

ENS – IISER / BIOSANTEXC Partnership Internship Proposal Form

FIELD
Biology / Earth Sciences

Environmental side effects of antibiotics: Do antibiotics alter the denitrification capacity and enhance eutrophication in natural waters?

Name of the laboratory at ENS: department of Environmental Sciences
Observatoire des Sciences de l'Université de Rennes (OSUR)
UMR Géosciences Rennes

Name of the internship supervisor: Camille Vautier
Email: camille.vautier@ens-rennes.fr

Requested level: Master 1 / Master 2 / Doctoral studies

Prerequisites for the internship: The candidate's profile is open. The student may have a background in ecology, microbiology, hydrology, geochemistry, or a generalist profile in life sciences, earth sciences, chemistry or physics, provided that he/she is open to other disciplines and ready to train scientifically in different fields during the internship.

The candidate should be interested in different methodologies (field work, lab, numerical modelling), yet it is not necessary to have already practiced them all.

Internship proposal (description and expected training outcomes / 15 lines max):

Human and veterinary medicine induces the release of antibiotics in natural waters, through the spreading of animal dejections on the fields, or through the contamination of sewage. Designed to fight pathogenic bacteria, antibiotics can, once in the environment, impact bacteria different from their initial target. A few laboratory studies show that some antibiotics can disturb the metabolism of denitrifying bacteria¹, which are crucial to reduce nitrate pollution in natural waters². This environmental side-effect of antibiotics could alter water quality and enhance eutrophication.

Are antibiotic concentrations in the natural environment sufficient to influence denitrifying bacteria? Does the exposure time in the aquifer cause a long-term effect? What is the overall effect of antibiotics on the nitrogen cycle?

The project will combine field work, laboratory experiments and modelling. (1) Nitrates and antibiotics will be measured in two agricultural catchments in Brittany, France. (2) Experiments in continuous flow reactors will be performed to characterize the action of antibiotics on bacteria of the nitrogen cycle. (3). Numerical models will be used to upscale laboratory results, with the objective of assessing environmental risks on a large scale.

1. Laverman, AM. et al. Exposure of vancomycine causes a shift in the microbial community structure without effecting nitrate reduction rates in river sediments. Environmental Science and Pollution Research 22 (2015). [doi:10.1007/s11356-015-4159-6](https://doi.org/10.1007/s11356-015-4159-6)
2. Galloway, J. N. et al. Transformation of the Nitrogen Cycle: Recent Trends, Questions, and Potential Solutions. Science 320 (2008). [doi:10.1126/science.1136674](https://doi.org/10.1126/science.1136674)

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