

Host microbiota interactions

Adrian L Smith

Associate Professor of Infectious Disease, Department of Zoology, Oxford

In this presentation we will consider the diversity of interactions between the host immune system and the colonising microbiota. A range of topics will be discussed including the influence of the microbiota on the developing gut immune competence as well as the potential for the immune response in shaping the developing microbiota. These interactions are clearly bi-directional and have impact not just on our understanding of a critical system but also on the development and manipulation of the microbiota under commercial circumstances. In brief, the microbiota of the commercial chicken is dramatically modified by commercial practices including the removal of close interaction with the hen and manipulations of the environment including diet, housing conditions and the numbers of individuals raised in close proximity.

We have tools and experimental conditions to measure many of the interactions but must strive for mechanistic understanding (as highlighted by other speakers, e.g. Prof Bailey and Prof Wigley at the meeting). Many of the future advances will come from application of current and new technologies (e.g. birds with deficiencies in parts of the immune system; “knockouts”) but the key will be careful interpretation of the biological circumstances and I actively encourage researchers to consider a combination of field and experimental approaches. During the presentation I presented data demonstrating the impact of an absence of microbes (germ free chickens) or restricted flora (gnotobiotic) compared with complex flora on the gut immune system including the repertoire of T and B cell populations. I used these to illustrate how these experimental systems can be used to identify changes that are influenced or independent of microbiota. In the second part of the talk I presented spatial data considering the population biology (and ecology) of the microbiota and immune system over small distances. I used these data to propose and support a hypothesis that the mucosal immune system is key in establishing the spatial structure within the microbiota. We also discussed how these quite specific findings could influence the field application of microbiota manipulations and how it is key that scientists and the industry work together to support advances in understanding the microbiota of chickens to develop new ways to manipulate the microbiota.