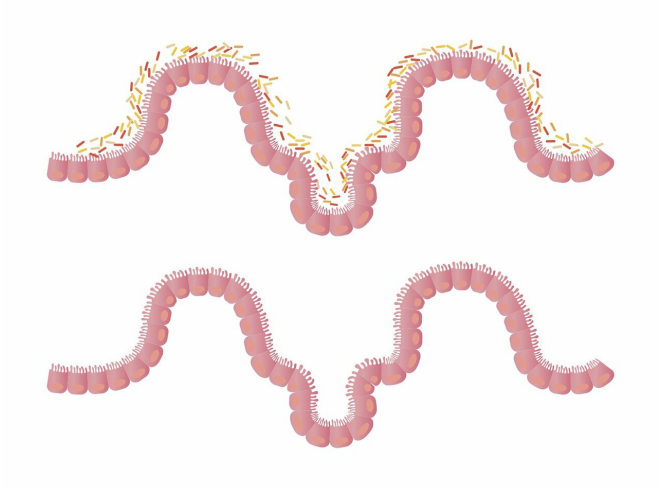
# Discovery of a crucial immune reaction when solid food is introduced that prevents inflammatory disorders

20 March 2019



Credit: CC0 Public Domain

Microbes colonize all body surfaces and balance the immune system. In newborn infants, the gut microbiome is first conditioned by breast milk components. When solid food is introduced, gut microbiota develops and bacteria proliferate. Scientists from the Institut Pasteur and Inserm have discovered that a key immune response is generated in mice when solid food is introduced and microbiota expands. But above all, they have shown that this immune reaction is essential, as it is involved in educating the immune system and leads to low susceptibility to inflammatory disorders (allergies, colitis, autoimmune diseases, cancer) in adulthood. These findings were published in the journal *Immunity* on March 19, 2019.

With the arrival of improved hygiene in the mid-19th century, the rate of death from diseases caused by microorganisms fell dramatically. In modern industrial societies, the hygiene hypothesis states that reduced exposure to microbes at an early age could lead to increased susceptibility to allergic or autoimmune diseases. Previous studies have shown that disruption of microbiota, particularly through exposure to antibiotics, may result in allergic responses .

In newborn infants, the composition of the gut microbiome is determined at birth by the bacteria acquired from the mother and the composition of breast milk. It mainly features bifidobacteria and lactobacilli. When new foods are introduced, the microbiota proliferates and the number of bacteria increases 10- to 100-fold. Scientists (Ziad Al Nabhani and his colleagues) from the Microenvironment and Immunity Unit (Institut Pasteur/Inserm), led by Gérard Eberl, have discovered that this phenomenon triggers an intense immune response in mice. "We showed that this mechanism takes place within a very specific time window: between two and four weeks in mice, which corresponds to three to six months in humans," explains Gérard Eberl, the lead author of the study.

"We then assumed that this specific time window means that the immune response is programmed over time and therefore has a unique role to play in the development of the immune system," says Gérard Eberl. The scientists demonstrated that when treated with antibiotics during this critical time window, mice were subsequently more likely to develop inflammatory disorders (intestinal allergies, colorectal cancer and colitis). Once the microbiome is destroyed by antibiotics, the immune reaction no longer occurs.

"This is what is known as pathogenic imprinting," explains Gérard Eberl, "That is to say, events occurring in early childhood determine future susceptibility to inflammatory disorders."

The scientists also revealed the presence of specific cells during this reaction which are necessary for balanced immune responses. These regulatory T cells (Tregs) are key modulators and without them immune responses are exacerbated, leading to inflammatory disorders.

All this data highlights the importance of early life exposure to microbiota for the development of a balanced immune system. "We would now like to confirm these findings on the impact of microbiota at weaning in the context of other pathologies, such as neurodegenerative diseases for example," says Gérard Eberl.

**More information:** Ziad Al Nabhani et al, A Weaning Reaction to Microbiota Is Required for Resistance to Immunopathologies in the Adult, *Immunity* (2019). DOI: 10.1016/j.immuni.2019.02.014

Provided by Pasteur Institute