Heavy metal contamination of sediments poses serious biototoxicity and bioaccumulation issues. Besides important ecological roles such as organic matter mineralization, bacteria play a key role in metal speciation. The MetalEurop foundry released zinc, copper, cadmium and lead in the “Deûle” river (France) during a century, resulting in present-day metal concentrations in sediments up to 30-fold higher than in the Férin site (a control site in the Sensée canal). On the basis of a shotgun metaproteogenomic approach, it was found that sediments of the two sites (MetalEurop & Férin) harbored phylogenetically analogous microbial communities (Gillan et al., 2015).

But what about bacterial activity?

This study compares taxonomic profiles of the complete (DNA) and the potentially active (RNA) fraction of the sediment prokaryotic communities present in MetalEurop and Férin via 16S rRNA gene amplicon sequencing (Illumina® MiSeq® 2x250 bp). The ecological concept of Functional Response Group was applied to decipher the tolerance and sensitivity patterns in the microbial community, linked to the long-term pollution (Nunes et al., 2016).

Using nbGLM, 97 OTU were found to respond significantly to metal-contamination and activity pattern.

• Similar communities dominated by Gammaproteobacteria and Firmicutes.
• Richness and Firmicutes activity increased in the metal-stressed community.
• The arrival of new bacteria (from upstream or the river banks) combined to the in situ metal selection seems to drive the shaping and activity of the community.
• Anthropogenic metal contamination uncovers rare and very active bacteria (Verrucomicrobia), as well as sporulating/dormant ones (Clostridiaceae). Slow-growing and dormant bacteria constitute a slow genetics reservoir.
• Metal tolerant bacteria characterize the contaminated sediments. They include diverse Proteobacteria and Firmicutes.

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Metal activated
Metal Tolerant
Rare but active /spore
Metal sensitive
Slow growing

0%
10%
30%

FRG1 FRG2 FRG3 FRG4 FRG5 FRG6 Other

Acidobacteria Gammaproteobacteria Clostridia Deinococccus-Thermus Frankibacteria Nodulipedia Unclassified Bacteria Actinobacteria Betaproteobacteria Gammaproteobacteria Chamaerski Deinococccus-Thermus Euryarchaeota Microviridans Bacteroidetes Phaeocollectae Verrucomicrobia