REFLECT

FACTSHEETS

ROLE OF MICROBIOLOGY IN GEOTHERMAL OPERATIONS

REFLECT: Redefining geothermal fluid properties at extreme conditions

Microorganisms are present in most ecosystems on Earth, and despite the extreme environmental conditions in geothermal fluids, these systems are also home to microbial life (Figure 1).

Inside power plant systems, **microorganisms can be involved in microbially induced corrosion** (MIC), **form biofilms or induce mineral precipitation**. One striking example of the impact of microorganisms on power plants is the induced precipitation of silica by bacteria, which strongly decreases the efficacy of a power plant [1].

However, other than in specific cases [1,2,3], knowledge of the diversity and prevalence of microbial life in deep geothermal reservoirs is still scarce. In order to fill in this knowledge gap, surveys of environmental DNA and cultivation of microorganisms under laboratory conditions (Figure 2) can be used to assess the diversity of microorganisms present in different power plants.

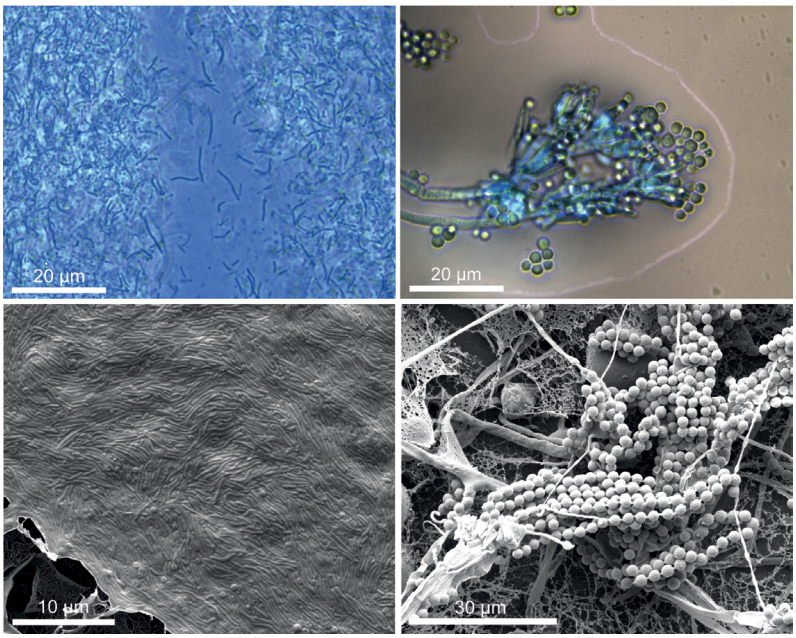

Figure 1: *Microscopical images of two microbial strains isolated from geothermal power plants. The two images on the left: Bacteria (Up: Optical microscopy, Bottom: Electronic Microscopy (Made by PME, UniL). The two images on the right: Fungus (Up: Optical microscopy, Bottom: Electronic Microscopy (Made by PME, UniL).*

Moreover, these studies should consider a broad spectrum of microbial groups, thus including simultaneously Bacteria, Archaea, and Fungi. A better knowledge of the microbial diversity present in these systems, as well as determining the conditions under which these microorganisms can grow, could allow to avoid problems generated by microorganisms in the pipes such as MIC.

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Furthermore, as the use of geothermal fluids to produce electricity changes the environmental conditions present in the fluids and in the reservoir, a better understanding of the microorganisms circulating in the power plants could allow to predict changes in the microbial population and its effects on the system in the long term.

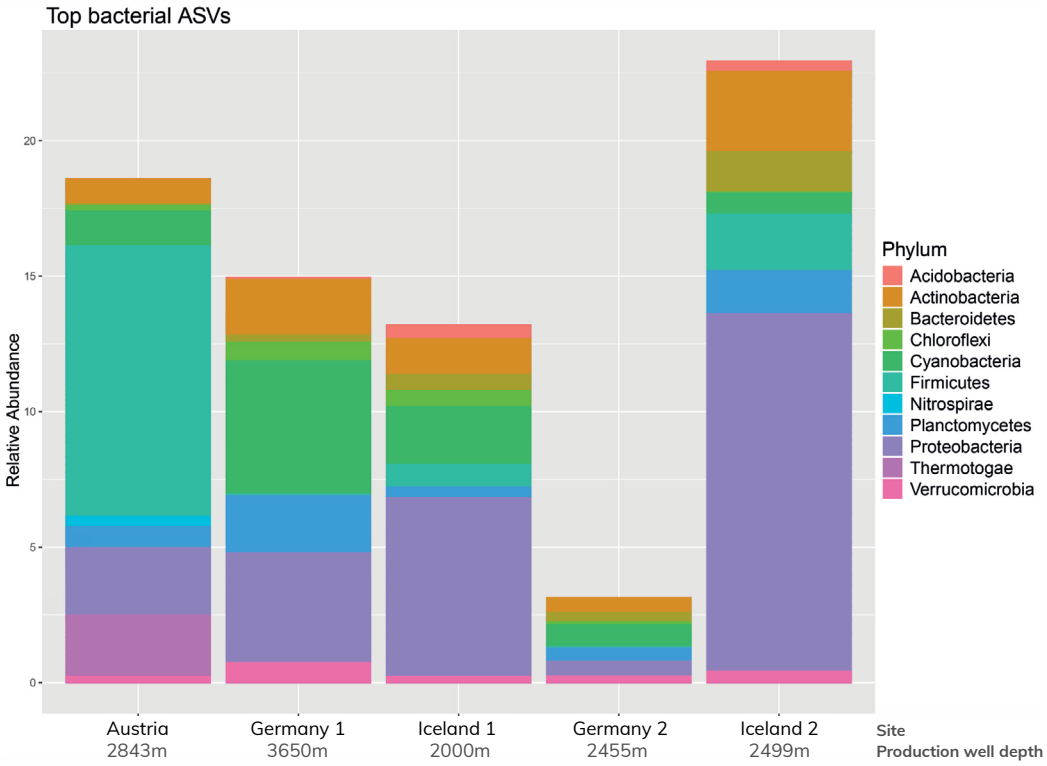

Figure 2: *Relative abundance of the top 100 bacterial species (ASVs) present at different power plants, grouped at the Phylum level.*

[1] Inagaki, F., Motomura, Y. and Ogata, S. (2003), *Microbial silica deposition in geothermal hot waters.* doi: 10.1007/s00253-002-1100-y

[2] Filippidou, S. et al. (2016), *Anoxybacillus geothermalis sp. nov., a facultatively anaerobic, endospore-forming bacterium isolated from mineral deposits in a geothermal station.* doi: 10.1099/ijsem.0.001125

[3] Westphal, A. et al. (2019), *Change in the microbial community of saline geothermal fluids amended with a scaling inhibitor: effects of heat extraction and nitrate dosage.* doi: 10.1007/s00792-019-01080-0

Further information

- *Scientific publication:* Dissolved organic compounds in geothermal fluids used for energy production: a review
- *Presentation from the REFLECT Geothermal Stakeholder Workshop:* Studying microbial life in deep geothermal reservoirs

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