Open PhD Position
Fluid mechanics of intestinal mucosa at micro-scales

Keywords: Biomechanics, Small Intestine, Microfluidics, Rheology

Laboratoire Rhéologie et Procédés, CNRS, Univ. Grenoble-Alpes, France
School of Health Sciences, Massey University, Palmerston-North, New-Zealand

To apply, send your application (CV, cover letter and academic results) to Clément de Loubens (clement.de-loubens@univ-grenoble-alpes.fr) before the 13th of May.

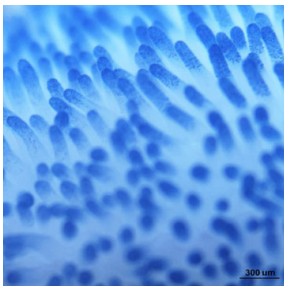
Funding

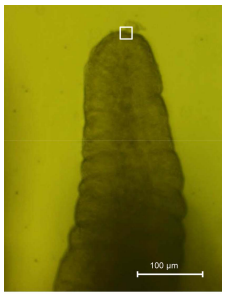
Co-funding Univ. Grenoble-Alpes / Massey University. The PhD student will share his/her time between the Laboratoire Rhéologie et Procédés, leading group in Europe in complex fluid dynamics and soft matter physics and the group of Pr. Roger Lentle in Massey University that has a strong expertise in gastro-intestinal physiology and biomechanics.

Profil and competences

- Engineer / Master 2 with a strong background in **fluid mechanics, rheology and / or biomechanics.**
- **Experimental** project around microfluidics, microscopy, rheometry, physiology digestive and image analysis.
- Good reporting skills in English, open-minded attitude, autonomy.

Context & Objectives





It has long been assumed that mass transfers and absorption into the digestive tract were limited by diffusion within the intestinal mucus. However, measurements of the effective thickness of this barrier have led to a new hypothesis: intestinal villi, a finger-like microstructures covering intestinal mucosa, could generate mixing at micro-scale. Recently, we have shown through ex-vivo experiments that the intestinal villi were indeed mechanically active. These findings suggest that there is a mechanism of mixing at micro-scales near the mucosa that has been described for the moment only by numerical simulations.

The objective of this PhD thesis is to elucidate the mechanisms of transport at microscopic scale near the intestinal mucosa.

Biomimetic experimental systems will be developed to understand the role of the mechanical activity of the mucosa on flow and mixing and will be compared to ex-vivo experiments with living mucosa.

References

Lentle et al, Neurogastroenterol. Motil. 25, 881 (2013).
Lim et al., J. R. Soc. Interface 10, 20121008 (2013).
Lim et al., Food Funct. 6, 1787 (2015).