

PhD position (3 years) on the role of mammary extracellular vesicles as a carrier of metal nanoparticles

Starting fall 2022, a 3-years PhD position funded by the French National Research Agency (ANR) is available at the French National Research Institute for Agriculture, Food and Environment (INRAE) in Jouy-en-Josas (Paris region, FR).



Extracellular vesicles (EVs) are nanoscale structures secreted by cells and playing a key role in intercellular communication. Detected in milk in 2007, milk-EVs have been proposed as beneficial to offspring but preliminary results suggest they may also carry pollutants such as metallic nanoparticles (NPs). Titanium dioxide (TiO₂) and other metal oxide NPs growingly contaminate ecosystems due to their extensive use in industrial applications (cosmetics, paints, drugs, food, electronics, fertilizers, air/water remediation). These NPs have been detected in milk of experimentally exposed rodents, secreted by a mechanism that remains unexplored but may involve mammary extracellular vesicles.

A collaborative research project coordinated by A. Burtey (ANR NanoMilk, 2022-2025) evaluates the existence of an actual contamination by NPs in milk, the cellular and molecular mechanisms underlying their secretion *in vitro* and their impact on the mother-to-offspring continuum *in vivo*.

In this context, the PhD project will focus on the *in vitro* analysis of the cellular and molecular mechanisms underlying the secretion of NPs by mammary cells, with a special interest on the role of mammary extracellular vesicles in this process. He/she will genetically manipulate cell lines models of mammary epithelial cells to study EV-mediated intercellular communication. State-of-the-art EV purification and analysis approaches will be combined to approaches dedicated to metal detection (ICP-MS, dual mode reflectance and fluorescence confocal microscopy, TEM-EDS). He/she will also develop coculture assays for a spatio-temporal analysis of the intercellular transfer of EVs and NPs between mammary cells (cf. Burtey et al, *The FASEB J.* 2015, Frei D. et al, *Sci Rep* 2015). Based on this approach, the candidate will identify genes involved in the transfer of EVs and NP-loaded EVs and analyse the impact of NP-loading on EVs proteome and on EVs function on receiving cells by transcriptomic analysis.

Our requirements: Candidates should hold a master or an equivalent degree in cell biology, biochemistry or related fields. Candidates should be highly motivated and with a strong background in cell biology and interest in vesicle trafficking and cellular imaging. Background in biophysics, nanoscience and/or chemistry is an advantage.

We offer:

- A 3 years PhD position based in Jouy-en-Josas, Paris area (FR), in the Animal Genetics and Integrative Biology research laboratory (GABI UMR1313) belonging to the National Institute on agriculture, food and environment research INRAE
- Enrolment in the PhD program “Structure and dynamics of living systems” (ED SDSV 157) at the Paris Saclay University (TOP20 world best universities Shanghai 2022)
- Work in a dynamic research group with strong expertise on cell biology, EVs, trafficking, milk, mammary gland, genetics and physiology and a strong collaborative international network with leading experts in biophysics, nanoscience and farming
 - Attendance to scientific conferences, in-house seminars and a large offer of trainings
 - A salary according to the French scale with subsidized public transportation, pension plan and access to 6-months housing on campus
 - Research stays in Norway in the Nano research group dir. by Mihaela R. Cimpan at the Institute of Clinical Odontology belonging to the University of Bergen

Contact: Anne Burtey anne.burtey@inrae.fr for information and applications (CV, cover letter) by nov. 1st, 2022