

PhD in epidemiological modeling, Oct. 2018 – Sept. 2021, INRA France (BIOEPAR, Nantes & MaIAGE, Jouy-en-Josas)

Modelling of epidemics spreading through animal trade networks accounting for farmers' decision making. Assessment of control strategies for enzootic diseases

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A PhD in epidemiological modelling is available at INRA located in BIOEPAR (biology, epidemiology and risk analysis in animal health; Nantes, France; <http://www.inra.fr/bioepar/>), in co-supervision with MaIAGE (Applied Mathematics and Computer Science, from Genomes to the Environment; <http://maiage.jouy.inra.fr/>), Jouy-en-Josas (Parisian area), in the framework of ANR project Cadence.

Effective control of livestock diseases, mainly spreading through animal trade, is a major issue for sustainable animal farming and competitive agri-food chains, as well as for public health. Preventing outbreaks and lowering prevalence or eradicating diseases call for improving current control methods, control scheme organization, and actors' compliance, in particular for unregulated diseases for which control related decisions are left to collectively local and/or individual initiatives. A growing concern is the interdisciplinarity between economics and epidemiology, for which scientific developments are expected to bring groundbreaking insight in field applications of infectious disease management. In this context, there is a need for integrative models combining dynamics of the contact network between farms, epidemic processes unfolding on these networks and farmers' behavior with respect to animal trade and implementation of control measures. These models are powerful tools complementary to field and experimental data and expertise, contributing to help guiding management of animal health at various organization levels and temporal and spatial scales.

The PhD will aim at assessing the impact of control strategies on the spread of enzootic pathogens, when accounting for farmers' decision making as regards animal trade and health management. Mechanistic dynamic models incorporating movements of animals between farms, epidemiological within-herd dynamics and farmers' decision making will be elaborated. This modeling approach will not only include epidemiological features but also health management variables derived from economic trade-offs at the farm level and feedback loops between epidemiological dynamics and farmers'

individual on-farm practices. The modeling approach will be designed for cattle enzootic diseases such as paratuberculosis or bovine viral diarrhea virus.

Qualifications

Candidates should have a master of science in applied mathematics / computational sciences or in ecology / epidemiology with quantitative skills. They should prove significant programming skills (C++/Python/R) and experience in modeling applied to epidemiology or population dynamics. Interest in infectious diseases, health economics and interdisciplinary researches are an asset. Organizational and written/oral communication skills (at least in English) are highly recommended.

Hosting conditions and research facilities

The successful candidate will be part of the team “Dynamic modeling” of the BIOEPAR laboratory (Nantes) and of the team Dynenvie in MaIAGE (Jouy-en-Josas), with regular visits in the second team (it can be envisaged to have MaIAGE as main location, if necessary). He/she will benefit from a rich scientific environment and will be able to interact with experts present in both labs, on various topics such as deterministic and stochastic modeling, network analysis, statistics, epidemiology, veterinary sciences, and animal health economics. Access to data, computing resources, and calculation servers needed to successfully complete the PhD will be available.

How to apply

Please send to both contacts Pauline Ezanno (BIOEPAR) et Elisabeta Vergu (MaIAGE):

- a curriculum vitae;
- a cover letter detailing your research experiences and interest towards the position;
- the names and contact details of two references.