MICROBIOME

# A new mouse model to study the early-life microbiome

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Microbial colonization of the human gut begins at birth and continues to develop for 2–3 years until the gut microbiome reaches an adult-like composition. Increasing evidence indicates that the microbiome shapes the immune system in early life and can affect the host's health later in life, but further studies are needed to fully understand the function of the early-life microbiome. In *Cell Host & Microbe*, Lubin et al. used a new mouse model (PedsCom mice) to demonstrate the critical role of the early-life microbiome on host immunity.

"Since the microbiome and immune system are extremely complex and dynamic systems, especially early in life, I thought we needed to develop a simplified, tractable model of the early-life microbes to discover which microbes educate the immune system to support a healthy immune system," comments Michael Silverman, senior investigator of the study.

To create their new model, Silverman and his team colonized germ-free (GF) mice with a consortium of 9 microbes (PedsCom consortium) isolated from the intestines of pre-weaning mice. The PedsCom consortium stably colonized GF mice and was transmitted vertically from dam to pup. Microbiome analysis revealed that the PedsCom consortium was resistant to diet-induced changes at weaning and retained the characteristics of a pre-weaning microbiome into adulthood.

The researchers used the PedsCom model to ask the fundamental question of how important is the maturation of the microbiome at weaning. They found that restricted intestinal microbiome maturation stunted specific components of the immune system in PedsCom mice such as peripheral regulatory T cells and IgA. In addition, adult PedsCom mice with a locked-in pre-weaning microbiome were more susceptible to *Salmonella* infection than mice harboring a more complex mature microbiome. These findings strongly suggest that microbiome maturation is essential for both normal immune maturation and protection from infection.

Next, the team plans to use the mice to leverage our new knowledge of how microbes interact with the immune system to improve immune development and prevent diseases such as allergy, autoimmunity and infection. "Once we define which microbes are important for healthy immune system development, we can introduce appropriate microbes to children who are missing these microbes and who are at risk for developing diseases that can be prevented by proper immune system development", concludes Silverman.

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