Bacterial necrotrophic growth on dead-biomass in drinking water

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Water sources nowadays are disinfected either chemically (e.g. chlorination) or physically (e.g. heat and UV). Such methods result in the reduction of bacterial loads by orders of magnitude. However, they cannot ensure that all microorganisms are killed, and concurrently the dead bacterial biomass may act as a carbon and nutrient source for the surviving bacteria. The capacity of bacterial strains to grow on dead-bacterial cells has been described before as necrotrophy or necrotrophic growth.

In this study, we investigated the effects of necrotrophy on the specific selection of bacteria in drinking water. More particularly, we studied how the addition of pre-killed bacterial biomass influences the bacterial concentrations and the bacterial community structure of bottled water. Heat-killed or fumigated-killed cells of a Gram+ (*Lactobacillus brevis*) and a Gram- (*Escherichia coli*) representative were added in bottled water. The cell concentrations of the samples were monitored over seven days by flow cytometry and the community composition was assessed at the end of the experiment by 16S rRNA gene amplicon sequencing. We observed that necrotrophic growth took place with the bacterial community growing from an initial concentration of 10^4 cells/mL to a final concentration 10^7-10^8 cells/mL. The community structure differed between the dead-cell treated and the non-treated samples and certain bacterial genera have been significantly more enriched during necrotrophic growth. Finally a general decrease in community diversity (phenotypic and taxonomic) was observed for all treated samples compared to non-treated water.

We showed that different indigenous bacterial taxa of natural aquatic microbial communities can grow on dead-biomass. The increased cell numbers in combination with the specificity of the taxa that grow necrotrophically can alter heavily the microbial community.