

STATISTICS REVEALS LINKS TO A MICROSCOPIC WORLD

STATISTICAL SIGNIFICANCE

Communities of microbes live in the world in and around us, and we are only now starting to understand how they affect our lives. Statisticians help scientists identify connections between microbiomes and human health and learn how to influence their composition to improve health and wellness.

WHAT IS A MICROBIOME?

A microbiome is a complex and diverse community of microorganisms (or microbes) such as bacteria, fungi, and viruses that are visible only through a microscope. These communities are found all over our planet: inside our bodies, on our skin, in the oceans, on rocks, in the soil, everywhere!

To learn more about the different types of microbes that make up a microbiome, check out: learn.genetics.utah.edu/content/microbiome/intro



IF MICROBES COULD TALK...

They could tell you a lot! Much of the focus in microbiome research has been on what a microbiome sample can tell a scientist about the person from whom it originated. In particular, statisticians have developed novel methods that allow scientists to test samples as whole units rather than many independent species. These new tools have led to an explosion of research demonstrating links between microbiome composition and health outcomes such as obesity, asthma and allergies, and pre-term birth.

The New York Times *Fighting Poisons With Bacteria*
Going Inside the Rice Microbiome

Forbes
The Fascinating Connections Between Gut Bacteria, Weight And Mood

The Washington Post Move over, blood doping; cyclists might be
'poop doping' soon

TIME Parkinson's Disease May Be Traced to
Gut Bacteria

SCIENTIFIC AMERICAN
Can Microbes Encourage
Altruism?

Soil Has a Microbiome, Too
Smithsonian

TARGETING INTERVENTIONS

The next phase in this research is to identify factors that can influence a microbiome's composition in order to improve health outcomes. Statisticians are working on that too.

The relationships within a microbiome are complex, and researchers risk misleading conclusions if those relationships are not modeled appropriately. Spatial and multivariate statistics step into this arena and provide tools to screen potential factors, such as whether or not one exercises or has a pet. These analyses account for the associations between microbes, providing a reliable test to determine which factors, out of many, affect community composition.

This test allows researchers to focus their efforts on designing interventions that have the highest chances of success, leading to more efficient allocation of resources and better patient outcomes across the board.