

GEOCHEMICAL AND METAGENOMIC ANALYSIS OF URBAN RIVER SEDIMENTS FOR ANTHROPOGENIC CITY POLLUTION

Augustė-Ona Jančiauskaitė¹, Dalius Butkauskas¹, Vytautas Samalavičius², Vesta Skrodenytė-Arbačiauskienė^{1*}

¹The Nature Research Centre, Vilnius, Lithuania

²Faculty of Chemistry and Geosciences, Vilnius University, Lithuania

auguste-ona.jancauskaite@gmc.stud.vu.lt

Human activities in the city area leads to greater pollution with significant impact on human health and damage to the natural or built environment [1]. Sediments cores are one of the most important tools for monitoring anthropogenic transformations in aquatic environments and some metals correlate as anthropogenic trace indicating that these elements had an identical origin [2]. Also, environmental pollution is an important factor to shape the microbial communities that eventually could lead into spread of pathogens and ecological functions disable and sediments is an active place with high abundance of microorganisms [3]. This study was conducted to investigate the shift in structure of sediment bacterial communities of river exposed to multiple anthropogenic contaminants and relate changes to chemical composition for potential of bioindication.

Neris river is a suitable model object to investigate the impact of pollution on the aquatic ecosystem, it crosses the capital Vilnius - one of the most urbanized cities in Lithuania. Three different anthropogenic sites were selected to sample Neris river sediments in two years row 2017-2018: before the city, city center and after wastewater treatment plant. Using the Inductively coupled plasma optical emission spectrometry, the chemical composition of heavy metals was analysed to uncover anthropogenic trace in river sediments samples. The microbiome was characterized on the basis of the V3 and V4 hypervariable regions of the 16S rRNA gene by using next generation sequencing platform Illumina MiSeq.

The chemical analysis of Neris river sediments uncovered anthropogenic trace in sampled sites. Comparison of Neris river bacterial communities revealed several uniquely found genera and pathogenic genera of Nostocales and Spirochaetales order as candidate bioindicators to monitor river pollution. Furthermore, potentially pathogenic bacterial genera *Flavobacterium* and *Clostridium* was dominant in anthropogenic impact sites. Overall, bacterial communities could provide a useful tool for monitoring and assessing ecological state in freshwater sediments while indicating anthropogenic city pollution.

[1] N. B. Grimm, S. H. Faeth, N. E. Golubiewski, C. L. Redman, J. Wu, X. Bai, J. M. Briggs, Global Change and the Ecology of Cities, *Science* 319(5864), 756-760 (2008).

[2] Z. Balogh, S. Harangi, I. Gyulai, M. Braun, K. Hubay, B. Tóthmérész, E. Simon, Exploring river pollution based on sediment analysis in the Upper Tisza region (Hungary), *Environ Sci Pollut Res Int* 24(5), 4851-4859 (2017).

[3] Z. Hou, W. C. Nelson, J. C. Stegen, C. J. Murray, E. Arntzen, A. R. Crump, D. W. Kennedy, M. C. Perkins, T. D. Scheibe, J. K. Fredrickson, J. M. Zachara, Geochemical and Microbial Community Attributes in Relation to Hyporheic Zone Geological Facies, *Sci Rep* 7(1):12006 (2017).