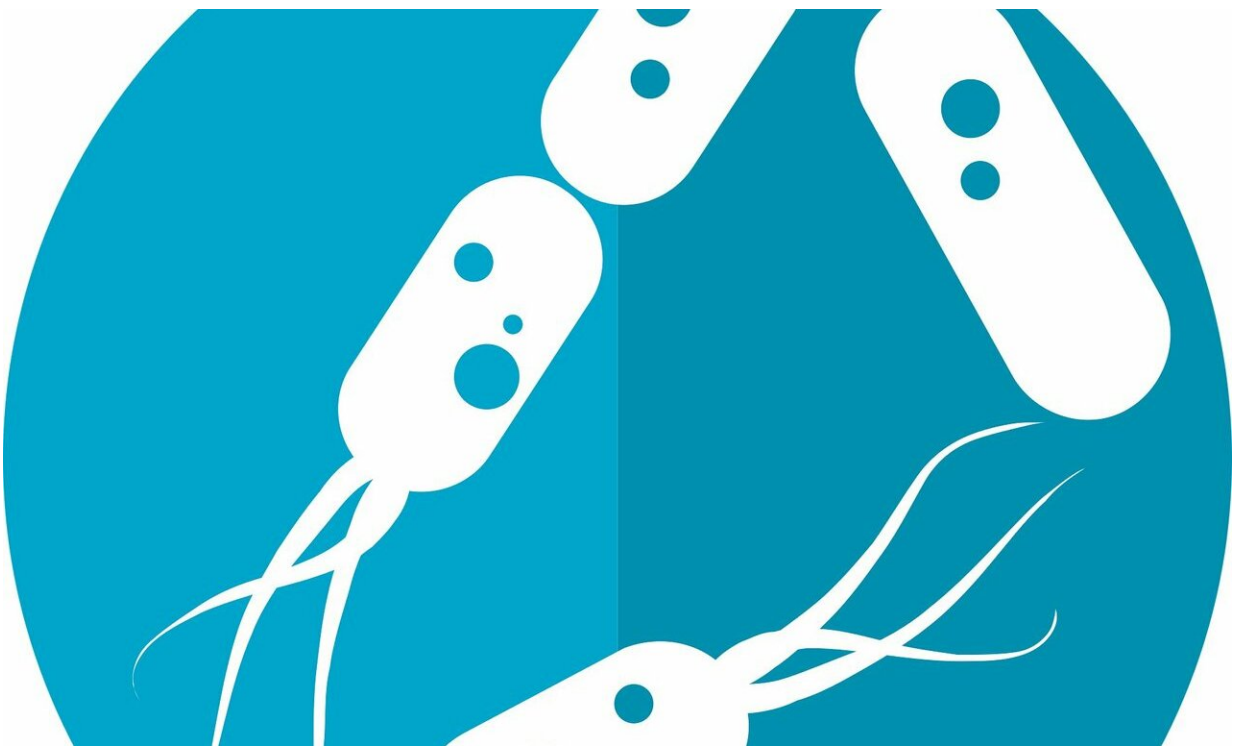


# How do human body–associated microbes spread? The transmission landscape of human microbiomes

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The microbiome is a great ally of our health. It performs a fundamental role in the functioning of the immune and digestive systems, among many others. However, there is still very limited knowledge on how the

bacteria and other microbes that make up the microbiome are acquired and transmitted among individuals.

The research group led by Nicola Segata (Department of Cellular, Computational and Integrative Biology-Cibio of the University of Trento and European Institute of Oncology), which coordinated an international study on the acquisition of health-associated [bacteria](#), tried to shed light on the issue. Eighteen institutions and research centers from all over the world were involved in the study, whose findings were published in *Nature*. The first author of the work is Mireia Valles-Colomer, a postdoctoral researcher at the Segata Lab of the UniTrento.

This is the largest and most diverse study to date on transmission of the human [microbiome](#). The researchers investigated how bacteria are transmitted between generations ([vertical transmission](#)) and among people who live in close contact with each other, such as partners, children, or friends (horizontal transmission). They analyzed more than 9,000 stool and saliva samples from participants in 20 countries and all continents in the world.

The study first confirmed that the first transmission of the gut microbiome occurs at birth and is very long-lasting. In fact, the bacteria from the maternal microbiome can still be detected in elderly individuals. However, infants lack many of the [bacterial species](#) that are common in adults, so the authors hypothesized that we pick them up later on. The analysis showed that adults acquire microbes through social interactions, for example between partners, sharing a household, or with friends.

The researchers also discovered that the oral microbiome is transmitted in a markedly different way from the gut microbiome. The bacteria present in the saliva are in fact transmitted even more frequently, but mostly horizontally. The transmission by the mother at birth is minimal,

but the more time people spend together the more bacteria they share.

Mireia Valles-Colomer, who tracked the transmission of more than 800 species of bacteria, said, "We have found evidence of extensive sharing of the gut and oral microbiome linked to the type of relationship and lifestyle. The results suggest that social interactions actually shape the composition of our microbiomes. We have also found that certain bacteria, especially those that survive better outside our bodies, are transmitted much more often than others. Some of these are microbes from which we know very little, they have not even been named yet. This inspires us to study them better, as we still have many unanswered questions about the transmission mechanisms of the microbiome and how this affects our health."

Nicola Segata explained, "In adulthood, the sources of our microbiomes are mostly the people we are in close contact with. The duration of interactions—think for example of students or partners sharing an apartment—is roughly proportional to the number of bacteria exchanged."

In many cases, however, bacteria can spread even between individuals who have superficial and occasional interactions. "The transmission of the microbiome has important implications for our health," Segata continued, "since some [non-communicable diseases](#) (such as cardiovascular diseases, diabetes or cancer) are partly linked to an altered composition of the microbiome. The demonstration that the human microbiome is transmissible could suggest that some of these diseases (currently considered non-communicable) could, at least to a certain extent, be communicable. Further studies on the [transmission](#) of the microbiome can therefore advance the understanding of the risk factors of these diseases and, in the future, explore the possibility of reducing the risk with therapies that act on the microbiome or its transmissible components."

**More information:** Nicola Segata, The person-to-person transmission landscape of the gut and oral microbiomes, *Nature* (2023). [DOI: 10.1038/s41586-022-05620-1](https://doi.org/10.1038/s41586-022-05620-1).  
[www.nature.com/articles/s41586-022-05620-1](https://www.nature.com/articles/s41586-022-05620-1)

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