Novel sources for natural products

The increasing spread of known and new pathogens and in particular the increase in multiresistant germs poses a serious threat to the health and well-being of humanity. New drugs to treat these pathogens are urgently needed. Microorganisms such as bacteria and fungi produce numerous low molecular weight compounds – so-called natural products – that have an antibiotic effect and can serve as basis for the development of novel anti-infectives. However, traditional methods rarely lead to the discovery of new structures and the rediscovery rate of already known active compounds is very high.

Natural products from prehistoric microbiomes

The department Paleobiotechnology aims to access an untapped source of natural product diversity. We do not limit our search for new molecules solely to the microorganisms existing today but also intensively investigate the time dimension. We do so by analyzing the genetic information of prehistoric materials, e.g. microbial DNA from dental calculus or fecal remains. We can thus study the evolution of natural product biosyntheses and retrieve active compounds, which were lost in nature. For this purpose, we apply state-of-the art technologies for both genome analysis and for the identification and isolation of natural products. Yet not only fossils, also traditionally produced food from regions of the world that have not been influenced by modern industry provide promising starting points for the hunt for natural products. We closely collaborate with Prof. Dr. Christina Warinner from the Max Planck Institute for the Science of Human History in Jena/Harvard University, Cambridge, USA.

Microbial predator prey interactions

Naturally occurring microbial communities provide another source of new natural products. For instance, we study social amoebae that co-exist with bacteria. Amoebae, in particular the social amoeba *Dictyostelium discoideum*, feed on soil bacteria. These bacteria in turn have developed strategies to defend themselves against the predator. Some of these defense mechanisms rely on the production and secretion of amoebicidal compounds. We study these compounds, their biosyntheses as well as their modes of action.

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