

SPPIN's seminar spring-summer 2024

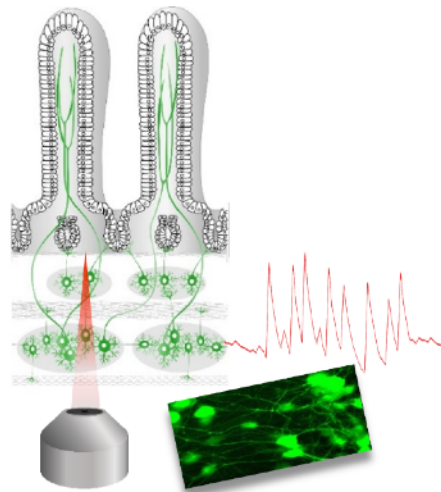
**Wednesday, 5 June, 14h00, SPPIN common room, 3rd floor**



Prof Pieter VANDEN BERGHE

Lab. for Enteric NeuroScience (LENS), University of Leuven, Belgium.

## **Imaging cellular interactions and activity in the intestinal wall using linear and non-linear optical techniques**



Gastrointestinal functions, such as motility, absorption and secretion, and - to some extent - host defense are controlled by the enteric nervous system (ENS). Although quite some information is now available about migration, proliferation and differentiation of enteric progenitors, our understanding of how developing and mature ENS cells interact to form a functional gastrointestinal system and keep it healthy over decades of lifespan remains limited.

Microscopy techniques have greatly contributed to our understanding of the gut's architecture and to the description of morphology and chemical coding of the contributing cells. For measuring cellular activity, compared to sharp or patch clamp electrophysiology, imaging with  $\text{Ca}^{2+}$  sensors benefits from the fact that multiple cells can be imaged at the same time, which makes studying interactions easier and allows correlating cellular activity with spatial organization. In our lab, we use 3-D imaging and optical modulation of cellular activity to understand how cells interact, what the stimuli are that activate them and what the direct consequences are for the neighboring cells. In combination with advanced optics (2-photon, spinning disk confocals) these help to shed

light on how functional units in the intestinal wall are being built. In the Lab. for Enteric NeuroScience we use several transgenic mouse lines and viral vector technology to induce expression of genetically encoded indicators (for Ca<sup>2+</sup>:GCaMP3/6) and actuators (Channelrhodopsin2) in enteric neurons and/or glia. Apart from fluorescence technology we also use second harmonic (SHG) imaging to determine the content and structure of the collagen lattices in the intestinal wall in several different conditions.

The combination of genetic and advanced optical approaches will remain extremely valuable to study and understand how functional intestinal nerve circuits develop and continue to interact throughout life.

Contact: [pieter.vandenberghe@kuleuven.be](mailto:pieter.vandenberghe@kuleuven.be)

Host: **Martin Oheim** contact [martin.oheim@u-paris.fr](mailto:martin.oheim@u-paris.fr) if you want to meet with Pieter

## References

[Nano-positioning and tubulin conformation contribute to axonal transport regulation of mitochondria along microtubules.](#)

Van Steenberghe V, Lavoie-Cardinal F, Kazwiny Y, Decet M, Martens T, Verstreken P, Boesmans W, De Koninck P, **Vanden Berghe P**. Proc Natl Acad Sci U S A. 2022 Nov 8;119(45):e2203499119. doi: 10.1073/pnas.2203499119. Epub 2022 Nov 2. PMID: 36322761

[Development of the intrinsic innervation of the small bowel mucosa and villi.](#)

Hao MM, Fung C, Boesmans W, Lowette K, Tack J, **Vanden Berghe P**. Am J Physiol Gastrointest Liver Physiol. 2020 Jan 1;318(1):G53-G65. doi: 10.1152/ajpgi.00264.2019. Epub 2019 Nov 4. PMID: 31682159

[Molecular understanding of label-free second harmonic imaging of microtubules.](#)

Van Steenberghe V, Boesmans W, Li Z, de Coene Y, Vints K, Baatsen P, Dewachter I, Ameloot M, Clays K, **Vanden Berghe P**. Nat Commun. 2019 Aug 6;10(1):3530. doi: 10.1038/s41467-019-11463-8. PMID: 31387998

[Regional complexity in enteric neuron wiring reflects diversity of motility patterns in the mouse large intestine.](#)

Li Z, Hao MM, Van den Haute C, Baekelandt V, Boesmans W, **Vanden Berghe P**. Elife. 2019 Feb 12;8:e42914. doi: 10.7554/eLife.42914. PMID: 30747710

[Structurally defined signaling in neuro-glia units in the enteric nervous system.](#)

Boesmans W, Hao MM, Fung C, Li Z, Van den Haute C, Tack J, Pachnis V, **Vanden Berghe P**. Glia. 2019 Jun;67(6):1167-1178. doi: 10.1002/glia.23596. Epub 2019 Feb 7. PMID: 30730592