Post-doctoral position proposal

Hosting organization	
Organization	INRAE: French National Institute for Agriculture, Food and Environment; Animal Health Division
Research Unit	UMR1300 BIOEPAR (INRAE, Oniris), DYNAMO team
Full Address	Oniris, site de la Chantrerie, rte du Gachet, CS40706, 44307 Nantes, France

Contact persons	
Full names	EZANNO Pauline (DR1, HDR) & BEAUNEE Gaël (CRCN)
Positions	Both are full time INRAE permanent researchers
Email addresses	pauline.ezanno@inrae.fr ; gael.beaunee@inrae.fr

Research proposal	
Title	**Multiscale epidemiological modelling: interactions between within-host infection dynamics and epidemics**
Starting date	September 2024
Duration	24 months
Salary	Basic gross salary ~3100-4000 €/month (according to experience)
Expected skills	PhD in multiscale modelling Experience in mechanistic modelling at several scale, with application to a biological system Excellent programming skills (Python, R, C++) Interest in infectious diseases, epidemiology, interdisciplinary research Strong organizational and written/oral communication skills, fluency in English Be highly motivated towards scientific research
Proposal description	Multiscale infectious processes, i.e., interactions between the host response to infection and epidemic dynamics, are little studied in animal health and for many zoonoses. Intra-individual dynamics are generally represented in a simplified way in epidemiological models by the international scientific community, inter-individual variability being neglected. This jeopardizes the robustness and accuracy of epidemiological model previsions and their interpretation in terms of disease surveillance, prevention and control needs. To either confirm or refute the major and recurring simplifying hypothesis that the heterogeneity and dynamics of host responses can be neglected, you will contribute to develop a multiscale modelling framework. First, you will compare several mathematical formalisms to represent the within-host infection dynamics and to characterize its heterogeneity among individuals, considering the requirements for future scaling-up of the proposed methods. You will then apply the most relevant method to real infectious diseases, in the frame of a Horizon Europe project (WiLiMan-ID), focusing on West-Nil fever, and potentially on avian flu and African swine fever. Second, you will study how accounting for such within-host dynamics in epidemiological models leads to different previsions from conventional epidemiological models, and could enhance the anticipation and control of epidemics. Knowledge of processes at the different scales (within-host and population), associated data and computing and operating resources are available. A junior researcher (CRCN) should join the team in September and will also collaborate on this topic. In addition, on-going collaboration with INRIA (Rapsodi team, Lille) and INRAE MathNum division (MaIAGE, Jouy-en-Josas) will help facing the most methodological aspects of the work.
How to apply	Please, send to both contact persons: your CV, a cover letter expressing your research experiences and interests, and at least two reference letters. The position is currently available, with flexible starting date. Review of applications starts immediately and will stop as soon as the position is fulfilled.