

**PhD position at ISA Group-Pasteur Institute:  
“3D enteric tissue culture on micro-electrodes for enteric cancer research”**

**Keywords:** *Cryptosporidium*, Cancer, Explant, Microsystem

**Context:**

Colorectal cancer is a major cause of morbidity and mortality worldwide. Recently, the parasitic protozoa *Cryptosporidium parvum* was described as a potential agent leading to the induction of invasive neoplasia in the gastrointestinal tract of mice (1). It is noteworthy that oncogenesis and invasive process are still difficult to study in *in vivo* models. A way to circumvent such problem would be to develop an automatized device for continuous measurement of cancer development (2) and its invasion (3-4) within enteric tissue of mice in an *ex vivo* approach. However such tools are still lacking for the characterization of carcinogenesis process. Consequently, the proposed thesis project aimed at developing a 3 dimension assay *via* enteric mice explant cultured on micro-electrodes and following cancer development after *C. parvum* infestation.

The continuous impedance recording would allow the analysis of cell transformation and invasion process *via* a trans-histological scan.

**Objectives:**

This project will thus aim at lifting current scientific and technological barriers which prevent the realization of enteric explant culture on microelectrodes. We will develop and test novel culture conditions and parasite infestation assay on this model. We will furthermore analyze the electric response of such system to manage the kinetic of tumor invasion.

**The candidate:**

The present project is interdisciplinary between cancer research, parasitology, cell culture and electronic microsystem. We are thus looking for candidate with both strong academic records and interest to work on such a challenging project.

**References:**

- 1-Certad, G., Ngouanesavanh, T., Guyot, K., Gantois, N., Chassat, T., Mouray, A., Fleurisse, L., Pinon, A., Cailliez, J. C., Dei-Cas, E. et al. (2007). *Cryptosporidium parvum*, a potential cause of colic adenocarcinoma. *Infect Agent Cancer* 2, 22
- 2- Tarantola M., A.K. Marel, E. Sunnick, H. Adam, J. Wegener and A. Janshoff, Dynamics of human cancer cell lines monitored by electrical and acoustic fluctuation analyses, *Integrative Biology*, 2, 139, 2010.
- 3-Verdier C., C. Couzon and A. Duperray, Critical stresses for cancer cell detachment in microchannels, *Eur.Biophys. J.*, 38 :1035-1047, 2009
- 4-Keese C., R. Bhawe, J. Wegener and I. Giaever, Real-time impedance assay to follow the invasive activities of metastatic cells in culture, *Biotechniques*, 33, 842-850, 2002

**Contact**

Candidates should send a CV, **cover letter explaining their interest for this topic** and contact information for two references to Jérôme FOLLET ([jerome.follet@isa-lille.fr](mailto:jerome.follet@isa-lille.fr)) or Gabriela CERTAD ([garbiela.certad@pasteur-lille.fr](mailto:garbiela.certad@pasteur-lille.fr))

### Description of the Laboratories:



**BioGAP** laboratory (ISA group) is a team of the agro-food and biotechnology research Institute: Charles Viollette, EA 1026, Lille University. His main domain of research is aimed at pathogenic agents in agriculture. This group had a 9 years research experience on *Cryptosporidium* parasite study in association with electronics at IEMN in the National Centre for Scientific Research (CNRS).

**BDEEP** laboratory “Biology and Diversity of Emerging Eukaryotic Pathogens” (CIIL-Institut Pasteur de Lille) targets eukaryotic pathogens responsible for emergent or re-emergent diseases with growing impact for the last years, currently constituting major public health issues. One of these pathogens is the protist *Cryptosporidium*. The BDEEP team tries to address key issues regarding i) prevalence, molecular diversity, and circulation in human and animal populations, ii) characterization of genetic

diversity and its impact on pathogenic power and on transmission of the identified species and variants, iii) the molecules and mechanisms involved in pathogenesis and proliferation and iv) interactions with host cells. Collaborations are developed with numerous French laboratories and hospitals and groups established in Europe, Asia, Africa, North and South America, and Australia.

### The City of Lille:



The city of Lille offers an attractive living environment while being a student city of more than a million inhabitants. Furthermore, it sits at the crossroad of three capital cities of Europe (Paris, London and Brussels being reachable within an hour train ride).