

Development of a sensor platform for the detection of pathogenic bacteria in aquaculture systems



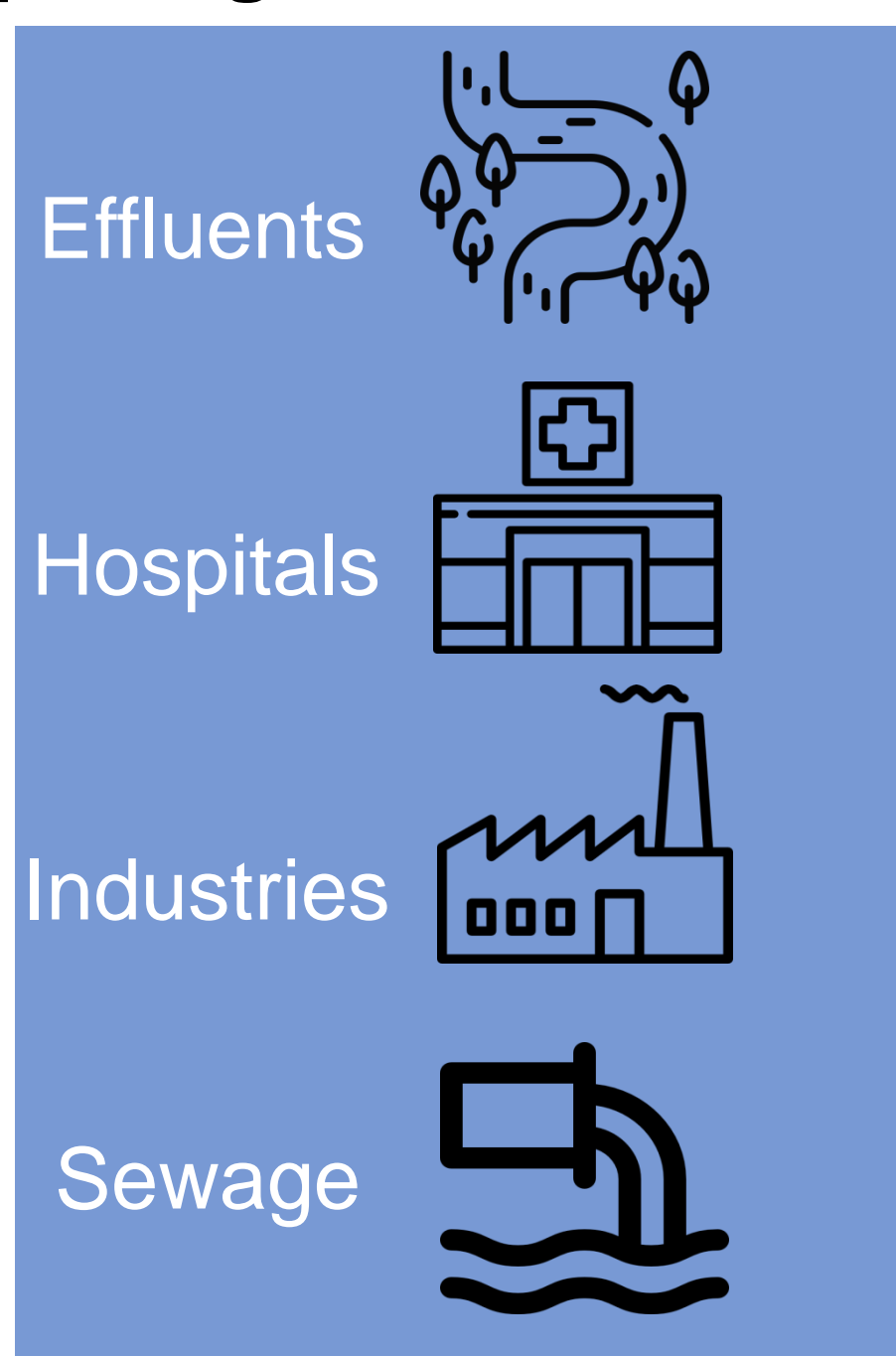
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Main Goal

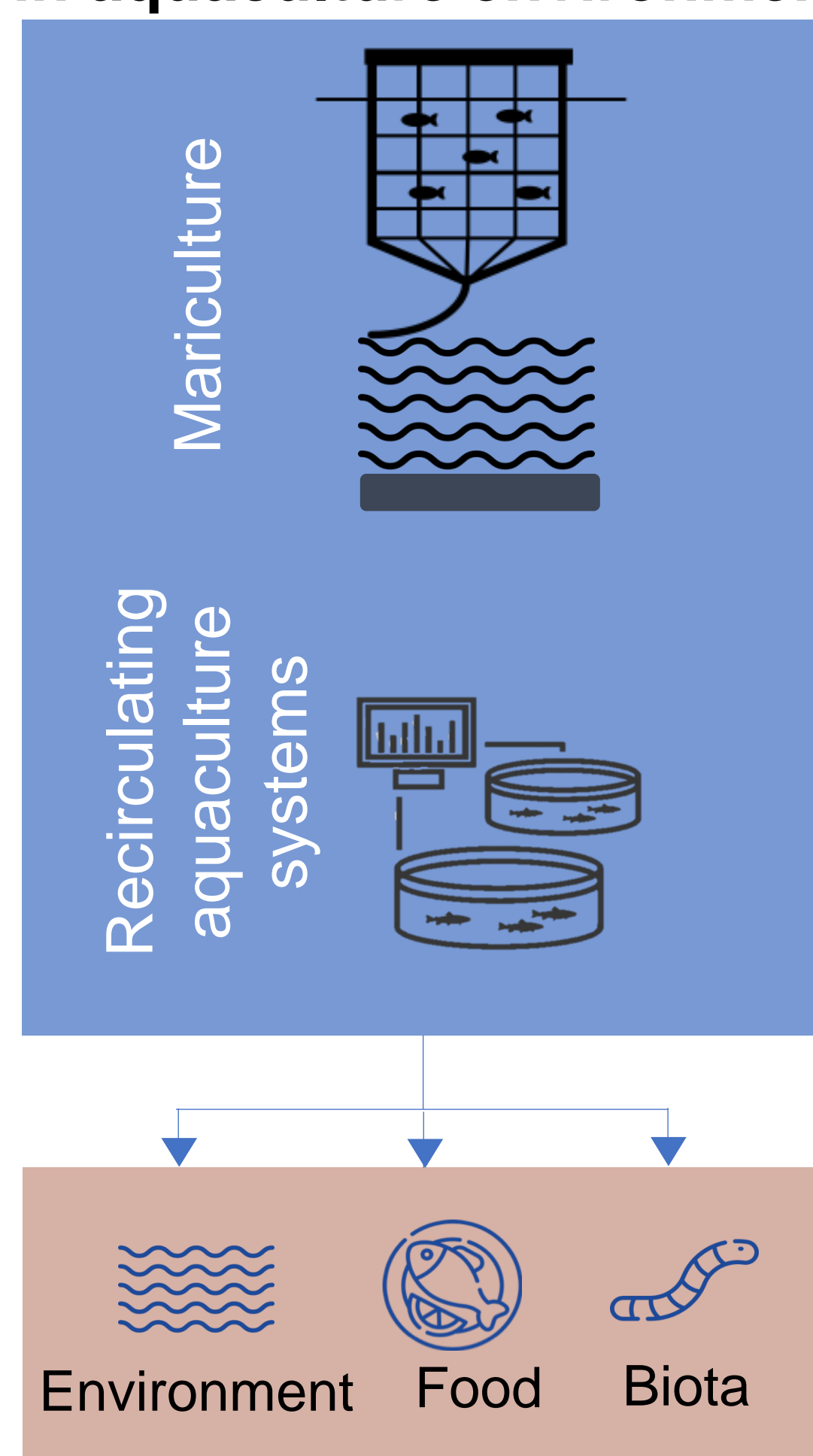
Aquaculture represents a key source of fish food for human consumption. Increasing concerns arise from the release of antibiotics (AB) in the environment and possible contamination of fish farms and products. The ARENA project aims to improve the quality assessment of aquaculture practices and products by exploring the fate of antibiotic and microbial contaminants across the water cycle.

Overall Concept

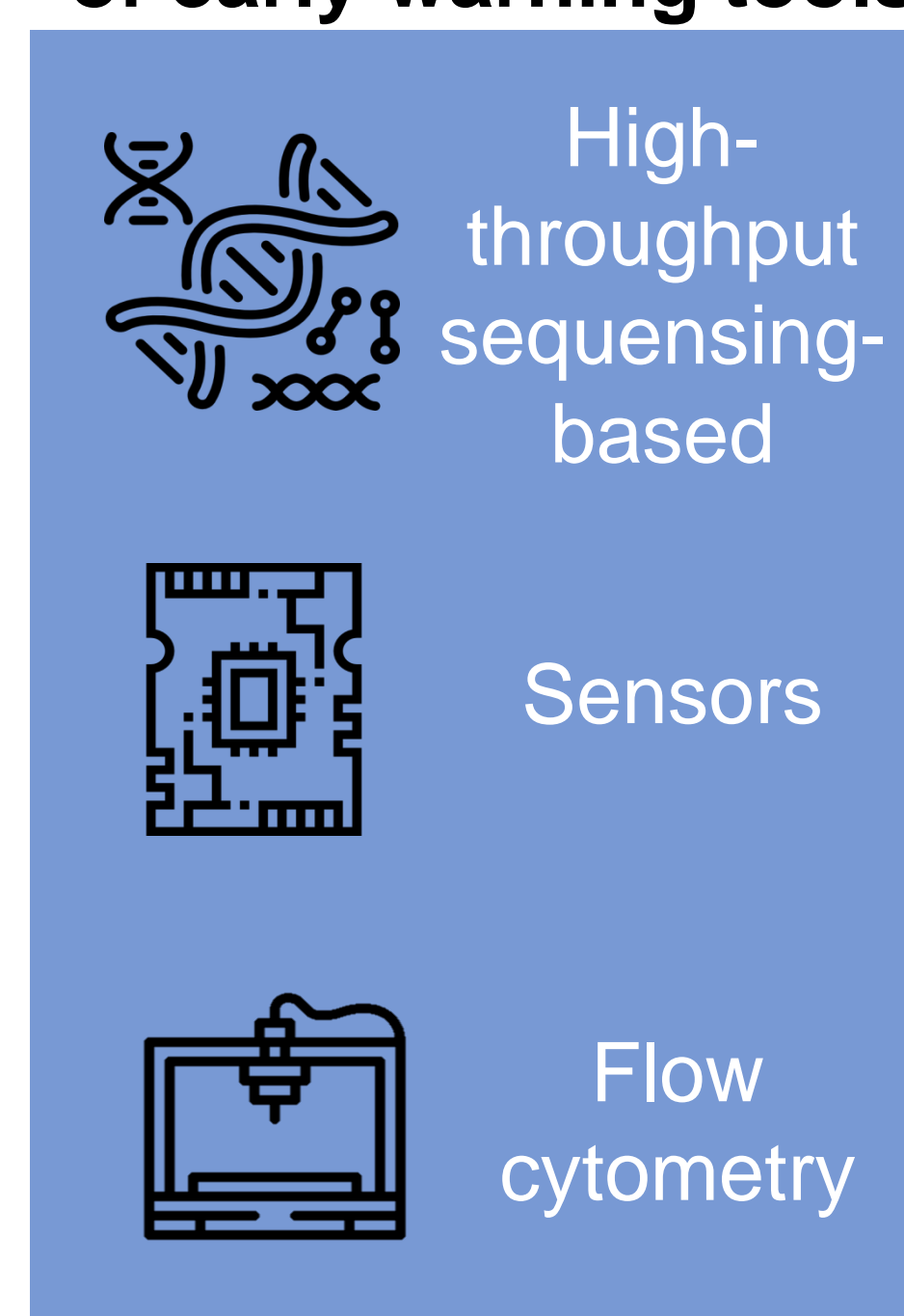
Sources of antibiotics and pathogen contamination



Assessment of contamination in aquaculture environment



Development and application of early warning tools



Contamination levels will be assessed from sources to aquaculture plants and final food products, along with the antibiotic resistome and pathogenic signature in open (mariculture) and recirculating aquaculture systems.

For mariculture, the assessment of the same contaminants will also be performed in benthic biota beneath fish cages.

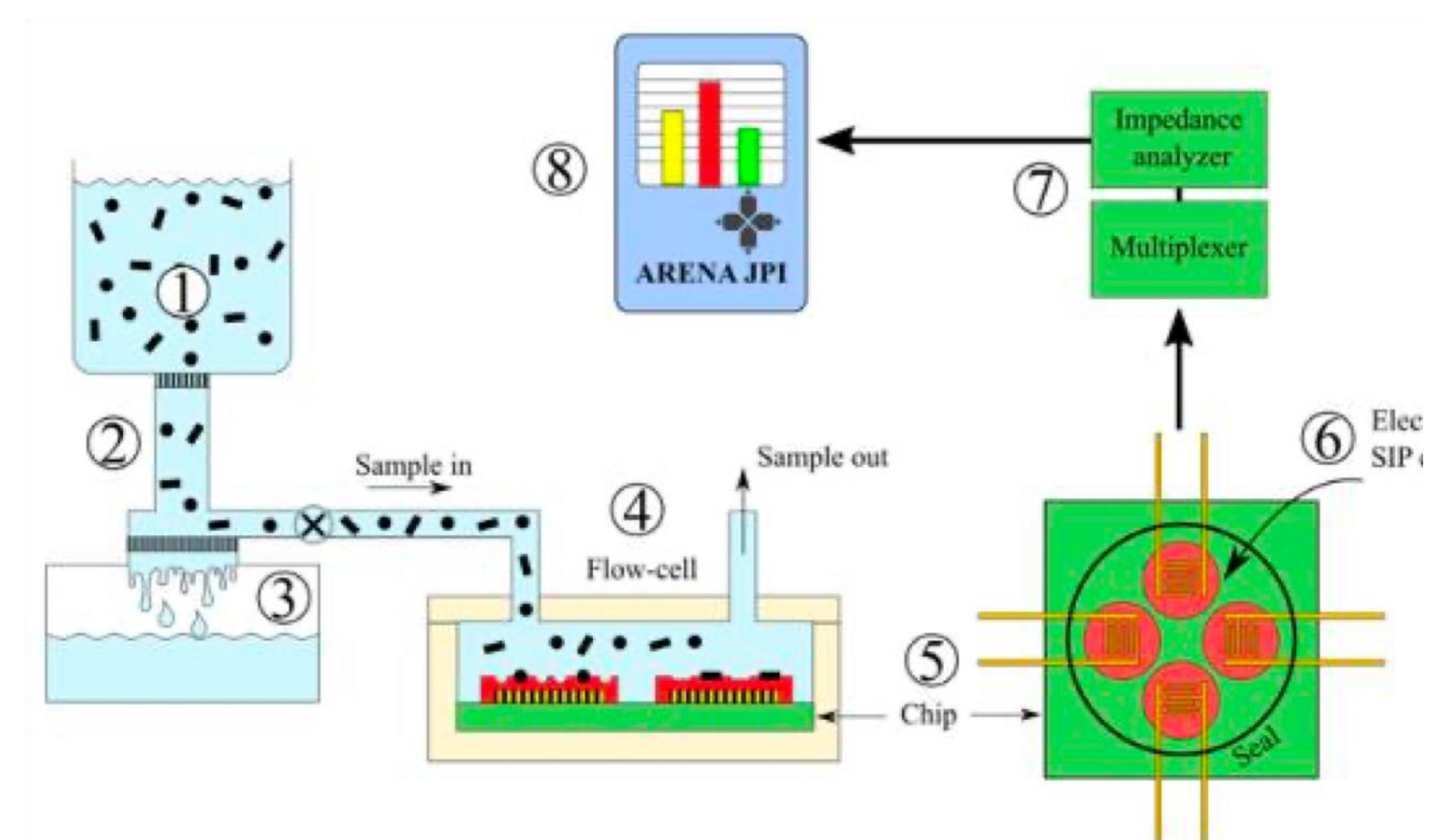
Early-warning tools for the rapid detection of antibiotic residues, antibiotic-resistance genes (ARGs), and microbial pathogens in environmental and biological samples will be optimized.

Experiments

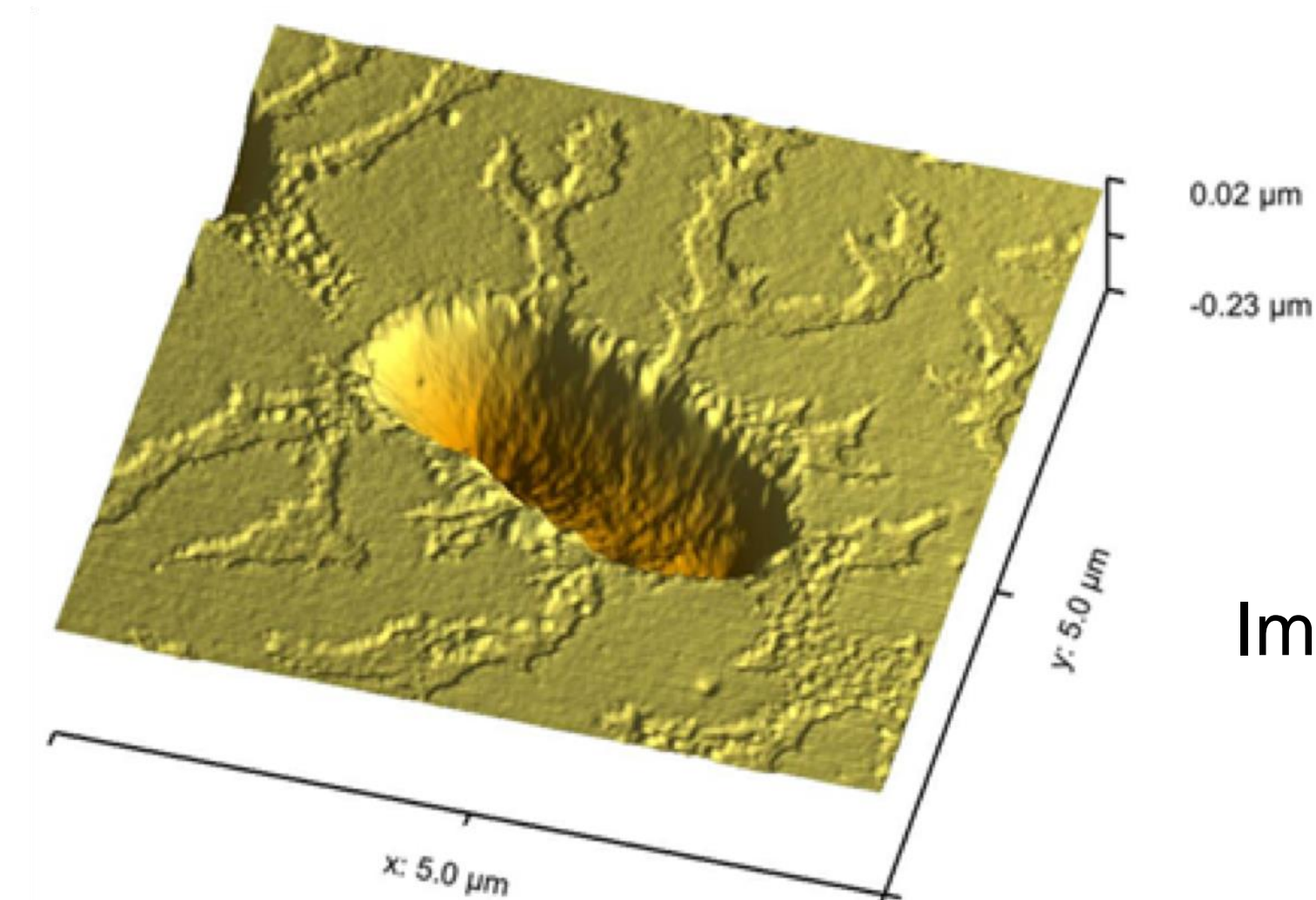
AIM – To improve the quality assessment of aquaculture practices and products by exploring the fate of antibiotic and microbial contaminants across the water cycle

METHODS:

- Application of shotgun metagenomics and qPCR/ddPCR for a complete overview of AB-resistome and pathogenic signature in aquaculture
- Set up of sensor platforms for on-site detection of pathogenic bacteria (including AB-resistant bacteria)
- Optimization of a flow-cytometry method for the early detection of AB residues
- Set up, optimization and validation of a nanopore-based method for the assessment of ARGs and ARBs in aquaculture settings



Schematic of sensor device for on-site bacterial detection



Imprint of *E. coli* on polyurethane

Outcomes and expected impact

- ARENA will provide knowledge and tools to decrease the spread and magnification of ARB and pathogens in aquaculture.
- ARENA will produce a complete overview of the AB-resistome and pathogenic signature of open and closed fish farms and their potential contamination sources and pathways.

- ARENA will optimize innovative approaches and test for their capability of rapidly detecting AB residues, ARGs, ARB, and other pathogens in the environment and in the fish products.

- ARENA will contribute to UN SDG 14 (Life below water): conservation and sustainable use the oceans, seas and marine resources for sustainable development.

