Paleoecotoxicology reveals higher tolerance of naive Daphnia magna genotypes to polycyclic aromatic hydrocarbons (PAH)

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Paleoecotoxicology enables the study of evolution of chemical tolerance [1]. The aim of the study is to investigate the evolution of tolerance to polycyclic aromatic hydrocarbons (PAH) in Daphnia magna in function of historical exposure to chemical stress. Resurrected populations of D. magna spanning a century, and including populations from semi-pristine and polluted environments were exposed to environmentally relevant concentrations (sediment) of PAH. Lake Ring: Shallow mixed lake, which was oligotrophic at the beginning of the 19th century, suffered from eutrophication from sewage inflow in the 1950-1960, suffered from increased land use from 1975 to ca. 2000 and partially recovered in modern times [2] (Fig. 2). PAH: PAH are mainly formed by incomplete combustion or by the emergence of oil spills. Due to the low volatility, high sorption and persistence of PAH, they spread ubiquitously in the environment by binding to dust or soot in the air. Model PAH in this study was Phenanthrene (PHE).

Conclusion & Next steps

Prior exposure to chemical stress reduces tolerance to novel chemical stress (e.g. PAH). Effect-based gene expression patterns will be investigated by performing RNA-sequencing. It will also be investigated whether phenanthrene alters the functionality of the gut microbiota. A change in algae uptake by the exposed daphnia was already seen when the reproduction test was performed.

Further studies will be investigated with resurrected Daphnia from the Stadtsee (Bad Waldsee, Germany) (DFG funded Bad Waldsee project).