Project Title: Dissemination of clinically-relevant antimicrobial resistance genes through selected pathways across hospital and municipal wastewater networks

Supervisor: Tim Erler M.Sc. / Dr.-Ing. Michael Savin-Hoffmeyer
Institute/group: Institut für Hygiene und Öffentliche Gesundheit/Public Health
Webpage: https://www.ukbonn.de/ihph/

Requirements: Sufficient lab experience (bacterial cell culture, PCR, method development, data evaluation), highly self-motivated and independent, able to work in a team

Skills to be learned: Digital PCR (dPCR), FACS, 16S-Sequencing, method development, RNA-Sequencing/Transcriptomics

Project Description (max. 150 words): Free-floating extracellular DNA (exDNA), which is released from bacterial cells actively or upon cell death, makes up a significant proportion of the total DNA found in wastewater networks. While exDNA is associated with mobile genetic elements facilitating gene transfer, the exDNA fraction may play an overlooked role in the dissemination of antibiotic resistance genes via transformation. In this project, a controlled laboratory model system will be developed to estimate the role of transformation-based gene dissemination in different bacterial communities and environments. The dissemination efficiencies will be directly compared to the predominantly investigated pathway of bacterial conjugation utilizing dPCR and FACS. The later will enable further insights into the key organisms for transformation-based resistance gene dissemination with subsequent 16S-sequencing and transcriptome analysis. Additional parts of this project will address the integrity of exDNA at different stages of the wastewater network and other relevant DNA fractions, such as sediment-bound exDNA.

Support concept (max. 75 words): The personal supervision by a doctoral student will facilitate the knowledge and skill transfer during the master studies, while gaining first hand research experience. Fixed weekly 1:1 meetings will give the opportunity to address open questions, get feedback and discuss the current progress. The in-house combination of fundamental research and interdisciplinary accredited contract analysis provides valuable insights in different aspects of the laboratory work. A monthly journal club will give additional opportunities to exchange ideas.

Interested to recruit and finance a suitable student by own funds: NO