Groundwater microbial communities response to simulated leackage of hydraulic fracturing-related fluids

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The exploitation of shale gas requires hydraulic stimulation (fracking), i.e. the injection of fluids at high pressures into the formations, to create fractures and fissures, and thus to release gas from the source rock. Up to 40% of these fluids flow back to the surface, together with reservoir waters. To assess the response of groundwater microbial communities to a potential leackage and their resilience, laboratory experiments under *in situ* conditions were conducted using groundwater samples. Microcosms were set up with groundwater spiked with either single frac chemicals, frac fluids, artificial reservoir water, oil or different mixtures of reservoir water and frac fluid (to simulate flowback). Microbiological and molecular analyses were used to assess the effects on the microbial activity, abundance and community structure. Microbial communities were quite halotolerant and their growth benefited from low concentrations of reservoir waters or salt, but they were negatively affected by higher concentrations of formation waters, salt, biocides or frac fluids. Changes on the microbial community structure could be detected by T-RFLP. Single frac components like guar gum or choline chloride were used as substrates, while others like triethanolamine or light oil distillate prevented microbial growth in groundwaters. Ongoing work will provide information on potential transformations of frac or geogenic chemicals by groundwater and reservoir microbiota and their lifetime.