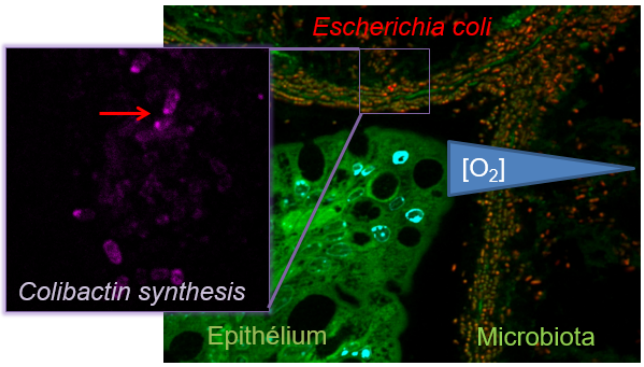
PhD position in biomicrofluidics

Connecting bacterial warfare in the gut to colorectal cancer

Supervisors	Jean-Philippe Nougayrède Institut de recherche en santé digestive (IRSD) jean-philippe.nougayrede@inserm.fr https://www.irsd.fr/jean-philippe-nougayrede.html	Yohan Davit Institut de Mécanique des fluides (IMFT) yohan.davit@imft.fr http://yohan-davit.com
Profile required	Microbiology, Molecular biology, Microfluidics, Biophysics Candidates must hold a Master degree validated in France	

Background. This project is at the interface between physics and microbiology. We are looking for either an experimental biophysicist with experience in microfluidics and a strong interest for microbiology; or a microbiologist with a strong interest in biophysics.

Labs and supervisors. This work is under the supervision of Jean-Philippe Nougayrède (microbiology of genotoxic *E. coli*) and Yohan Davit (biophysics of bacterial biofilms), in collaboration between the Institut de Recherche en Santé digestive (IRSD) and the Institut de Mécanique des Fluides de Toulouse (IMFT). A fundamental aspect of this work will be to get strongly involved and actively participate to the life of both groups on the campus of Purpan University Hospital.



Scientific project. It is now well established that the gut microbiota is key in the development of colorectal cancer. Intestinal enterobacteria can produce toxic metabolites that damage the DNA of surrounding bacteria and participate in interbacterial competition. Collaterally, these genotoxins induce mutagenic DNA damage to intestinal cells and promote colorectal cancer. It is therefore important to dissect the interbacterial interaction and understand how it modulates the production of genotoxins. Further, bacterial toxin production is finely regulated by the microenvironment, in particular the oxygen gradient, which is difficult to grasp *in vivo* and to reproduce *ex vivo.* The goals of this PhD project are to: 1) develop a novel pluridisciplinary approach of "microenvironment on a chip" that reproduces the oxygen gradient, a key element of the gut microenvironment and 2) use this microfluidic device to characterize how bacterial warfare at the lumen-epithelium interface modulate the production of the colibactin genotoxin involved in colorectal cancer.

As part of the collaboration established between the two laboratories, we have already developed a microfluidic system that allows us to study individual cells of *Escherichia coli* in O2 gradients, in particular the genotoxin production, motility, aerotaxis and adhesion. The chip is fabricated in PDMS and the gradient is generated by the diffusion of gas. Measurements are performed by optical microscopy with real time observations of toxin production, gene expression, functional assembly of the biosynthetic machinery, using fluorescent reporters. This thesis project will use a similar device to work with high-density bacterial communities. The production of toxin and DNA damage in bacterial colonies will be examined with a reporter of activation of the bacterial SOS pathway. The coupling of toxin production with aerotaxis and (ana)erobic respiration mode will be studied in real time with isogenic mutants inactivated for bacterial traits.

How to apply? By e-mail as detailed below.

Title of the mail: phd_tiris_toulouse
To: jean-philippe.nougayrede@inserm.fr, yohan.davit@imft.fr
Message: rapid presentation and motivation
Attached: CV + transcript/master ranking + recent thesis