Contribution ID : **16** Type : **Poster**

Characterization of the distribution and dynamics of the antigen-presenting cells using light sheet miscroscopy

The aim of our project is to depict the dynamics of mouse antigen presenting cells (APCs) in a mammary gland during the ontogenesis and breastfeeding period. Additionally, the theory postulating transport of bacteria from the small intestine to the mammary gland will be tested.
Recent studies show that a subset of bacteria in milk could be transported by dendritic cells (DCs) from the maternal small intestine. This fact is in agreement with our observations of massive imigration of immune cells to the mammary gland at the beginning of the breastfeeding period. To understand the mechanism, immune cell populations will be precisely phenotyped in the maternal mammary gland and small intestine, with focus on changes during the breastfeeding period. The phenotypic and functional connection between the mammary gland and the small intestine will be explored using flow cytometry and immunodetection in situ. Our goal is to characterize complex cellular interaction in histological context using fluorescent techniques compatible with 3D reconstruction and quantification tools, ideally in the whole organ context. Light sheet microscopy is in this view optimal tool for our research.
The role of the interaction with bacteria and adaptive immunity in APC tissue localization will be investigated using appropriate mouse models. We routinely use MHC II-EGFP knock-in mouse model, which allows us to direct visualization of professional APC.

Differences in a gut microbiota composition are linked to pathological conditions. Understanding the mechanism of the transmission of bacteria from the maternal intestine to the infant digestive system via mammary gland may change the perception of differences in the fitness of breastfeeded non-breastfeeded youth. Exploration of this phenomenon using combination of mouse models could be translated in the human therapeutics.

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Session Classification : Posters