# Specific gut bacteria can help or hinder cancer treatments

Rich Haridy

Researchers have identified certain gut bacteria that can influence the success or failure of cancer treatments (Credit: University of Texas)

As medical technology races into the 21st century, the idea of personalized medicine is growing in prominence. A vastly complex array of factors determine whether a drug works for an individual and evidence is mounting of the important role gut bacteria plays in a person's response to a drug treatment. Two new studies are offering the best evidence to date of this process, showing how the gut microbiome of different patients can affect the success of cancer treatments.

In recent years researchers have revealed how our gut microbiome, the large population of bacteria living inside our body, has an incredibly broad and systemic control over our health. Gut bacteria has been found to potentially play a role in PTSD, Alzheimer's, obesity, diabetes and even aging.

Numerous studies have also found causal connections between gut bacteria and the efficacy of certain drugs, from those as simple as ibuprofen, to more complex interactions with HIV-prevention treatments. In 2015, two groundbreaking studies focused in detail on how the presence (or absence) of certain gut bacteria in mice can determine the efficacy of a new type of cancer treatment called checkpoint inhibitors (PD-1).

Now, two new studies have identified similar gut bacteria discrepancies in human cancer patients. Both studies examined the gut microbiome of cancer patients undergoing treatment with PD-1 inhibitors, a new type of cancer therapy that for some reason is only successful in 25 percent of patients.

The first study, from a team of researchers in France, found that cancer patients recently treated with antibiotics exhibited significantly less success with PD-1 treatment than patients who hadn't recently taken antibiotics. Examining the gut bacteria of these subjects the researchers identified one particular species, *Akkermansia muciniphila*, as substantially lacking in the group treated with antibiotics.

In follow up mice experiments the researchers confirmed the correlation by fecal microbiota transplants. Mice receiving fecal transplants from humans that had responded to the PD-1 treatment subsequently displayed a positive response to the drug, whereas the mice given fecal transplants from the antibiotic group did not respond as well. Most interestingly, the study showed that after those non-responsive mice were fed a supplement of *Akkermansia muciniphila*, they increased their positive response to the PD-1 treatment.

The second study, led by the University of Texas, looked more closely at the bacterial diversity of patients who successfully responded to PD-1 treatment versus those who did not. They found significant differences in the diversity of gut bacteria between the two groups, but identified different relevant bacteria than to the first study.

In this instance those subjects with a high volume of *Faecalibacterium* had a more positive response to the treatment, while an abundance of *Bacteroidales* was found in subjects with a low response to the treatment. Like the first study, fecal transplants were delivered to mice to verify the specific gut bacteria having an effect on the outcome of the PD-1 drugs.

"You can change your microbiome, it's really not that difficult, so we think these findings open up huge new opportunities," says the University of Texas study leader Jennifer Wargo. "Our studies in patients and subsequent mouse research really drive home that our gut microbiomes modulate both systemic and anti-tumor immunity."

With an eye on long-term outcomes, both studies also attempt to examine the mechanisms behind how certain bacteria could affect the efficacy of these cancer treatments, but more direct short-term outcomes could be as simple as avoiding antibiotics while undergoing PD-1 treatment. The researchers suggest that this alone could increase positive patient responses to PD-1 treatment from 25 percent to 40 percent. Other more immediate implications from this research include examining whether specific bacterial treatments delivered alongside the PD-1 drugs could help patients respond more positively.

The first study was published in the journal *Science,* as was the second study.

Source: The University of Texas MD Anderson Cancer Center