

Gut microbiome of mother found to impact immunity of mice pups

March 18 2016, by Bob Yirka



Credit: martha sexton/public domain

(Medical Xpress)—A team of researchers from Switzerland and Germany has found that the gut microbiome of a pregnant mouse can

have an impact on the development of the immune system in the pups she delivers. In their paper published in the journal *Science*, the team describes their experiments with introducing bacteria into the gut of pregnant mice and what they found by doing so.

It has long been believed by scientists that the gut microbiome of mice develops during and after birth, which leads to its ability to ward off gut ailments via an enhanced immune system. But now it appears that mice pups also benefit from bacteria in its mothers gut during pregnancy as well. In this new effort, the researchers used samples of *E.coli* that had been genetically engineered to live just a very short time—the idea was to introduce the bacteria into the guts of [pregnant mice](#) where they would interact with the resident microbiome and then die before the pups were born, preventing direct exposure. Studying the pups after birth to see if there were any differences between them and a control group would reveal what impact the short-term existence of the bacteria in the mothers' gut had had on its offspring.

The researchers found that the presence of the bacteria in the mother's gut during pregnancy did have an impact—the pups had higher levels of a several types of [immune cells](#) in their own guts (compared to a [control group](#)), which persisted until after the pups were weaned. Additional experiments showed that introducing other bacteria types into the mother's gut during pregnancy produced similar results. Furthermore, when the team studied the DNA of the pups, they found differences between the transcriptional profiles of the test pups and the controls—the result was an increase in expression of genes that cause mucus and ion channel production in gut epithelium—this the team suggests, is evidence that the mother's [gut microbiome](#) had a true impact on immune system development of offspring.

The researchers also noted that there was no evidence that the [bacteria](#) made its way to the [pups](#) via the placenta, instead they found evidence

that bacterial metabolites made their way from mother to pup and continued to do so after birth via milk.

More information: M. Gomez de Agüero et al. The maternal microbiota drives early postnatal innate immune development, *Science* (2016). [DOI: 10.1126/science.aad2571](https://doi.org/10.1126/science.aad2571)

Abstract

Postnatal colonization of the body with microbes is assumed to be the main stimulus to postnatal immune development. By transiently colonizing pregnant female mice, we show that the maternal microbiota shapes the immune system of the offspring. Gestational colonization increases intestinal group 3 innate lymphoid cells and F4/80+CD11c+ mononuclear cells in the pups. Maternal colonization reprograms intestinal transcriptional profiles of the offspring, including increased expression of genes encoding epithelial antibacterial peptides and metabolism of microbial molecules. Some of these effects are dependent on maternal antibodies that potentially retain microbial molecules and transmit them to the offspring during pregnancy and in milk. Pups born to mothers transiently colonized in pregnancy are better able to avoid inflammatory responses to microbial molecules and penetration of intestinal microbes.

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Citation: Gut microbiome of mother found to impact immunity of mice pups (2016, March 18) retrieved 10 April 2024 from <https://medicalxpress.com/news/2016-03-gut-microbiome-mother-impact-immunity.html>

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