

Built environments: new insights into the microbiome and resistome

Gabriele Berg¹, Christine Moissl-Eichinger^{2,3}, and Alexander Mahnert¹

¹Institute of Environmental Biotechnology, Graz University of Technology, Austria, ²Department of Internal Medicine, Medical University Graz, Austria, ³BioTechMed Graz, Austria,

Built environments are also residences for a specific microbiomes. In the last years, they were intensively studied but less knowledge was transferred into strategies for microbiome management. We studied coherences of microbial confinement and resistances as well as the impact of indoor plants and biostimulants on the indoor microbiome to design management strategies.

In a unique design of six model habitats (public buildings, public and private houses, intensive care units – ICUs and cleanroom facilities), the comparative analysis of deeply sequenced shotgun metagenomes show that anthropogenic influence shifted the active microbiome and even more the resistome (1). The influence was visible in a reduced diversity, and a significant increase of potential pathogens. The resistome reflect these shifts and showed higher resistances especially against fluoroquinolones, triclosan or elfamycins and more mobile genetic elements which mediate more resistances against fluoroquinolones, aminoglycosides and diaminopyrimidines in controlled habitats. The data set allowed developing prediction models for both, the microbiome and resistome (1).

Plants are often part of indoor environments and provide a sustainable but underexploited solution to enhance microbial diversity (2,3). Plants can alter microbial abundance and diversity within the built environment (4). This suggests that it might be possible to not only influence the microbiome of a plant, but also their environment by increasing and stabilizing the existing microbial community with them. In addition, we showed that biostimulants applied to indoor plants improve plant health but also biodiversity in the surrounding environment (5).

In conclusion, there are possibilities to predictively manage the microbiome and resistome of the built environment by re-thinking cleaning, integrating plants and applying biostimulants.

(1) Mahnert *et al.* Nature Communications 2019

(2) Berg *et al.* Fron Microbiol. 2014

(3) Ortega *et al.* FEMS Microbiol Ecol. 2016

(4) Mahnert *et al.* Front Microbiol. 2015

(5) Mahnert *et al.* Front Microbiol. 2018