Composition and functioning of microbial communities depending on geochemical conditions

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Characteristic properties of formation and functioning of microbial communities depending on temperature, pH, HS^- and native radionuclides (Rn, ^{226}Ra, ^{228}Ra) were examined by the example of communities of hot springs of Barguzin basin in the Baikal rift zone.

Barguzin basin with its hot springs is one of those locations where diverse cyanobacterial communities develop dynamically. All the springs are alkaline-silicate hydrotherms with the nitrogen prevailing in the gas composition. The Alla, Kuchiger and Umkhei springs waters belong to the same type and represent HCO_3-SO_4-Na according to their major and minor elements composition. These springs are HS^--bearing and low Rn concentrations. Seya spring waters belong to same type but HS concentration in it is lower. The Garga, Gusikha and Uro spring waters are characterized by the absence of HS^- in the solution and radon content 30-10 eman.

Our study revealed that the constant geochemical condition and low temperature, low HS^-, Rn content and the absence of a strong currrent form the conditions under which thick multilayered mats are being formed. This mats in Seya, Garga and Uro hot springs are characterized by a considerably higher productivity and low species composition. Under unstable geochemical conditions and high temperature, HS^- gradient heterogeneous microbial communities are being developed. Such communities are thin and multicomponent.

Some species develop at high temperature and high HS^- content and some species, for example *Mastigocladus laminosus*, were observed at high Rn content.

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Molecular interactions of planar PAHs with mineral surfaces

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Polycyclic Aromatic Hydrocarbons (PAHs) are ubiquitous natural and anthropogenic compounds, stable under both reducing and oxidising environmental conditions, which are known to induce cancer, mutations and reproductive disorders in humans and mammals. The study of transport and fate of PAHs and their derivatives has become a serious environmental concern.

Planar PAHs are hydrophobic and tend to become sorbed onto particles; therefore their subsurface mobility is governed by physicochemical interactions with soil components. Previous studies of PAH-mobility have concluded that mineral surfaces play an important role, but the wide range of materials and conditions previously used has produced inconsistent results and consequently the nature of the interactions between mineral surfaces and PAHs remains poorly understood.

The current research aims to quantify the uptake of various structurally simple (planar) PAHs onto mineral surfaces in the absence of organic matter and to complete surface analyses aimed at providing constraints on how these molecules bond to the substrate. To this purpose, thoroughly characterised and pre-treated minerals typical of groundwater systems such as quartz and various phyllosilicates will be exposed to selected planar PAHs. Experiments will include mixed sorption tests (analysed by SPME-GC-MS) as well as detailed surface analyses. This combined approach will contribute to a better understanding of the surface reactions taking place environmentally and the nature of the resulting stable products.