

Microbiota Vault – the ‘Noah’s Ark’ for intestinal bacteria



**Be it a modern or a somewhat archaic
refuge: it's the content of our intestines
that really counts.**

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Biodiversity probably isn't the first thing we'd associate with our gut, even though it harbours an extremely diverse ecosystem. A single gram of intestinal content contains billions of microbes that are intricately interlinked and probably have a major influence on our health. This needs to be systematically documented. In Switzerland, researchers are storing human faeces for the future.

An exceptional biobank for future generations is taking shape at the University of Zurich: As microbes in the gut are under threat of extinction, researchers intend to store human faeces from a wide variety of countries and cultures. The underlying aim is to gain knowledge from this in order to cure diseases. Similar to the Human Genome Project or the Human Cell Atlas, the *Microbiota Vault database* will contain a blueprint of the microbiota of humans, plants, animals, soils and natural environments

on a global scale, which will serve as a catalyst for future research, innovation, conservation and restoration.

Extinction of species in the gut

The habitat in our bodies is changing. Many bacteria are becoming rarer – the intestines of the populations of industrialised Western countries in particular no longer seem to offer microbes a comfortable home. The South American scientist Maria Gloria Dominguez-Bello was among the first to study the microbiome. The professor at Rutgers University discovered that members of indigenous peoples in the Amazon region have a much more diverse gut flora than people in Europe and the USA. Our microbiome is becoming increasingly impoverished. Species that protect us from diseases or have other important functions might disappear. By 2050, two thirds of humanity will probably be living in cities, which will further fuel the extinction of species in the gut. The reasons for this lie in our diet and lifestyle, but also in our medication. Antibiotics specifically have a side effect of not only killing the bacteria that cause an infection, but also almost all others in the body. Yet most germs are very useful; they break down nutrients for us, aid digestion and allow our bodies to access vitamins from food. Researchers suspect that an impoverished or disrupted microbiome plays a role in the occurrence of a number of diseases. Preserving the diversity of species in our gut is the top priority of the Swiss-launched project, which is being driven forward by a number of universities in Switzerland and the USA.

Biobank for gut microbes

A type of ‘Noah’s Ark’ has been set up at the University of Zurich for this purpose. A biobank for gut microbes is taking shape, similar to the seed vault on the Norwegian island of Svalbard, in which the seeds of all important food plants are frozen – as a kind of insurance for the future. In a sense, the research project to save the intestinal flora is a kind of faecal library on behalf of all countries in the world. For the time being, this library consists of several white freezers. The bacteria survive for many years at minus 80 degrees and can simply be defrosted again in the

future. The researchers have experimented with a wide range of preservation methods – from freeze-drying to adding nutrients and various freezing methods. But it’s not just preservation that is complex and difficult – there are also legal i’s to dot and t’s to cross. It is not possible to simply collect and take stools from a foreign country, because stools are a cultural asset. Many legal

regulations must be met before faeces can be exported. The ‘Noah’s Ark’ for intestinal bacteria is a very expensive and highly complex international project that is still in its infancy. A secure storage facility for the valuable faecal samples is being sought. The Microbiota Vault researchers have been looking around for Swiss army bunkers for future storage. One day, the faecal library will be safely stored deep within the solid rock of a mountain.

Long-term project with potential

The Microbiota Vault project is of great significance for several reasons and has the potential to impact the future of mankind in many ways:

Health

The microbiota plays a crucial role in the health of humans, animals and plants. A better understanding of the microbiota can help us understand diseases, develop prevention strategies and improve treatments.

Environmental protection and sustainability

The microbiota also influences the health of ecosystems, including soils and water bodies. By collecting and analysing microbiota samples from different environments, we can better understand how human activities affect the microbiota and how we can protect and restore ecosystems.

Agriculture and food security

The microbiota plays an important role in soil fertility, plant health and yield.

A better understanding of the microbiota can help to develop more sustainable agricultural practices, improve food security and reduce the use of pesticides and fertilisers.

Innovation and technology

The Microbiota Vault project database will be a valuable resource for scientists and innovators around the world. It will enable researchers to gain new insights, develop innovative technologies and find solutions to pressing global challenges.

Cultural heritage and diversity

The microbiota is an important component of biodiversity and cultural heritage. The Microbiota Vault project will help to preserve the diversity of the microbiota and ensure that future generations can benefit from this rich heritage. As a whole, the project can act as a catalyst for research, innovation, conservation and restoration and have a positive impact on the future of humans and the planet.