Biofilm-mediated *Pseudomonas aeruginosa* contamination of a drinking water distribution system

Grobe, S.[1], Schaule, G.[1], Flemming, H.-C.[1,2], Wingender, J.[1,2]
[1]IWW Water Centre, Department of Applied Microbiology, Moritzstrasse 26
45476 Mülheim a. d. Ruhr, Germany; [2]Biofilm Centre, Aquatic Microbiology, Faculty of Chemistry, University of Duisburg-Essen, Geibelstrasse 41, 47057 Duisburg, Germany

Category: Case Studies and Lesson Learned

Summary of poster:

P. aeruginosa is an opportunistic pathogen which can be involved in sporadic or persistent contamination events in drinking water systems. The basis of the present study was the recurring cultural detection of *P. aeruginosa* in water samples from a German drinking water distribution system during warm periods in several successive years. In order to track the source of this contamination, both water and biofilms were investigated for the presence of *P. aeruginosa*, using a combination of culture-based and culture-independent molecular methods. Genotyping of 18 *P. aeruginosa* water isolates from throughout the distribution system and the waterworks was performed, using pulsed-field gel electrophoresis (PFGE). Independent of sampling site and date, a single clone of *P. aeruginosa* was detected, indicating that a systemic contamination was highly probable, which seemed to originate from the waterworks. Additionally 22 biofilm samples were analyzed for *P. aeruginosa*. The bacteria were not detected culturally in any of the biofilms; however, by means of culture-independent fluorescence *in situ* hybridization (FISH), *P. aeruginosa* was identified in 17 out of the 22 biofilms. In conclusion, *P. aeruginosa* occurred in biofilms of the distribution network and the waterworks in a viable state which could not be recognized by routine culture analysis. Thus, the biofilms were a reservoir of *P. aerguinosa* and presented a continuous contamination potential for the water phase. A possible explanation for cultural detection of *P. aeruginosa* in drinking water during certain times of the year may be the transition from the non-culturable to culturable state under favorable environmental conditions which have yet to be defined. This case study demonstrates that molecular methods such as FISH and PFGE can be useful in localizing sources of bacterial contamination in drinking water systems that cannot be recognized by conventional culture methods alone, and thus, these supplementary molecular techniques can contribute to a more rapid initiation of suitable sanitation measures.