Post-doctoral Fellow

Monitoring of human noroviruses and viral contamination indicators in a public health context: development of an approach of invertebrate encagement coupled with modelling.

Starting date : as soon as possible
Funding : Agence nationale de sécurité sanitaire de l'alimentation, de l'environnement et du travail. Programme National de Recherche en Environnement-Santé-Travail.
Research program : ANSES 2020-01-038 SENTINEL
Keywords : biomonitoring, caging, modelisation, watercourse viral contamination

Offered post-doctoral position:

Human noroviruses (NoV) are responsible for sporadic diseases and epidemics worldwide. They are found in aquatic environments through discharges from wastewater treatment plants. The presence of NoV in aquatic ecosystems could be informed by using indicators such as F-specific RNA bacteriophages (FRNAPH) and somatic coliphages (SC). Non-pathogenic, the different genotypes of FRNAPH make it possible to target the sources of contamination while the SC show a high persistence and a great diversity making them very relevant to follow in a context of diagnosis of water bodies. However, a monitoring strategy of NoV and its indicators FRNAPH and SC, based on punctual water samplings is not adapted to integrate the strong geographic and temporal variabilities. To meet these limits, an original approach based on active biomonitoring using invertebrate organisms that integrate contamination has proven to be relevant in continental environments for detecting protozoan parasites. Preliminary results have recently shown the ability of zebra mussel (*Dreissena polymorpha*) to accumulate FRNAPH in dose-dependent way.

The innovative idea of the SENTINEL project is to develop a disruptive approach in public health via the active biomonitoring of continental water bodies coupled with the application of models as a tool for managing water environments through the prediction of viral contamination of water bodies. The SENTINEL project aims to develop this strategy with the caging of *D. polymorpha* and *Gammarus fossarum*. The use of these two species widely distributed at the national and European level and for which the caging techniques are validated and available within the consortium. In order to develop the mathematical models, the invertebrates will be exposed to a concentration gradient in NoV and indicators (FRNAPH and SC) followed by a depuration step. This first step aims to describe the accumulation and the fate of viral pollution and to establish a link between the concentration in water and that in tissues (for NoV, FRNAPH and SC). The quantification of NoV and its indicators in water and in invertebrates will be determined respectively by molecular biology (RT-qPCR). The modeling will be done by a biodynamic (or mechanistic, based on differential equations) approach. The validation of the use of these invertebrates as a viral risk diagnostic tool will then be evaluated in situ using an active approach. The sites will be determined thanks to the expertise of the consortium on a large number of sites already studied, in particular for viral contamination within the Moselle network.

The objective of this post-doctoral fellow is to determine and formalize, through modelling, the bioaccumulation and depuration kinetics of viral loads (NoV, FRNAPH-II, SC) by two sentinel invertebrates of freshwater environments; *D. polymorpha* and *Gammarus fossarum*, during exposure

in laboratory situations. Also, different parameters that can modulate accumulation rates (temperature, viral interactions) will be tested and, if their effect on accumulation is significant, they will be integrated into the model to improve *in situ* predictions.

Required profile:

- Doctorate in biology / ecotoxicology or in environmental virology
- Good experience and knowledge of bioinformatics and statistical data processing tools will be an important asset
- Knowledge in physiology, ecology and biology of aquatic organisms, especially invertebrates, will be appreciated
- This position requires frequent interactions with colleagues and other partners: communication skills will be essential
- Organized, highly motivated, autonomous and capable of integrating with the multidisciplinary staff of the SENTINEL project

Duration: 24 months (one year renewable once) and the monthly net remuneration will be 2097 €.

Deadline for application: October, 4th 2021.

Application:

The application may be written in English or French, and should contain the following elements:

1. CV which includes a brief summary of past scientific achievements and the list of publications;
2. A plan for the research during the postdoctoral fellowship (max 3 pages);
3. Names of two referees, with email-addresses and telephone numbers.

Application should be compiled in one single pdf file and sent by email to:

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