



UFZ-Seminar „Water and Environment“

20 March, 3 pm

Seminar Room 1, Brückstr. 3a, Magdeburg or

<https://ufz-de.zoom.us/j/6831992537?pwd=VXZFSmF3ZDZ3ckJ0dEUxNUQzSHR6QT09>

Michael Hügler, TZW: DVGW-Technologiezentrum Wasser, will give a talk on

Mass development of coliform bacteria in oligotrophic lakes and reservoirs: monitoring, causes, and relevance for water supply

Surface waters are one of the main sources for drinking water production, thus microbial contamination should be as minimal as possible. In recent years, increased numbers of coliform bacteria have been observed in oligotrophic lakes and reservoirs used for drinking water production. Certain strains of coliform bacteria, namely *Enterobacter asburiae* and *Lelliottia* spp., have been shown to be present during summer months, reaching values above 10⁴ per 100 ml, representing an increase of four orders of magnitude compared to winter. Interestingly, the same, very closely related strains have been found in several reservoirs from different regions in Germany. The fecal indicator bacteria *Escherichia coli* and enterococci could only be detected in low concentrations. Furthermore, fecal marker genes were not detected in the reservoir, indicating that high concentrations of coliform bacteria were not due to fecal contamination. Microbial community revealed *Frankiales* and *Burkholderiales* as dominant orders.

Nevertheless, such high concentrations challenge drinking water treatment and occasionally the respective coliform bacteria have been detected in the treated drinking water. Thus, the question of their hygienic relevance is of high importance for water suppliers and authorities. Genomic analyses suggest that the strains are not hygienically relevant, as typical virulence factors are absent and antibiotic resistance genes in the genomes most likely are of natural origin. The genome analyses further suggest adaptations to oligotrophic and changing environmental conditions, like e.g., genes to cope with low nitrate and phosphate levels and the ability to utilize substances released by algae, like amino acids, chitin, alginate, rhamnose and fucose. This leads to the hypothesis that the proliferation of the coliform bacteria could occur due to algae die-off.

We conclude that the proliferation in reservoirs and lakes during stable summer stratification is an autochthonic process of certain *E.asburiae* and *Lelliottia* strains, that are well adapted to the surrounding oligotrophic environment. It is correlated to higher water temperatures in summer and is therefore such “coliform bloom” are expected to occur more frequently in the near future, challenging drinking water production.