We are interested in the fundamental principles of host-microbe interactions in the gut and how they can affect liver disease. The intestinal bacterial flora is recognized as a “virtual organ” that regulates multiple metabolic and immunological processes. The gut and the liver communicate in a bidirectional way and influence each other in physiological and/or pathological conditions. This bidirectional communication occurs over the gut-liver axis trough the portal circulation that carries gut derived products to the liver and through the biliary system that transports the bile from the liver to the intestine.

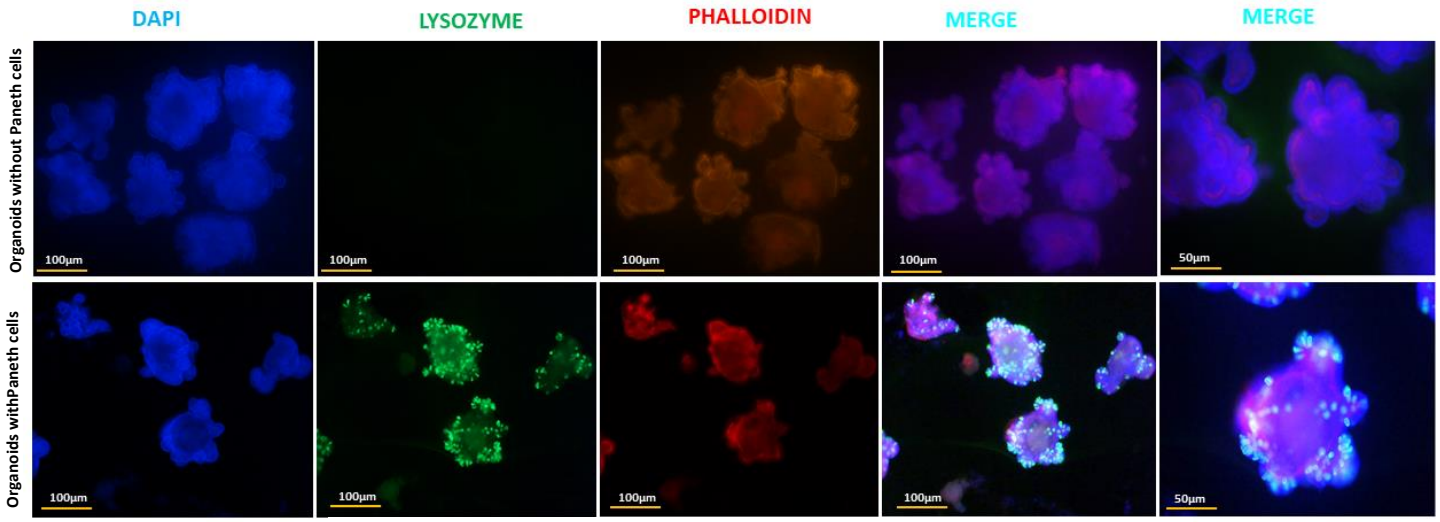
In chronic liver disease, disturbances over the gut-liver axis, due for example to the disruption of the intestinal epithelial barrier may lead to bacterial translocation to extra-intestinal organs and to the activation of the immune system promoting the progression of the disease.

The main aim of our research is to understand how the disruption of the gut mucosal barrier occurs and how this may affect the course of liver diseases and the progression of portal hypertension. We are focusing on blood and lymphatic vessels, because their proliferation along the gut-liver axis contributes to the development of portal hypertension.

Recently, we found that Paneth cells, i.e. cells of innate mucosal immune system that secrete antimicrobial peptides, also regulate the development of intestinal and mesenteric vessels. We want now to identify, describe and understand the mechanisms by which Paneth cells can regulate blood vessel development in the abdomen of individuals with chronic liver disease and portal hypertension.

We use different experimental models of chronic liver disease and study them in axenic, gnotobiotic, and Paneth cell depleted conditions and to further explore the mechanisms of interaction between the body and the intestinal flora in health and disease we transfer our research in the laboratory using mini-guts or intestinal organoids.

The findings that we obtain contribute to the identifcation of new mechanisms of disease and novel targets for therapeutic interventions.



3D enteroids in presence and absence of Paneth cells

DAPI nucleus
LYSOZYME Paneth cells
PHALLOIDIN F-actin

Small intestine without Paneth cells

Small intestine with Paneth cells