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Establishment of the gut communities (microbiota) in early stages of life

Some macaques develop large TH17 populations, while others have few such cells, which could profoundly affect the animals' ability to fight infection. To understand this variability we studied groups of breast- and bottle-fed rhesus macaques from five to 12 months of age. We observed differences in the two groups' microbiota, as was to be expected in animals receiving different diets. Surprisingly, at 12 months of age the two groups displayed significant contrasts in their immune systems, with differences centered on T cell development. The breast-fed group showed a much larger percentage of experienced "memory" T cells, including TH17 cells and immune cell populations making interferon. We also uncovered differences in the gut metabolome that may drive immunologic differences between the two groups, including arachidonic acid, which stimulates the production of TH17 cells. This chemical is tightly linked to TH17 cell development and previous studies have suggested that it can influence the immune system, and specifically T cell development.

The remarkable role of gut microbiota in immune system development can be utilized in increasing the vaccine efficacy and enhanced treatment of chronic infectious diseases such as AIDS.

Breast-fed and bottle-fed infant rhesus macaques develop distinct gut microbiotas and immune systems

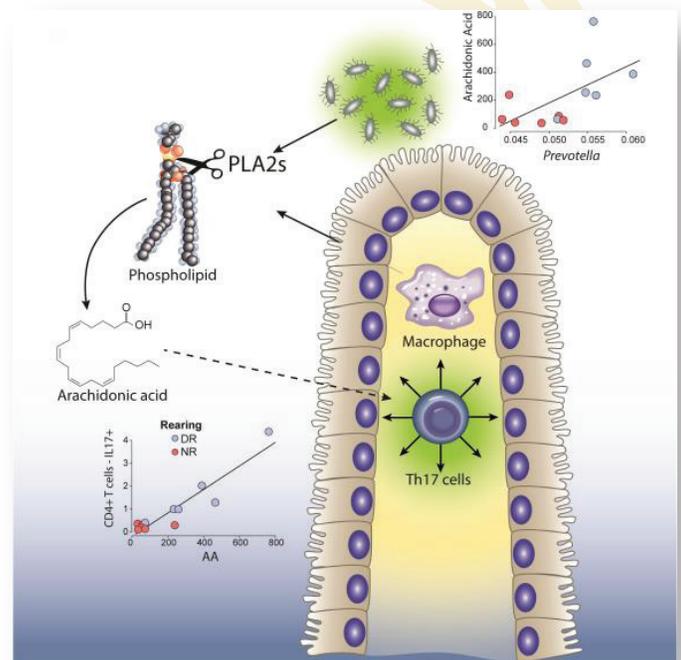
Ardeshir A, Narayan N, Méndez-Lagares G, Lu D, Rauch M, Huang Y, Van Rompay KA, Lynch SV, Hartigan-O'Connor, DJ

Science Translational Medicine 2014, 6, 252ra120

Therapeutic Helminth Infection of Macaques with Idiopathic Chronic Diarrhea Alters the Inflammatory Signature and Mucosal Microbiota of the Colon

Broadhurst MJ, Ardeshir A, Kanwar B, Mirpuri J, Gundra UM, Leung J, Wiens K, Cvijin IV, Yarovinski F, Lerche NW, McCune JM, Loke P

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Gut microbial communities that are present in early life leave a durable imprint on the shape and capacity of the immune system.