Project 1.10 Antibodies and microbes as tools for asthma prevention

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Background:

The collection of microbes living inside us, known as the microbiota, is central to our health. Over the last decades, we have started to reveal the multi-faceted ways these microorganisms use to influence immunity. To disentangle these interactions, asthma often served as a disease model due to strong epidemiological data supporting the role of microbes in dictating its severity.

The microbiota composition is shaped by environmental and endogenous factors. Of the latter, secretory immunoglobulin A (sIgA) has long been recognized for the "immune exclusion" of bacteria. However, recent evidence indicates that the role of sIgA may be more complex as in certain instances, antibody binding may in fact increase the fitness of coated bacteria. The mechanisms that discriminate between these two fates remain largely unknown, but one element that is likely to be of key importance is the specificity of the antibody.

In our previous studies, we have discovered one such specificity – the identified antibody clone coated certain bacterial taxa, promoted their colonization in the gut, and protected mice against asthma. Here, we plan to take advantage of this model to understand the properties behind the antigen-antibody interactions in the gut that facilitate this process. Next, deploying this new knowledge, we will design antibody or probiotic based approaches to prevent the development of asthma.

Aim:

The project will consist of two specific aims:
In aim 1, we will identify candidate antigens and antibodies that can be formulated into vaccines or passive immunizations.
In aim 2, we will i) characterize the impact of antibody coating on the function of bacteria, and ii) identify strains with probiotic potential in the context of asthma.

Altogether, this project will shed new light on the mechanisms that support antibody-mediated microbial colonization and propose strategies to harness them for human health benefits.

Requirements:

- MSc degree in biology, biotechnology, medicine or similar,
- excellent technical skills in molecular biology (PCR, ELISA); Practical skills in flow cytometry is a plus,
- fluency in English (written and spoken),
- good organization skills,
- experience in laboratory animal handling is a plus.