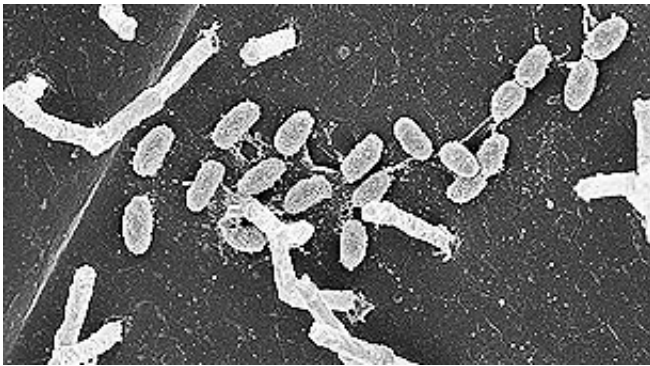


Microbial companions of humans and animals are highly specialized

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Microorganisms like these bacteria on the skin of a small crustacean are the constant companions of humans and animals. Researchers at the University of Basel were now able to show, that these microbial communities are dominated by species that are highly specialized to their host. Credit: University of Basel

Humans and animals are never alone. Everyone is host to over two thousand different species of microbes, of which most colonize our bodies only after we are born. One would assume that the generalists among them have an advantage. Zoologists from the Department of Environmental Sciences at the University of Basel have now shown that the opposite is the case. Microbial communities living on humans and animals are mostly dominated by specialists.

It has long been known that almost all organisms have microbial companions. However, only about ten years ago did researchers find out

that these bacterial communities are extremely rich in species. Humans and other mammals are often hosts to several thousand species, and even minute organisms like water fleas can carry over one hundred species. This knowledge only became available by the use of [genetic methods](#), that allowed researchers to sequence all genes of a single ecosystem (for example of the human intestine) at once. Data resulting from this method was also analyzed for the new study of the research group of Dieter Ebert, Zoologist from the Department of Environmental Sciences at the University of Basel.

Specialists or generalists?

The initial question was how specialized these [microbes](#) are. Since most bacteria only get recruited after their hosts' birth, one would assume that most of them are generalists. After all, microbes able to live in different environments and on a variety of hosts would have a significant advantage over specialists. However, earlier studies had already shown that [microbial communities](#) differ between different hosts or habitats. However, why these differences occur was unknown. Some researchers assumed that even though hosts are colonized by several microbe species, only a few of them are successful.

The team of researchers around Dieter Ebert hypothesized that the successful microbes are specialists. Meaning that the successful species are those that prefer one specific host, where they then occur locally in great numbers. To test their thesis they developed a statistical method allowing them to align the relative abundance of a specific bacteria species with the degree of its local specificity.

They applied their new method to three very different data sets: Zooplankton from the Ägelsee pond, near Frauenfeld in Switzerland, different human habitats (such as ear, nose, mouth and arm pit) and a set from several ecosystems including water and sediment samples from

fresh as well as salt water.

Specialists are more abundant locally

All three data sets revealed the same results: locally abundant microbes are local specialists. And vice versa: the smaller the relative abundance of one [species](#), the more likely is it found in several habitats. Generalists are everywhere but nowhere in abundance, whereas specialists only occur abundant locally.

More information: "Microbial ecosystems are dominated by specialist taxa." *Ecology Letters* (2015), [DOI: 10.1111/ele.12478](https://doi.org/10.1111/ele.12478)

Provided by University of Basel

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