Investigation of the influence of materials and water qualities on the biofilm community in drinking water biofilms

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Pathogenic microorganisms in drinking water like *P. aeruginosa* and *L. pneumophila* pose a threat for human health. They settle in biofilms, which protect them against decontamination and offer an optimal habitat. In water installations many different materials are used over a long period of time. Depending on the applied materials and the ambient conditions, like stagnation and water temperature, different biofilm communities are formed. Materials which support growth of biofilms present a serious contamination risk for drinking water with hygienically relevant microorganisms. Up to now mainly indirect methods exist for the assessment of biofilm formation on materials, which measure the thickness of biofilms, the consumption of oxygen or the activity of microorganisms. There is only little information available about the influence of house installation materials on the composition of a biofilm population.

In this project, biofilm communities grown on different drinking water pipe materials (Copper, different PE-X and rubber qualities) at different sites of Germany (reduced groundwater[1]; recharged and reduced groundwater; river bank filtration[3]) are analyzed. The objective was to correlate factors from the water, the different materials and the composition of the resulting biofilms. In addition we examined native, contaminated (*P. aeruginosa, L. pneumophila, E. amnigenus, C. freundii*) and mechanically treated and disinfected (chlorine dioxide) biofilms on different materials at two different water temperatures (12 °C, 37 °C) from a pilot water house installation of our research partner[1].

Additional evaluations on the effect of other disinfectants on biofilm communities were carried out with biofilms grown on silicone provided by our research partner[2].

The biofilm communities on different materials were compared with a fingerprinting method (DGGE) and cloning (16S rDNA). The different biofilm communities had high diversity on rubber and comparatively low diversity on PE-X. DGGE patterns and cloning results of the same materials exposed at different sites showed a relatively low similarity. Consequently, the composition of the biofilm population is influenced both by the material and the origin of the drinking water. A contamination with water relevant pathogens resulted in a changed population structure. Chemical treatment induced a selection pressure and resulted in a new biofilm population.

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