

Post-doctoral research fellowship in modelling of the immune response to Ebola vaccine

One postdoc position is available to work on the modelling of the immune response to Ebola vaccine 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

Human-to-human transmission of Ebola virus in West Africa was interrupted in 2016 but the risk of re-emergence of the disease is real. Thus, efforts to develop a safe and effective vaccine against Ebola virus disease with a durable prophylactic effect in communities must continue. The Partnership for Research on Ebola Vaccinations (PREVAC) is an international consortium including the French Institute of Health and Medical Research, the London School of Hygiene & Tropical Medicine, the US National Institutes of Health, health authorities and scientists from Guinea, Liberia, Mali and Sierra Leone, a non-governmental organisation (Alliance for International Medical Action), and Merck, Johnson & Johnson and Bavarian Nordic companies.

The PREVAC trial is a phase IIB, randomised, placebo controlled, multicentre trial evaluating the safety and immunogenicity over 12 months of three vaccine strategies in children and adults. Participants are randomised to one of five groups: (i) vaccination with Ad26.ZEBOV prime and MVA-BN-Filo boost, (ii) vaccination with rVSVΔG-ZEBOV-GP prime and a boost of the same vaccine, (iii) vaccination with rVSVΔG-ZEBOV-GP vaccine without boost, (iv) placebo group 1 and (v) placebo group 2. Preliminary phases started in Liberia and Guinea in March 2017; the main phase of the trial evaluating the five regimens begun in Liberia, Guinea Sierra Leone and Mali in April 2018 with an enrolment targets of 1,400 adults and 1,400 children.

The PREVAC-UP trial consists in a long term follow-up of patients included in the PREVAC trial to determine (i) the long-term immunogenicity and safety and (ii) durability of humoral and cellular immune responses of Ebola vaccine regimes over 60 months. In this postdoc, we propose to address these two question using mathematical modeling and statistics.

The SISTM (Statistics in Systems and Translational Medicine) team directed by Pr. Rodolphe Thiébaud is involved in PREVAC and PREVAC-UP and had been also involved in many international consortium for EBOLA, ie. EBOVAC1 and EBOVAC3 and coordinates EBOVAC2. In this context one of its main goal is to conduct the analysis and the modelling of the immune response to the Ebola vaccine strategy, using data including immunological substudies 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

The main objective of this postdoc position will be to use the data gathered through the PREVAC/PREVAC-UP trials to build and fit a model of the immune response to the Ebola vaccine in order to better characterize the response (duration) and better understand the mechanism of its establishment. Model estimation will be performed using maximum likelihood approach as implemented with the SAEM algorithm, for example in the MONOLIX software of the Lixoft suite. Methodological development will consist in building a series of model building strategies.

Modeling will be inspired from work previously published by the team:

[1] Pasin, C., Balelli, I., Van Effelterre, T., Bockstal, V., Solfrosi, L., Prague, M., ... & Thiébaud, R. (2019). Dynamics of the humoral immune response to a prime-boost Ebola vaccine: quantification and sources of variation. *Journal of virology*, 93(18), e00579-19.

[2] Balelli, I., Pasin, C., Prague, M., Crauste, F., Van Effelterre, T., Bockstal, V., ... & Thiébaud, R. (2020). A model for establishment, maintenance and reactivation of the immune response after vaccination against Ebola virus. *Journal of Theoretical Biology*, 495, 110254.

See this book for an introduction to mechanistic model:

[3] Lavielle, M. (2014). *Mixed effects models for the population approach: models, tasks, methods and tools*. CRC press.

The Prevac trial is described here:

[4] Badio, M., Lhomme, E., Kieh, M., Beavogui, A. H., Kennedy, S. B., Doumbia, S., ... & Yazdanpanah, Y. (2021). Partnership for Research on Ebola VACCination (PREVAC): protocol of a randomized, double-blind, placebo-controlled phase 2 clinical trial evaluating three vaccine strategies against Ebola in healthy volunteers in four West African countries. *Trials*, 22(1), 1-15.

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 PREVAC-UP consortia as well as from the Labex Vaccine Research Institute).

Qualifications and Personal Skills:

The candidate should hold a PhD 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 modelling and applications in biology is highly recommended and previous work in immunology/Vaccinology, systems biology will be highly appreciated.

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:

- A one-page text describing current research interests and potential contributions to the planned project.
- 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 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. Deadline for Application is August 1st 2022.

Applicants may be called in for an interview. In accordance with the University of Bordeaux's equal opportunities policy, we invite applications from all interested individuals regardless of gender or ethnicity.

Region:

Bordeaux, Aquitaine, France

Working hours:

Full-time

Application deadline: December 15, 2022.

Starting date: As soon as possible.

Location:

Centre de recherche Inserm U1219

Université de Bordeaux, ISPED case 11

146 Rue Léo Saignat, 33076 Bordeaux, France

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