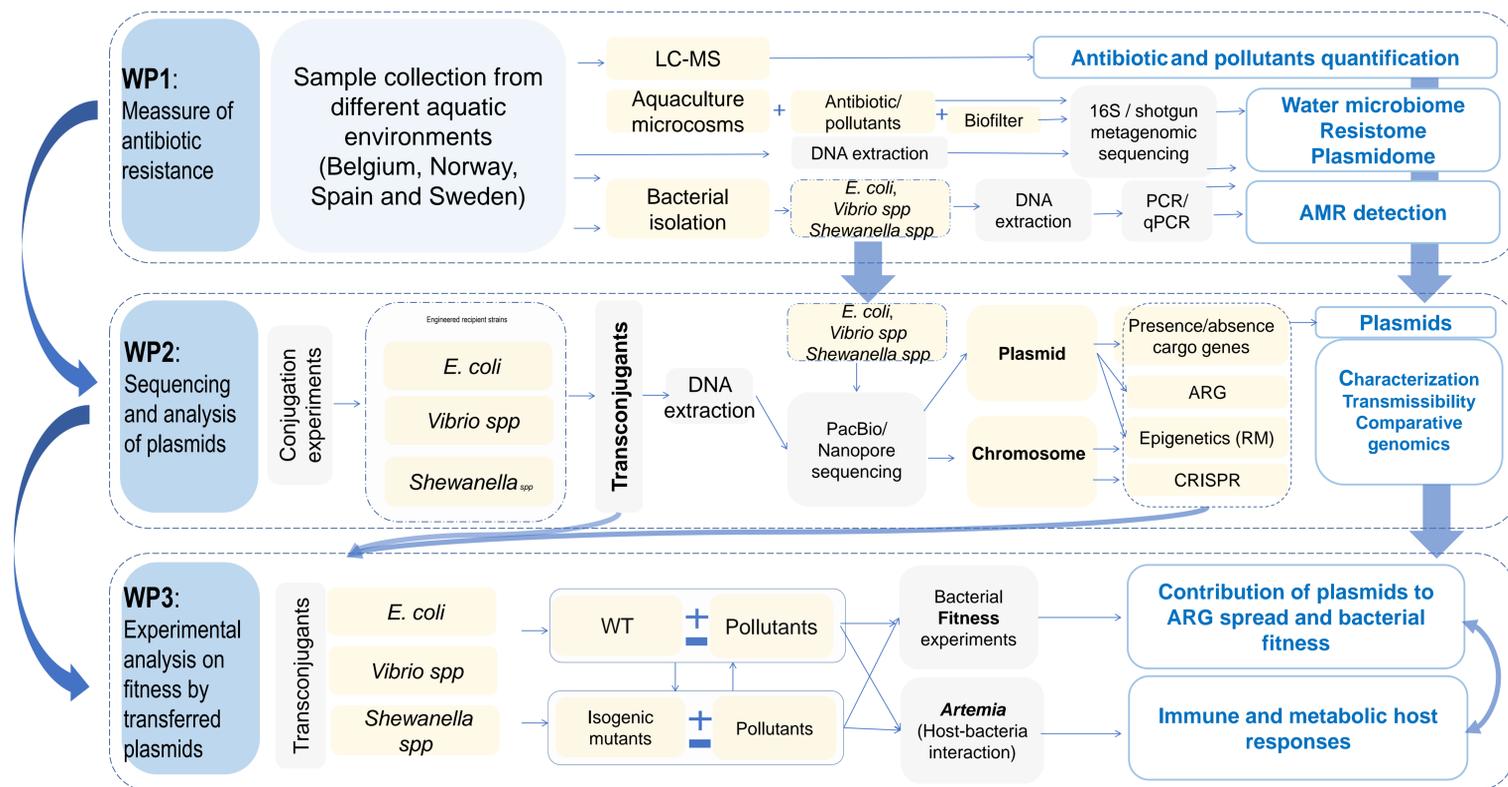


Probing Antibiotic Residues and Resistance Transfer in Aquatic Environments, PARRTAE

Åsa Sjöling¹, Marc Heyndrickx², Olav Vadstein³, Maria Tavío del Mar⁴, Kartik Baruah⁵, Jonatan Martín-Rodríguez¹, Enrique Joffré¹, Geertrui Rasschaert²

1. Karolinska Institutet, Sweden, 2. ILVO Technology and Food, Belgium, 3. Norwegian University of Science and Technology, Norway, 4. Universidad Las Palmas de Gran Canaria, Spain, 5. Swedish University of Agricultural Sciences, Sweden

The project aims to study bacteria, antibiotic resistance genes (ARGs) and antibiotic residues in groundwater, surface water, wastewater, marine water environments in the North Sea and the Atlantic including ports, and aquaculture facilities. Samples will be collected from sites with high and low suspected loads of antibiotic residues. Culture-based and sequencing-based methods will be used to identify ARGs. Transfer of ARG-containing plasmids will be analyzed using indicator bacteria *Escherichia coli*, *Vibrio* spp., and *Shewanella algae* as recipients. LC-MS/MS will be used to quantify the levels of different antibiotics in the collected samples.



We hypothesize that local water microbiota, antibiotic residues, and recipient species will affect the type of plasmids transferred. The effects of the acquired plasmids on the physiology of our bacterial models will be analyzed in experimental lab systems, and their influence on fitness and virulence in a live host will be studied by host interactions in a shrimp (*Artemia*) model. The project will determine common ARG plasmids circulating in European waters and their inherent properties as a fundament to understand and prevent their dissemination.

OUTCOMES AND EXPECTED IMPACT

The impact of circulating ARG plasmids and antibiotic residues and their contribution to the emerging resistance problem has only begun to be understood. This project aims to detect emerging plasmids and other mobile elements and their corresponding bacterial hosts by joining microbial expertise from the health, aquaculture, freshwater, and marine sectors.

We aim to determine and measure the behavior of important ARG plasmids, corresponding genes and bacterial hosts in water and over time, and experimentally analyze the driving sources, including antibiotic residues, behind the preponderance of such plasmids.

The PARRTAE project will:

- Provide a broad overview of relative frequencies of ARGs in different bacterial species in water environments.
- Correlate the presence of antibiotic residues to the presence and frequency of ARG indicator bacteria.
- Determine occurrence and frequency of different ARG plasmids and their transferability to recipient strains.
- Determine the impact of plasmid gene content on transfer frequencies, fitness and impact on water residing eukaryotic hosts using an Artemisia model.