

- **Presentation sheet :**

UMR CNRS 6023 Laboratoire Microorganismes : Génome et Environnement (Didier debroas)

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Deciphering the main vehicles of the antibiotic resistance genes in the environments: role of the phages and membrane vesicles.

At the global scale, antibiotic resistance is a rapidly growing health care problem. At least 700,000 deaths are yearly attributable to resistant microbial infections worldwide, and estimates rise above 10 million by 2050 in the absence of a proactive solution. The One Health concepts integrate knowledge of the biological elements required for understanding the evolution of antimicrobial resistance, including all the vectors involved in its emergence and dissemination. Most mobile genetic elements are transferred through cell-cell contact by a conjugation mechanism. However, other mechanisms do not require cell contact between microorganisms, the persistence of the DNA in the environment is therefore critical. Thus, vehicles for the transfer between non-contiguous cells could be phages or, more generally, all vehicles protecting the nucleic acids such as gene transfer agents or membrane vesicles.

We hypothesize that the role of phages and membrane vesicles (MVs) in the dissemination of the antibiotic resistance genes (ARGs) are largely underestimated. The main objectives of this PhD are: 1) To assess the relative importance of phages and MVs compared to the microbiome (plasmids) 2) To evaluate the proportion of the ARGs harbored specifically by MVs and phages; 3) To propose a wastewater monitoring to track dissemination and emergence of the antibiotic resistances by targeting the main vehicles of the ARGs defined in this project.

Debroas, D. & Siguret, C. Viruses as key reservoirs of antibiotic resistance genes in the environment. ISME J 1–12 (2019).