

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) & PICAULT Sébastien (CRHC, HDR)
Positions	Both are full time INRAE permanent researchers
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Research proposal

Title	Combining mechanistic model and early warning to support decision making in animal health
Starting date	October 2024
Duration	12 months
Salary	Basic gross salary ~3100-4000 €/month (according to experience)
Expected skills	<p>PhD in mechanistic modelling or computer science</p> <p>Experience in complex system modelling</p> <p>Excellent programming skills (Python/R)</p> <p>Interest in infectious diseases, epidemiology, interdisciplinary research</p> <p>Strong organizational and written/oral communication skills</p> <p>Be highly motivated towards scientific research</p>
Proposal description	<p>Epidemic mechanistic models are helpful to better understand and anticipate pathogen spread in host populations under contrasted situations, e.g. to prioritize disease control strategies. However, to be useful for stakeholders, model previsions should be done at the right time (as defined, e.g., by an early warning tool) and fed by field observations to be realistic enough (e.g., define model initial conditions) for their recommendations to be helpful. Additionally, models are often challenging for end-users to operate unless they are accessible through user-friendly and interoperable interfaces. You will work at combining mechanistic stochastic epidemiological models with early warning tools (based on statistical or machine learning (ML) approaches) which create an alarm when decisions should be made by farmers, thus when previsions from a model-based support decision tool ranking possible interventions would be most useful on farm.</p> <p>This combined modelling framework will be applied to a real case study in the frame of an H2020 EU project (DECIDE): rationalizing a targeted and optimal use of antimicrobials (AMU) to control on-farm bovine respiratory disease (BRD). BRD is one of the major enzootic diseases of young cattle in Europe, leading to economic losses, animal welfare issues, antimicrobial usage, and an enhanced impact of diseased animals (compared to healthy ones) on the environment. With this work, you will thus contribute to reduce both infection impact - and associated ecological, economic, and welfare impacts, and AMU – and associated antimicrobial resistance.</p> <p>You will first combine an already existing model for BRD in young cattle (Sorin-Dupont et al. 2023), developed using EMULSION software (Picault et al. 2019), with available early warning models in order to better define model initial conditions and rank possible interventions (do nothing, treat individuals or groups, change practices for subsequent groups, e.g. using vaccination, etc.). At least two early warning models can be envisaged (being already developed): one using a Dynamic Generalized Linear Model (a method developed in DECIDE project by Danish collaborators) to detect abnormal dynamics in BRD detected cases; one using a ML approach (developed by a PhD student co-supervised by S. Picault) to identify abnormal situations and increased BRD risk from external information such as real-time sensor data. Well-described data on real BRD cases are available. Access to computing resources needed to complete the project successfully is guaranteed. Second, you will use PASTE software (Picault et al. preprint) to build a support decision tool based on your combined model, to be further tested on farm.</p>
How to apply	<p>Please send to both contact persons: your CV, a cover letter expressing your research experiences and interests, and at least two reference letters.</p> <p>The position is currently available, with flexible starting date in the last trimester 2024.</p> <p>Review of applications starts immediately and will stop as soon as the position is fulfilled.</p>