Application of droplet-based microfluidics in screening and characterization of microorganisms

Johann Michael Kohler, Dana Kursten, Katharina Wetzel, Jessica Teuber and Jialan Cao
Technische Universität Ilmenau, Germany

The interaction of microorganisms with chemical effectors, combinatorial effects on single organisms and microbial communication are crucial topics for ecology, medicine, drug development and food production. In particular, natural microorganism communities are highly dynamic systems, which are modulated in their composition and activity by physical and chemical factors. It has to be assumed that soils and other natural systems contain a restricted number of active species, but a high number of species in a dormant state which are activated only in case of changing environmental conditions. The apparent discrepancy between the very high diversity concluded from metagenomic data and the number of isolated microorganisms can be interpreted by the existence of this huge majority of species which carries the principle ecological potential of a soil to respond to a large spectrum of different conditions. There is a strong demand for the development of new strategies for the evaluation of the ecological function and the synthesis potential of known and unknown microorganisms. The complexity of the problem is enhanced by organism interactions beside temperature, and the content of minerals, nutrients and humidity. The technique of micro-segmented flow can mimic to a certain extent the natural situation of complex habitats in laboratory screenings. It allows to subdivide samples containing mixtures of microorganisms into small fractions and to cultivate them under well-defined conditions in large sample sets. In particular, this technique is suited for the variation of concentrations of effector substances and for the determination of highly resolved dose/response functions. This potential was used for the evaluation of response of different bacteria and eukaryotic microorganisms on antibiotics, heavy metal ions, nanoparticles, pharmaceutical drugs and other substances as well as for studying combinatorial effects of these substances. In many cases, sharp transitions between undisturbed growth and growth suppression have been observed, which speak for “switch-like” effects of critical effector concentrations. In binary studies, all types of combinatorial effects as additives, independent effects, synergy, antagonism and complex responses have been observed. The technique can also be applied for the evaluation of artificial and natural communities.

Johann.Kohler@etit.tu-chemnitz.de

Assessment of chemical quality of wells water in the region of El-Harrouch (Algeria)

Mohamed Kahoul
University of Annaba, Algeria

Our study is based on the evaluation of the chemical quality of wells water in the El-Harrouch region in north-eastern Algeria. Chemical analyses were performed according to method described by Rodier et al, and experiments were conducted on water samples from 24 wells and concerned the following parameters: pH, suspended solids, chlorides, dissolved oxygen, free chlorine, total hardness, calcium, magnesium, nitrites. The results of the chemical analysis of the water revealed that the mounted chemical quality of the water varies from one well to another well. Measurements of pH, suspended solids, chlorides, dissolved oxygen and free chlorine may be considered eligible and are safe for human consumption. The problem lies in the level of total hardness, calcium, magnesium and nitrites which are superior to local and international standards, thus revealing that the water of these wells have a poor chemical quality required for this purpose adequate treatment to shelter consumer health.

kahomedi@yahoo.fr