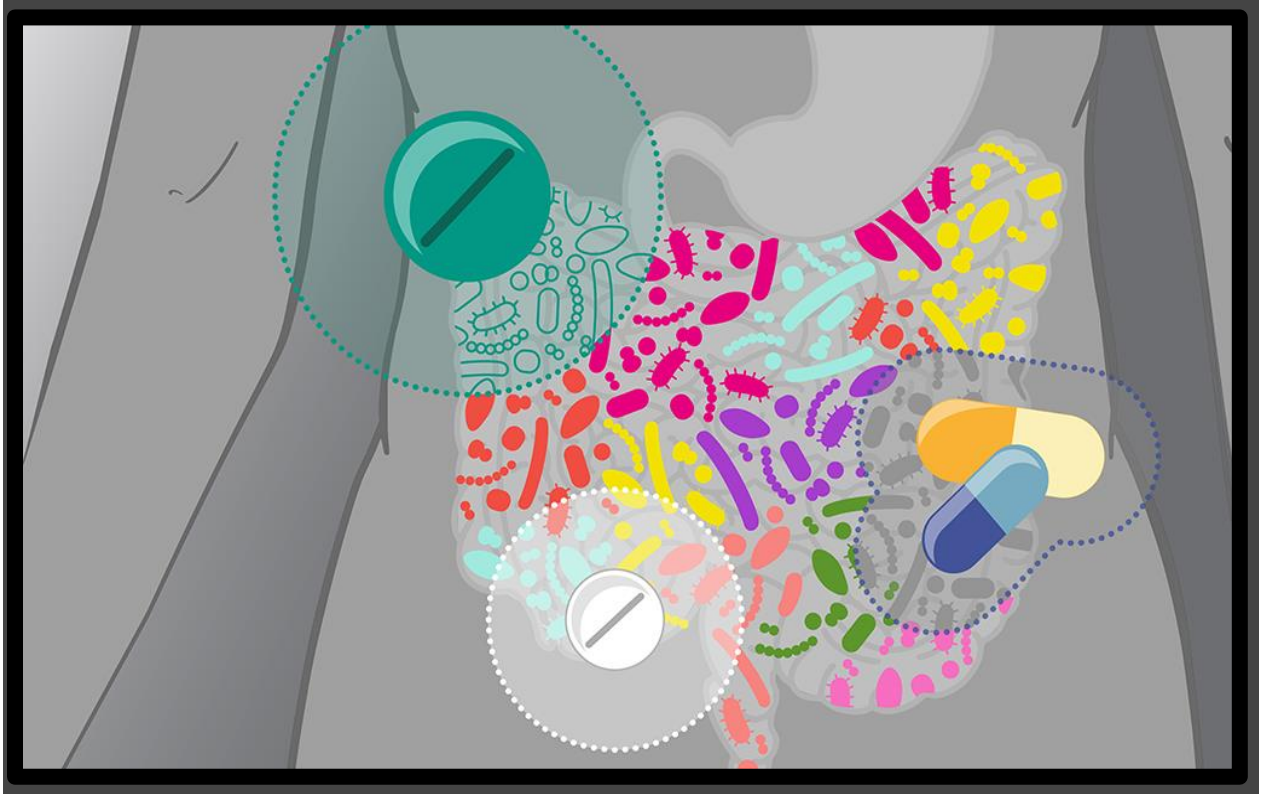
ABSTRACTED TO ILLUSTRATE THAT DRUGS, BOTH PRESCRIPTION AND OVER THE COUNTER SUPPLEMENTS, CAN AFFECT INTESTINAL MICROBES



Microbiome State Affected by Many Common Drugs

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Source: Isabel Romero Calvo/EMBL

The microbiome may be distorted not just by disease, but by the medications we use to treat disease. Researchers representing more than 20 different European institutes analyzed data from MetaCardis, a European Union–funded research project investigating the role of gut microbes in cardiometabolic diseases.

MetaCardis offered clinical and metagenomics information from a large cohort: 2,173 patients who were either healthy or had common chronic diseases such as atherosclerosis of the heart, type 2 diabetes, or obesity. By sifting through MetaCardis data and applying a statistical approach that accounted for the effects of multiple confounding factors, the researchers investigated the relationship of different kinds of ordinary medicine with the abundance and function of intestinal bacteria and their connection to disease severity.

"We analyzed the effects of 28 different drugs and several drug combinations," said Peer Bork, PhD, director of scientific activities at EMBL Heidelberg. "Many drugs negatively impact the composition and state of the gut bacteria, but others, including aspirin, can have a positive influence on the gut microbiome. We found that ***drugs can have a more pronounced effect on the host microbiome than disease, diet, and smoking combined."***

Bork is a senior author of an article that appeared December 9 in *Nature*. The article, "Combinatorial, additive and dose-dependent drug–microbiome associations," describes how the effects of drugs and disease on host and microbiome features in multimedicated individuals were disentangled in the analysis of the MetaCardis data. The article also argues that the explanatory power of drugs for the variability in both host and gut microbiome features exceeds that of disease.

"We investigated drug–host–microbiome associations for eight major indications (antidiabetic, antihypertensive, antidyslipidaemic, antithrombotic, antiarrhythmic agents, gout medication, PPIs, and antibiotics)," the article indicated. "The most commonly prescribed cardiometabolic disease drugs were statins, beta-blockers, metformin, aspirin, angiotensin converting enzyme inhibitors, and angiotensin II receptor blockers, often taken in combination."

The scientists discovered that gastric acid medication, so-called proton pump inhibitors, are linked to adverse changes in the intestinal microbiome.

Not unexpectedly, the researchers found that repeated antibiotic treatments over the past 5 to 10 years is associated with a less diverse gut microbiome. Healthy people tend to have a diverse gut microbiome, whereas the microbiome of people who live with chronic diseases such as obesity, diabetes, and

cardiovascular disease, tends to be less diverse. This lack of diversity may reduce the capacity of the gut's "chemical factory" to produce health-promoting molecules.

The researchers also determined that the dosage of drugs prescribed also has a significant effect on the level of impact on the microbiome.

"We know that the microbiome can reflect the status of a patient's health and provide a range of biomarkers to assess the severity of diseases," noted Rima Chakaroun, MD, one of the lead authors of the study and a clinician scientist at the University of Leipzig Medical Center. ***"What is often overlooked, however, is that the medication used to treat a disease also affects the state of the microbiome."***

The researchers are hopeful that these results can provide knowledge that could potentially help in drug repurposing as well as in planning individualized treatment and prevention strategies.