

Is a Well-Behaved Immune System Key to Successful Transplant Outcomes?

Researcher Kate Markey uses American Cancer Society funding to explore the link between the gut microbiome and chronic graft-versus-host disease after stem cell transplantation.

May 20, 2026 By Fred Hutch News Service and Bonnie Rochman

Eager for some “me time”? Think again. Even when you believe you’re all alone, there are trillions of bacteria jockeying for space on your skin and inside your body, a microscopic community otherwise known as the microbiome.

[Kate Markey, MBBS, PhD](#), has discovered a link between the intestinal [microbiome](#) and chronic [graft-versus-host disease](#) (cGVHD), a common complication of allogeneic stem cell transplants. This type of [bone marrow transplant](#) is used to treat aggressive blood cancers such as [leukemia](#) and involves replacing the immune system of the patient with one from a donor.

Kate Markey, PhD, has discovered a link between the intestinal microbiome and chronic graft-versus-host disease. Courtesy of Fred Hutch/Eric Peacock

“Transplant offers the gift of a cure and improved quality of life but can come with serious complications,” she said.

The new donor-derived immune system can attack the patient’s body, causing chronic GVHD symptoms such as dry eyes and mouth, uncomfortable skin thickening and lung problems that can require oxygen. In extreme cases, patients may eventually die from respiratory failure.

Each year, there are more than 25,000 people globally who receive an allogeneic stem cell transplant (allogeneic transplants rely on donor cells while autologous transplants use a patient’s own cells). Nearly 30% of allogeneic transplant recipients suffer from chronic GVHD. Markey has been researching GVHD for 20 years, since she started working on her PhD examining the role of [cytokines](#), immune system-signaling molecules, and deciphering how the immune system knows what to react to and what to ignore.

Now she’s training her lens on the microbiome and the role it might play in how a person recovers from a transplant, thanks to a new four-year \$946,000 grant from the [American Cancer Society](#).

It appears that damage to the microbiome is associated with poor outcomes for cancer patients, including more GVHD, infections and even earlier death.

“We are trying to answer the question: what levers do we have within the microbiome that we can use to try to improve things for patients?” Markey said.

The immune system is regulated by 50 million different signaling molecules, some of which have been studied for decades. Others come from the microbiome, an emerging focus of research. Scientists are only now starting to understand their significance.

An ecosystem of bacteria

Think of the microbiome as an undervalued “extra organ,” comprised of a community of trillions of tiny bacteria.

“It’s an entire ecosystem that influences health,” said Markey. “A good microbiome will support health from within the gut; it will stop potential pathogens from growing out of control and creating infection. It also produces molecules that get out into the bloodstream and signal to the whole rest of the body — and we are really just starting to understand how we can intervene.”

To measure the complex ecosystem of thousands of different strains of bacteria, researchers use [sequencing technology](#) that has increased in precision and affordability in the last two decades.

“In the last 10 to 15 years, we really have been able to sequence patient samples as well as thousands of stool samples from healthy people, and this has led to a much better understanding of these microbial communities,” said Markey.

In her lab, Markey is combining her expertise in human clinical analyses with mouse models of transplantation to try to learn more about the mechanics of the microbiome. In cancer patients, for example, the [chemotherapy](#) that’s required before transplant and the process of transplant itself can completely upend the microbiome.

“Transplant is a very perturbing event for the microbiome — an earthquake,” Markey said. “We give people chemo and radiation, then they often don’t eat much because they feel so terrible. On top of that, we’ve wiped out the immune system so fevers and infections are common, which means antibiotics and even more microbiome damage. Basically, while caring for the patient, we are doing a terrible job caring for the microbiome.”

Transplant works by resetting the whole immune system; it also wreaks havoc in the microbiome at the same time. Markey is focused on what can be done to limit that microbiome upheaval.

“We probably can’t keep it completely unperturbed, but how can we keep the ship as steady as possible?” she said. “For transplant to be successful, we want someone’s cancer to not come back, we want someone to avoid suffering from infections because their immune system didn’t come back online, and we want the immune system to behave itself and not cause GVHD and attack the patient’s body.”

Getting the immune system to behave

Just like a parent trying to get an unruly child to cooperate, Markey is focused on limiting immune upheaval.

“Having a well-behaved immune system is what we’re looking for because even a mildly misbehaving immune system can end up with someone getting GVHD, which itself causes a lot of symptoms, but also leads to treatment with steroids, which can compromise the immune system even further,” she said.

Markey’s research has already found that some molecules made by the intestinal microbiome — known as [short-chain fatty acids](#) (SCFA) — can prevent cGVHD from developing because they keep the immune system behaving as it should post-transplant. But she’s also found that people who tend to develop cGVHD have a relative loss of the short-chain fatty acids in their blood. In other words, these molecules aren’t being churned out efficiently. The big question is why.

“I’ve spent the last six years in the lab working on that,” Markey said.

One of her findings is that SCFA control the development of [B cells](#), which make antibodies.

“Short-chain fatty acids seem to keep B cells behaving more normally,” she said. “They stop them from going rogue and making the wrong type of antibodies. That is not a pathway we have known about before.”

Markey’s ACS grant will help her lab dive into the details of why and how. She will rely on two unique mouse models of cGVHD to investigate short-chain fatty acids (butyrate and propionate) that regulate immune function. Defining the specific pathway that these SCFA use to control the B cells after transplant could lead to the identification of new preventive strategies for cGVHD.

“We know that the short-chain fatty acids are depleted because the microbiome has become abnormal, and we see that B cells are out of control and making the wrong kinds of antibodies,” she said. “What we care about is the specifics of signaling. We want a clear understanding of how to target these cells in humans.”

Could certain foods, supplements or medication regimens help?

“It might be that we can replace particular bacteria that get lost in the post-transplant chaos, or maybe we could give metabolites, small molecules, as drugs, or maybe a precise dietary strategy could help — maybe it’s a combination of things,” Markey said.

“Patients who go through transplant already go through so much,” she said. “If we want to ask people to do something new — eat this, take this pill, come to clinic for this infusion — we have a responsibility to develop really good science behind that ask.”

Bonnie Rochman is a senior editor and writer at Fred Hutch Cancer Center. A former health and parenting writer for Time, she has written a popular science book about genetics, "The Gene Machine: How Genetic Technologies Are Changing the Way We Have Kids—and the Kids We Have. Reach her at brochman@fredhutch.org.

[This article](#) was originally published April 29, 2026, by Fred Hutch News Service. It is republished with permission.

© 2026 Smart + Strong All Rights Reserved.

<http://beta.docker.cancerhealth.com/article/wellbehaved-immune-system-key-successful-transplant-outcomes>