



RESEARCH TOPIC MEM13

Role of the microbiota in the gut-liver-brain axis

Curriculum MEM Standard

Laboratory name

Mucosal immunology and microbiota Unit, Humanitas University

Pre-clinical Supervisor

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Abstract

Around 30% of patients with inflammatory bowel disease (IBD, Crohn's disease and ulcerative colitis) present with extra intestinal manifestations of the disease including elevated disturbed psychosocial functioning and poor quality of life 1-3. We previously demonstrated the existence of a gut vascular barrier (GVB) throughout the intestine, which controls the systemic dissemination of molecules and bacteria from the intestine to the liver, and can be considered a gateway between the gut and the liver 4,5. We now found that during DSS-driven intestinal inflammation, the GVB opens up, allowing the recruitment of inflammatory cells in the gut, and the propagation of inflammation to the liver and, unexpectedly, the brain. In this project we want to understand how the GVB interacts with the vascular barriers in the brain and in the propagation of the inflammation. In particular we want to study the role of the microbiota in controlling the opening/closure of the GVB and the effects on the brain barriers.

Main technical approaches

Microbiology and immunology techniques, in vivo studies

Scientific references

- 1 Golan, D. et al. Cognitive Function of Patients with Crohn's Disease is Associated with Intestinal Disease Activity. *Inflamm Bowel Dis* 22, 364-371, doi:10.1097/MIB.0000000000000594 (2016).
- 2 Keefer, L. & Kane, S. V. Considering the Bidirectional Pathways Between Depression and IBD: Recommendations for Comprehensive IBD Care. *Gastroenterol Hepatol (N Y)* 13, 164-169 (2017).
- 3 Chen, J. et al. Genesis of anxiety, depression, and ongoing abdominal discomfort in ulcerative colitis-like colon inflammation. *Am J Physiol Regul Integr Comp Physiol* 308, R18-27, doi:10.1152/ajpregu.00298.2014 (2015).
- 4 Spadoni, I., Pietrelli, A., Pesole, G. & Rescigno, M. Gene expression profile of endothelial cells during perturbation of the gut vascular barrier. *Gut Microbes* 7, 540-548, doi:10.1080/19490976.2016.1239681 (2016).



5 Spadoni, I. et al. A gut-vascular barrier controls the systemic dissemination of bacteria. *Science* 350, 830-834, doi:10.1126/science.aad0135 (2015).

Type of contract

Scholarship of € 21.000 gross per year awarded by Istituto Clinico Humanitas. This sum is subject to IRPEF income tax and exempt from social security contributions.

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