were presented as part of the 2018 annual meeting of the American Society of Hematology (ASH) press program.

In the analysis, which was led by MSK's Jonathan U. Peled, MD, and Marcel van den Brink, MD, Ph.D., researchers studied 1,922 stool samples from 991 people undergoing allogeneic BMTs. The patients involved in the study, all adults, were treated at MSK and at three other transplant centers: Duke University School of Medicine in Durham, North Carolina; Hokkaido University in Sapporo, Japan; and University Hospital Regensburg in Regensburg, Germany. The samples were evaluated for a range of bacteria types, including commensal strains and those that are known to cause disease.

Researchers found that people preparing to undergo BMT had gut microbiota that was 1.7 to 2.5 fold lower in diversity compared to healthy volunteers. The microbial communities in the majority of the patients' guts were also dominated by a single bacterial species. One of the most serious complications of BMTs is graft-versus-host disease (GVHD). Patients with the lowest microbial diversity showed lower overall survival and a higher risk for GVHD, a condition in which donated cells attack the patient's healthy tissues.

"There are as many bacterial cells as there are human cells in our bodies," says first author Jonathan Peled, an MSK medical oncologist who specializes in BMTs. "These bacteria are really important for the way our bodies function. One of the main findings of this study was that the injury patterns that we saw in people's microbiotas were comparable across geography. This suggests that if we find interventions to correct these imbalances at one [hospital], they will also apply to people being treated in other parts of the world."

Researchers found that, on average, people preparing to undergo BMTs had decreased diversity of bacteria in their guts. They also found that different strains were dominant compared to healthy volunteers. Diversity in microbiota is important because commensal bacteria help to keep more dangerous strains in check. Commensal flora are microbes that live in the body without causing disease, and that may in some cases provide benefits. Previous studies have also shown that certain commensal strains provide specific benefits for people undergoing transplants.

"Patients who went into the BMT process with a gut flora that was already disrupted had a higher risk of death after the transplant," says senior author Marcel van den Brink, Chief of MSK's Division of Hematologic Malignancies. "The thing that we keep coming back to is that preserving the commensal flora in the microbiome is good for transplant patients."

Many scientists who study the gut microbiota refer to it as the "forgotten organ" and assert that it can have a huge impact on someone's health. But researchers are still learning what makes it healthy or damaged, and what can be done to correct that damage.

"Before someone has a BMT to treat their cancer, we do a lot of screening tests to make sure they are otherwise healthy. We look at things like their heart, lung, and kidney functions," Dr. van den Brink says. "This study suggests that we should also screen the microbiota. If we find out that it's in bad shape, we could do something to repair it."

This study did not attempt to determine how gut microbes might influence the transplantation process or lead to complications. Other studies suggest microbes could affect the movement and activation of T cells, which play a key role in BMTs. Dr. Peled says that more research will be needed to assess whether a causal relationship exists and

investigate whether any such effect is related to a decrease in protective bacteria or an increase in harmful species.

"This study opens the door to repairing the microbiota in the pretransplant period," notes Dr. Peled. "Because this is a time when we're usually not in a rush to move forward with treatment, it's also a good time to look for ways to do this before continuing the transplant." Interventions that could improve the health of the microbiota include changes to diet, using or avoiding certain antibiotics, and fecal transplants of healthy gut microbes.

Provided by Memorial Sloan Kettering Cancer Center

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