### Microbiome, Mucosal Immunology, and Immunomodulation

#### Exogenous Stimuli Maintain Intraepithelial Lymphocytes Via Aryl Hydrocarbon Receptor Activation


**PURPOSE OF THE STUDY.** Intraepithelial lymphocytes (IELs) are immune cells with unique but incompletely understood properties related to epithelial barrier defense. This study builds off the authors' previous work with specialized T-cell populations and investigates how these interesting cells develop and function.

**STUDY POPULATION.** Studies were performed in mice.

**METHODS.** The authors used gene expression studies and transgenic mouse models to characterize factors involved with IEL development, survival, and function in the gastrointestinal tract.

**RESULTS.** In contrast to other lymphocyte populations, IELs were found to express high levels of a transcription factor known as aryl hydrocarbon receptor (Ahr). In Ahr-deficient mice, IELs developed and were recruited normally to the intestines and skin, but their survival was markedly diminished and they eventually disappeared as the animals matured. Previous studies had shown Ahr to bind to plant-derived nutrients found naturally in cruciferous vegetables, and therefore the authors investigated whether diet affected Ahr signaling and, consequently, IEL development. Feeding wild-type mice a synthetic diet devoid of Ahr ligands resulted in the disappearance of intestinal IELs similar to that seen in transgenic mice lacking Ahr expression; and the IELs returned when a single specific Ahr ligand was added to the synthetic diet. Finally, IELs appeared to be important for intestinal health, since their absence was associated with increased intestinal bacterial burdens, resulting in abnormal immune activation and increased susceptibility to chemical-induced colitis.

**CONCLUSIONS.** Diet-derived compounds activate Ahr-signaling pathways to maintain proper intestinal immune function.

#### Infant B Cell Memory Differentiation and Early Gut Bacterial Colonization


**PURPOSE OF THE STUDY.** To determine whether early intestinal bacterial colonization patterns are associated with B-cell activation and maturation.

**STUDY POPULATION.** The study evaluated 65 healthy Swedish infants (33 boys and 32 girls) born at term in rural areas in southwest Sweden. These infants were part of a prospective newborn/infant cohort that was followed to investigate the relation between intestinal bacterial colonization and pattern and maturation of the immune system.

**METHODS.** Cord blood samples from newborn children and peripheral blood samples from children at 3 to 5 days, 1 month, 4 months, 18 months, and 36 months of age were obtained. Phenotypic characterization of the circulating B cells by flow cytometry was performed within 72 hours after venipuncture. Fecal samples were obtained at 1, 2, 4, and 8 weeks of age and cultured quantitatively for major groups of aerobic and anaerobic bacteria.

**RESULTS.** At both 4 months and 18 months of age, children colonized with *Escherichia coli* and/or bifidobacteria during the first 8 weeks of life had significantly higher numbers of CD27<sup>+</sup> memory B cells than did noncolonized children. Early colonization with *Staphylococcus aureus* was associated with low numbers of CD27<sup>+</sup> memory B cells at 4 months of age.
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