Bacterial community structure in an aquifer down-gradient from uranium in situ recovery mine

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Uranium in situ recovery (U ISR) is one of the most effective and economical technologies used for U extraction from low-grade roll-front deposits [1]. Microorganisms are likely to play an important role at all stages of U ISR, however their effects are still poorly investigated. Hence, this study focus on the determination of diversity of bacteria inhabiting an aquifer down-gradient from uranium roll front deposit that is part of an ISR mine project at Zoovch Ovoo (Mongolia) and their possible interactions with the main co-contaminants involved in ISR processes such as NH_4, NO_3, SO_4, U and other metals. Pristine water samples were collected before any ISR interventions following the natural redox zonation, including the native mineralized orebody, and both the upstream and downstream compartments.

Next generation sequencing data showed that the redox gradient shaped the bacterial community of the native aquifer. Sulphate-reducing bacteria (e.g. *Desulfovibrio*, *Nitrospira*), iron-reducing bacteria (e.g. *Gallionella*, *Sideroxydans*), iron-oxidizing bacteria (e.g. *Rhodobacter*, *Albidiferax*, *Ferribacterium*), and nitrate-reducing bacteria (e.g. *Pseudomonas*, *Aquabacterium*), which may be involved in metal reduction including uranium (e.g. *Pseudomonas*, *Albidiferax*, *Caulobacter*, *Zooglea*), as well as other metabolically interesting bacteria were observed in all different water samples. Our results show the presence in each compartment of mixed ecosystems containing suitable microorganisms that may be prone to promote the remediation of the acidified aquifer necessary for the uranium recovery. All in all our results help to understand the natural attenuation process, commonly used for the remediation of the acidified aquifers necessary for U recovery, as well as to predict the efficacy of the remediation strategy and to determine the bacterial assistance in the improvement of ISR efficiency, avoiding thus potential environmental risks.

[1] Seredkin et al. (2016), *Ore Geology Reviews* 79, 500–514.