PRESS INFORMATION

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IFREMER researcher is laureate of prestigious ERC "Advanced Grant" program for scientific excellence

What if there was an alternative to antibiotics in the ocean?

Frédérique Le Roux, an IFREMER researcher in molecular microbiology at the Roscoff marine station (CNRS/Sorbonne Université), has won a €2.5 million Advanced Grant from the ERC (European Research Council) for DYNAMIC1, a project that studies phages in marine environments. Phages, which are natural predators of bacteria, could be an alternative to antibiotics.

"The ERC grant is an amazing success for IFREMER and marine science. The topic "ocean & health" will be essential in the upcoming years," underlines **François Houllier, CEO at Ifremer.** *Because ocean biodiversity is a fantastic reservoir of molecules that can be used for human health, because the ocean gets many biological contaminants from the land, and because seafood quality is critical for consumers. With this project, Frédérique Le Roux and her team will, I hope, provide key knowledge to finding alternatives to antibiotics. This is a global challenge that the scientific community takes up today."*

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ERC Advanced Grants give researchers with national and international recognition in their fields the opportunity to pursue ground-breaking, high-risk projects that open up new paths in their own discipline or other domains

Frédérique Le Roux is one of 18 French laureates (six of whom are women) out of the 161 total recipients of the 2019 ERC Advanced Grant (1881 candidates applied, yielding a success rate of 8.5%). DYNAMIC is the only French project that was retained for the Ecology, Evolution and Environmental Biology evaluation panel (LS8). This is the first Advanced Grant that IFREMER has received and the third grant that the institute has received from the ERC.

Antibiotic resistance is an environmental problem too

"We're seeing the emergence of bacteria that are resistant to all antibiotics, and at the same time new molecules are not being produced. Models show that there could be 10 million deaths in 2050 due to infections by multidrug-resistant bacteria, which is more than the projected deaths from cancer," explains Frédérique Le Roux. *"There are two solutions to this predicament: using antibiotics only when absolutely necessary, and finding alternatives. My approach is to investigate how bacteria's natural enemies control their spread and evolution in nature."*

"Phages are bacteria's natural predators. They specifically attack certain bacteria without disturbing other organisms like animals and algae. Our research aims to understand the extent to which phages are specific to pathogenic bacteria, how bacteria resist them and how phages counter-attack—this is what we call co-evolution. Most of the scientific community is working on the use of phages in human health, for treating bacterial infections as a complement to or a replacement for antibiotics. But antibiotic resistance isn't only a clinical problem. It's an environmental problem that affects agriculture and aquaculture as well. If a human is infected by multidrug-resistant bacteria, the source of those bacteria is the environment."

[1] DYNAMIC: "A mechanistic approach to understand microbiome-viriome **dynamics** in nature"

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Farmed oysters as a research model

"Marine bacteria, especially vibrios, can infect farmed animals like shrimp, fish and mollusks. With the DYNAMIC project, we're going to study the interactions between phages and bacteria associated with oyster mortality. The knowledge we develop will improve our understanding of the ancient relationships between bacteria and phages that are present in all ecosystems, whether oyster farms, pig farms or the digestive tract. This fundamental knowledge may help us understand whether it's possible to use phages as an alternative to antibiotics in aquaculture."

The ERC Advanced Grant: recognition of teamwork

Frédérique Le Roux is "delighted and relieved" to have won the five-year ERC Advanced Grant. This award marks a new phase in the 53-year-old's remarkable career. Le Roux is the daughter of a sailor/fisherman and she wrote her thesis on human virology. After two post-doctorates, she was recruited by IFREMER in 2000 and started working on pathogenic vibrios in oysters. Through different placement opportunities, she was able to train with the best teams researching antibiotic resistance. Le Roux worked at the Pasteur Institute for four years before moving to Harvard Medical School in Boston, where she stayed for two years. In 2010, when she returned to France from the United States, she felt ready to lead her own research team at the Roscoff marine station. The ERC grant is the culmination of ten years of work with her team, which is composed of a researcher, an assistant engineer, doctoral students and post-docs, all of whom Le Roux thanks for their contributions. This grant will enable them to purchase more equipment (which can be very expensive in molecular biology); to recruit two doctoral students, two post-docs, an engineer and a technician; and of course, to continue to benefit from opportunities for collaboration in France and abroad.

En savoir plus sur : https://erc.europa.eu/news/erc-2019-advanced-grants-results

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