

Dynamisms and characteristics of dissolved organic matter (DOM) in deep aquifer: A scope for deep biosphere

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Dissolved organic matter (DOM) is generally derived from multiple sources and affected by complicated transformation and degradation reactions. In a general geochemical description of marine environments, high-molecular-weight DOM (HMW-DOM; >1 kDa) particularly represents a unique organic carbon pool, which is accompanied by considerable difference in the molecular and stable isotopic compositions from other organic components such as particulate organic matter (POM) and low-molecular-weight DOM (LMW-DOM; <1 kDa) (e.g., Benner et al., 1997).

To date, formation of DOM fraction and potential microbial interaction in deep aquifer have been particularly poorly understood on the context of prokaryotic ecology. We investigated the molecular composition of DOM fraction including LMW and HMW by an improved method (Urai et al., 2018). The filtered samples are tentatively defined by conventional size scales; macromolecular scale (100 nm >> 40 nm), POM (40 nm >> 0.6 μm), HMW-DOM(0.6 μm>>1kDa), and total-DOM (<0.6 μm). We also have a validation to distinguish the molecular signature between phototrophic primary producers (i.e., fossil molecules) and presently living benthic prokaryotes (i.e., modern molecules; cf. biological methanogenesis, Kaneko et al., 2014). We report a preliminary result of the feasibility study and discuss a perspective from the view of deep biosphere.

References:

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Urai et al. Algal-derived 24-ethylcholesta-5, 22-dien-3β-ol (stigmasterol) is frequently found in high-molecular-weight dissolved organic matter (HMW-DOM) during summer in freshwater and brackish lakes. *Geochemical Journal* 52, e15-e20 (2018).

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