

Master 2 project 2026-2027:

Single-cell characterization of host-virus interactions using porcine edited organoids.

GABI, Jouy-en-Josas, France

INRAE, the French public research organisation dedicated to agricultural, food, and environmental research is one of the world's leading research institutes in these fields. GABI (Génétique Animale et Biologie Intégrative) is a research unit dedicated to animal genetics and integrative biology (<https://gabi.jouy.hub.inrae.fr>).

Organoids are 3D *in vitro* cultures that reproduce the architecture and function of a given organs and are powerful tools for studying animal traits in line with the 3Rs principle (Replacement, Reduction and Refinement). The pig is both a major livestock species, whose production systems must transition to sustainability, and an important biomedical model. Our laboratory has established expertise in porcine organoid culture and phenotyping (1-3) and in genome-editing (4), and is an active member of the EuroFAANG research community (<https://eurofaang.eu>) (5). We are currently characterizing the host response to a main virus affecting pig production (TGEV) using porcine organoids combined with CRISPR-based genome editing.

Project. The aim of your project is to resolve the molecular mechanisms of the host response at single-cell level. The work builds directly on a pilot experiment carried out in the laboratory, which established infection kinetics and showed the optimal interval values of multiplicity of infection (MOI) required to obtain a fraction of infected cells compatible with robust single-cell analysis to allow the comparison of infected, bystander and uninfected cells within the same culture. A second arm of the project used organoids knocked out for ANPEP, the entry receptor of TGEV, generated in the laboratory by CRISPR/Cas9. These KO organoids serve as stringent specificity control and to test to which extent the transcriptional response of non-infected cells depends on productive infection of their neighbours.

You will learn to design, analyse and interpret a single-cell RNA-seq experiment at the finest biological resolution. You will get familiar with the strengths and limitations of stem cells and organoids for the study of host-pathogen interactions and with genome editing tools. As a member of the team you will be mentored by researchers in bioinformatics, animal cell biology, genomics, will have access to state-of-the-art resources and of a supportive and collaborative, internationally embedded environment.

We are looking for a highly motivated and enthusiastic M2 student with a background in bioinformatics or computational biology, and an interest in 3Rs research in animals. Please send your CV, a covering letter detailing your research interests and qualifications, and your transcripts to Giorgia Egidy (giorgia.egidy-maskos@inrae.fr) and Elisabetta Giuffra (elisabetta.giuffra@inrae.fr) by November 6th 2026.

References:

1. Beaumont *et al* Intestinal organoids in farm animals *Vet Res.* 2021 doi: [10.1186/s13567-021-00909-x](https://doi.org/10.1186/s13567-021-00909-x)
2. Blanc *et al*. Phenotypic characterization of organoids derived from pig intestine segments. Wageningen Academic Publishers, pp.2097-2100, 2022
3. Giuffra *et al*. In Vitro Systems for Genotype-to-Phenotype Research in Farmed Animals: From Functional Genomic Screens to Mechanistic Insights[v1] | Preprints.org
4. Blanc *et al* Adult porcine intestinal organoids as models for regional epithelial identity and individual regulatory variation Fany <https://doi.org/10.1101/2025.10.29.679705>
5. Egidy *et al*. An in silico-in vitro workflow to validate useful genomic variants against intestinal infectious diseases in pigs. Proceedings of "2026 WCGALP" (Madison, WI, July 12-17, 2026) ISU Digital Press (in press).