

Diet, gut microbes affect effectiveness of cancer treatment, research reveals

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Eyleen O'Rourke, UVA assistant professor of biology, says that by modulating the microbes that live in our gut, there is enormous potential to improve treatment outcomes. Credit: Dan Addison, University Communications

What we eat can affect the outcome of chemotherapy—and likely many

other medical treatments—because of ripple effects that begin in our gut, new research from the University of Virginia suggests.

Scientists found that [diet](#) can cause microbes in the gut to trigger changes in the host's response to a chemotherapy drug. Common components of our daily diets (for example, [amino acids](#)) could either increase or decrease both the effectiveness and toxicity of the drugs used for cancer treatment, the researchers found.

The discovery opens an important new avenue of medical research. It could have major implications for predicting the right dose and better controlling the side effects of chemotherapy, the researchers report. The finding also may help explain differences seen in patient responses to chemotherapy that have baffled doctors until now.

"The first time we observed that changing the microbe or adding a [single amino acid](#) to the diet could transform an innocuous dose of the drug into a highly toxic one, we couldn't believe our eyes," said Eyleen O'Rourke of UVA's College of Arts & Sciences, the School of Medicine's Department of Cell Biology and the Robert M. Berne Cardiovascular Research Center. "Understanding, with molecular resolution, what was going on took sieving through hundreds of microbe and host genes. The answer was an astonishingly complex network of interactions between diet, microbe, drug and host."

How diet affects outcomes

Doctors have long appreciated the importance of nutrition on [human health](#), but the new discovery highlights how what we eat affects not just us, but the microorganisms within us.

The changes that diet triggers on the microorganisms can increase the toxicity of a chemotherapeutic drug up to 100-fold, the researchers

found using the new lab model they created with roundworms. "The same dose of the drug that does nothing on the control diet kills the [roundworm] if a milligram of the amino acid serine is added to the diet," said Wenfan Ke, a [graduate student](#) and lead author of a new scientific paper outlining the findings.

Further, different diet and microbe combinations change how the host responds to chemotherapy. "The data show that single dietary changes can shift the microbe's metabolism and, consequently, change or even revert the host response to a [drug](#)," the researchers report in their paper published in *Nature Communications*.

In short, this means that we eat not just for ourselves, but for the more than 1,000 species of microorganisms that live inside each of us, and that how we feed these bugs has a profound effect on our health and the response to medical treatment. One day, doctors may give patients not just prescriptions, but detailed dietary guidelines and personally formulated microbe cocktails to help them reach the best outcome.

More information: Wenfan Ke et al. Dietary serine-microbiota interaction enhances chemotherapeutic toxicity without altering drug conversion, *Nature Communications* (2020). [DOI: 10.1038/s41467-020-16220-w](#)

Provided by University of Virginia

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