Bordeaux, December 1st, 2021.

Post-doctoral research fellowship OR research scientist in modelling of the immune response to vaccine.

One postdoc position (post PhD degree) OR one engineer position (post Master2 degree) is available to work on the modelling of the immune response to Nipah vaccine and antiviral therapies at Inserm U1219 Bordeaux Population Health Center, Statistics in Systems and Translational Medicine team (SISTM) in Bordeaux (France) for a **minimum** period of 12 months.

Context

Nipah virus (NiV) is a recently emergent, highly pathogenic, zoonotic paramyxovirus first recognized following a 1998-99 outbreak of severe febrile encephalitis in Malaysia and Singapore (Chua et al., 2000). NiV can cause atypical pneumonia or necrotizing alveolitis with hemorrhage, pulmonary edema and aspiration pneumonia, leading to acute respiratory distress syndrome. As for the huge majority of risk group 4 pathogens, the knowledges on NiV virus infection remain very limited. Diagnosis, therapeutic and prophylactic means still do not exist. The Nipah project funded by the « Ministere de l'enseignement supérieur, de la recherche et de l'innovation » investigates these aspects in collaboration with Chinese institutions.

In this project, the SISTM team directed by Pr. Rodolphe Thiébaut aims at conducting the analysis and the modelling of the immune response to antiviral and vaccine strategies, using the data produced in pre-clinical and Phase I clinical, including immunological sub studies recording many biomarkers (cell phenotype, functionality, gene expression, antibody titers…).

SISTM is a team belonging to INSERM U1219 [Bordeaux Population Health](#) and [INRIA](#) Bordeaux Sud-Ouest research institutes. The group is dedicated to the analysis and the modelling of the data generated in epidemiology and medicine with a special focus on vaccines and immune interventions in HIV and other infectious diseases. Its expertise is mainly in biostatistics with a special emphasis on dynamical models based on ODE and statistical learning using moderately high dimensional data.

Job Description

As the SARS-CoV-2 crisis delayed almost all experiments for the Nipah project, the main objective of this postdoc position will focus on methods developments. Application of these methods to real datasets will also be possible thanks to Ebola projects (EBOVAC series) and Sars-CoV-2 projects (EMERGEN).

Model building is a crucial problem when modeling data using mechanistic models (see an example in Pasin et al. 2019). The mathematical model based on ordinary differential equations must be chosen and its identifiability must be verified. Then, a statistical model must be built on the parameters of the model to understand the link between 1/ the available descriptive variables and parameters 2/ the residual variability

due to the heterogeneity of the observed individuals. Finally, the observation model allowing to link the data to the trajectories of the model need to be specified. Most of the model building strategy rely on the optimization of a penalized log-likelihood. We propose to build strategies around these topics including covariate model building, selecting the best penalization this covariate model building and down selecting parameters on which random effects are mandatory to model the inter-individual variability, Estimation will be based on likelihood optimization based on the SAEM algorithm as implemented in lixoft Monolix suite. All development will be made in R. Part of this work will be done in collaboration with Marc Lavielle from Inria Saclay Xpop at Ecole Polytechnique.

Other integrative analysis such as exploratory analysis may also be achieved on the data generated in the Nipah project. In particular, Principal component analysis (PCA) which is a technique for reducing the dimensionality of large datasets, increasing interpretability but at the same time minimizing information loss. Part of this work will be done in collaboration with Jérémie Guedj from Inserm IAME, Université de Paris.

The candidate will be integrated in a team of biostatisticians and modelers working on related topics: modeling of HIV vaccine response. The candidate will benefit from a very attractive environment with computing facilities and close collaborations with mathematicians (from INRIA and INSERM research centers) and immunologists (from the Labex Vaccine Research Institute).

Qualifications and Personal Skills:

The candidate should hold a PhD (or at least M2 degree) in mathematics, physics or statistics. We are looking for a highly motivated candidate with an outstanding potential and a strong background in statistics and a deep interest in immunology and biological application. Proven experience in R language is required. The ideal candidates are able to work effectively as part of a team, but also to develop and pursue independent ideas. The successful candidates are expected to conduct innovative research at the highest international level.

Experience in biostatistics and computational biology is highly recommended. Previous work in immunology/Vaccinology, systems biology will be highly appreciated but not mandatory.

The expected starting date can be **as soon as possible**. Salary will follow Inserm rates and can be negotiated to be higher depending on previous experience and skills.

The application must include:

- CV summarizing education, positions held, details of academic work, pedagogical and administrative experience and other qualifying activities
- List of publications
- Copies of educational certificates and transcripts of records
- Names and contact details of 2-3 referees stating relation to candidate, e-mail and telephone number

The application with attachments should be sent to Sandrine.darmigny@u-bordeaux.fr and melanie.prague@inria.fr. Foreign applicants are advised to attach an explanation of their University's grading system. Please remember that **all** documents should be in English or French. Applicants may be called in for an interview.

Region:
Bordeaux, Aquitaine, France

Working hours:
Full-time

Application deadline:
As soon As possible.

Location:
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