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Master 2 internship project
Year 2022-2023

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Laboratory/Institute: TIMC (Translational Innovation in Medicine and Complexity)
Director: Alexandre MOREAU-GAUDRY
Team: TrEE (TRanslational microbial Evolution & Engineering)
Head of the team: Fabien PIERREL and Bertrand TOUSSAINT
Name and status of the scientist in charge of the project:
Elena BÜLOW, Contract researcher and Corinne MERCIER, Professor   HDR: yes ■ (Corinne Mercier)
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Program of the Master's degree in Biology:
■ Immunology, Microbiology, Infectious Diseases   ■ Structural Biology of Pathogens
☐ Physiology, Epigenetics, Differentiation, Cancer   ☐ Neurosciences and Neurobiology

Title of the project:
Monitoring antibiotic resistant pathogens in hospitals by metagenomic characterization of sink and hospital wastewater biofilms in comparison with conventional culturing methods

Objectives (up to 3 lines):
In the context of the "one health" approach, the proposed project will correlate 1/microbiota and resistome composition of sink and hospital waste water biofilms to 2/ incidence of infections and 3/ antibiotic treatment and medication at the Grenoble's University Hospital Center.

Abstract (up to 10 lines):
The proposed research project aims to improve existing surveillance of antibiotic resistant bacteria (ARB) in hospitals by combining culture-dependent approaches with omics data. Biofilms that form in the sink or in shower drains of hospital wards potentially contain nosocomial pathogens or ARB, that could be transmitted to patients. Furthermore, hospital wastewater (WW) that collects the feces of patients may indicate the level of pathogen contamination in the patient microbiota, including ARB. Specifically, hospital WW biofilms are important hot spots for the accumulation of pathogens and the dissemination of antibiotic resistance genes (ARGs). However, until today, biofilms from the hospital environment are not part of routine diagnostics for the monitoring of ARB and nosocomial pathogens at the Grenoble's University Hospital Center. Here we will study hospital WW and sink biofilms by culture-dependent and omic approaches to correlate our data with the infection rate and the consumption of antibiotics at the hospital. Together, these results will allow a better estimation of the infection transmission risks in hospitals.

Methods (up to 3 lines):
Characterization of biofilms (hospital WW and sink biofilms) by conventional culturing techniques; analysis of the biofilm microbiota by full-length 16S rRNA sequencing; "resistome" analysis by targeted high-throughput qPCR; analysis of the infection rate and consumption of antibiotics at the hospital

Up to 3 relevant publications of the team:
Büelow *et al*., FEMS Microbiol Ecol., 2018; Bûelow *et al*., Water Res X., 2020

Requested domains of expertise (up to 5 keywords):
Microbiology, molecular biology, bioinformatic analysis of sequencing data, statistical analyses