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Natural products from ancient sources

Milk and dairying are an essential part of the Mongolian culture, and raw milk as well as fermented dairy products are staple foods. The preservation of milk plays an important role in Mongolia, particularly in the winter months. One way to preserve raw milk, especially yak milk, is through the production of *urum*, a typical and traditional Mongolian dairy product.

Microorganisms are fundamental key players in dairy products. For example lactic acid bacteria and yeast can act as starter cultures for dairy fermentations of *e.g. airag*. Milk-associated microbes can affect the flavor and are conducive to human health. However, they can also lead to spoilage or cause disease. The impact that microbes have on food is often mediated by low molecular weight molecules. These natural products often show bioactivities including anti-bacterial or anti-fungal effects. The aim of the project is to investigate the function of natural products and to identify new bioactive compounds from Mongolian dairy products. This project focuses on the interdisciplinarity of the natural sciences and combines chemistry, microbiology, food science and cultural anthropology.

Besides the ethnological research on Mongolian dairy products and their associated microorganisms, the research on bone-associated bacteria and biosyntheticgenes from prehistoric DNA is another part ofthe project. Bone-associated bacteria, e.g. from an ancient human femur from an archeological excavation, will be cultured and can also be used as a source of low molecular weight molecules.

Analyzing genetic information from ancient sources, for example microbes from dental calculus, can contribute to the identification and hereinafter isolation of novel and undiscovered bioactive compounds. The key approach here is the heterologous expression of the identified biosynthetic genes, which will produce synthetically in modern Hosts systems to revive these genes and their corresponding natural product. To do so, different cloning methods will be developed and established. The functionality and bioactivity of the natural products will be tested and biosynthetic pathways will be studied.

In summary, the project will reconstruct the evolutionary history of microbiome samples and provide novel
insights into the evolution of biosynthetic gene clusters and thus enable the further development of antibiotics.

Supervisor

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