

The Intestinal Microbiome and Cancer Immunotherapy

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The human gastrointestinal tract is inhabited by a diverse population of bacteria that play a crucial role in maintaining homeostasis both within the gut and within the body. These various species of bacteria aid in the digestion and absorption of food products as well as functioning in less obvious roles such as protecting against invasive gastrointestinal infections and modulating the body's natural immune system.

What is your understanding of the gut microbiome as it relates to cancer treatment? Would you or your loved one consider a fecal transplant as part of their cancer treatment?

Recent advances in our understanding of the microbiome's role in maintaining a balanced immune system has led to the suggestion that the bacterial makeup of the gut microbiome influences the effectiveness of immune checkpoint blockade drugs, which stimulate the immune system to treat cancer.

Research published in the journal *Science* by Routy et al. demonstrated that disruption of the gut microbiome through the use of antibiotics could alter the body's response to certain immune checkpoint blockade drugs in patients with lung and kidney cancer. They went on to show that performing a fecal microbiota transplant (FMT), the process of transferring feces from one organism to another, using stool from a human patient with a "favorable" gut microbiota to a cancer-bearing mouse could effect the response of the mouse's tumor to immunotherapy. Similarly, a second article published in *Science* by Gopalakrishnan et al. showed that patients undergoing treatment with immune checkpoint blockade for melanoma were more likely to respond to treatment if a certain bacterial species

were present within the gut microbiota as well as if a more diverse bacterial population was present. Again, mice that received FMT from melanoma patients who responded to treatment had a higher likelihood of responding to immune checkpoint blockade drugs.

The results from these studies provide insight into the complex interplay between the body's immune system and the bacterial makeup of the gastrointestinal tract. However, it is important to keep in mind that there are many factors that influence whether a tumor will respond or will not respond to immunotherapy. These findings do not suggest that antibiotics should be avoided while receiving immunotherapy nor that fecal transplants are necessary for treatments to succeed. Additional research is needed to fully understand the effect of the microbiota on cancer and cancer treatment.

In my practice I recommend any person undergoing treatment with immunotherapy maintain a varied and well-balanced diet that includes leafy green vegetables, which tend to carry healthy bacteria that can be useful in maintaining a diverse gut microbiome. In the ever-changing landscape of medicine, there may be a time in the not-so-distant future when testing of a patient's feces and medically manipulating the gut ecosystem will become a part of routine cancer care.



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The ACCC Immuno-Oncology Institute is supported by Bristol-Myers Squibb (charitable donation); EMD Serono; Kite, a Gilead Company; and Merck & Co, Inc (educational grant).

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