

9<sup>th</sup> INTERNATIONAL SYMPOSIUM OF SUBSURFACE MICROBIOLOGY

ISSM 2014

October 5-10, 2014, Pacific Grove, California, USA

The 9<sup>th</sup> International Symposium on Subsurface Microbiology in Pacific Grove, California, attracted 228 scientists, engineers, and students from 25 countries and 5 continents. The symposium offered four plenary sessions, ten regular sessions and two poster sessions. Since the last meeting in 2011, a great deal of new knowledge was adopted and for this reason the organizers decided to combine contributions into the following topics: Biomes, Chemistry, Contaminants, Ecology, Fate and Methods. A special session within Biomes was also dedicated to Cave, Karst, and Fractured Rock Microbiology.

Recent developments, especially in metagenomics, facilitated scientists to stretch their research above the general question “who is there” towards the question “what do they do”. Nevertheless, proper and quantitative DNA isolation is the most critical step to obtain the relevant results in downstream applications. It was emphasized that physical proximity of microbial communities in the subsurface is not necessarily related to the similarity among these communities. Surface sediments were found less diverse than the subsurface ones. Such understudied environments offer a great potential for isolation of microbes of biotechnological importance, for example those which can resist high ionic conditions.

New borders of our knowledge on microbial habitability have been drawn. For example, the largest aquifer on the planet is the ocean crustal aquifer, where hydrothermal vents are typically found, and the environmental conditions can be highly varying, e.g. pressure from 150 to 500 bar and temperature from 4 to 350 °C. On the other hand, large datasets of bacterial diversity can help “to predict” geochemical characteristics. It seems that microbial structure has “memory” of past environmental conditions. Diverse microbes were found in the Precambrian rock, can we consider these rocks the oldest habitat on Earth?

Microbial metabolism was the focus of several oral and poster presentations. Abundant polysaccharide biofilms in the form of reduced sugars can act as an “electron sink”. However, sometimes the environmental conditions, such as the presence of clays, can make mi-

crobial to uptake of essential nutrients, such as nitrogen, more difficult. Microbial conversions of dissolved organic matter can occur faster than previously thought in underground karst rivers. Going deeper into the subsurface, autotrophy can in some cases notably exceed heterotrophy. On the other hand, serpentinization, which results in formation of H<sub>2</sub> as an energy source, does not always increase microbial biomass because CO<sub>2</sub> can be a limiting factor.

Electromicrobiology is a rather novel microbiological subdiscipline which has lately attracted more scientific attention. Microbes are able to transport electrons directly from minerals, using nanowires or along cell filaments. It was proven that electric current can be produced on pyrite. Filamentous bacteria, also called “cable bacteria”, can produce an electric field when the circuit of electrons is coupled with the circuit of ions. Microbial activity on the sea floor gives approximately 20 mW/m<sup>2</sup>.

Biodegradation and remediation of contaminated sites is a very challenging topic for microbiologists. It was recently proven that biodegradation of oil occurs with the minimum presence of water. Namely, the presence of an electron acceptor, i.e. sulphate, is in such systems crucial for biodegradation. Radioactive contaminated sites in the U.S. (Manhattan project from the WWII) and Russia (Karachay Lake with more than 42,000 mg of NO<sub>3</sub><sup>-</sup> per liter) are especially challenging in terms of microbial metabolism and diversity. The impact of hydraulic fracturing which introduces organic C and allocthonous microbes in the subsurface is not studied enough.

Water quality and pollution is a global urgent issue, with the respect of water usage increase of 1% annually. New developed tools to predict scenarios of fecal pollution are thus highly welcome. An important global issue related with climate changes is the release of organic C from permafrost.

The new president of the society became Reiner U. Meckenstock and the next ISSM symposium will in 2017 in New Zealand.

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