

Breast milk hormones found to impact bacterial development in infants' guts

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Image: Wikipedia.

A new University of Colorado Anschutz Medical Campus study finds that hormones in breast milk may impact the development of healthy bacteria in infants' guts, potentially protecting them from intestinal inflammation, obesity and other diseases later in life.

The study, published Monday in the *American Journal of Clinical Nutrition*, examines the role of human milk hormones in the development of infants' microbiome, a bacterial ecosystem in the digestive system that contributes to multiple facets of health.

"This is the first study of its kind to suggest that hormones in human milk may play an important role in shaping a healthy infant microbiome," said Bridget Young, co-first author and assistant professor of pediatric nutrition at CU Anschutz. "We've known for a long time that breast milk contributes to infant intestinal maturation and healthy growth. This study suggests that hormones in milk may be partly responsible for this positive impact through interactions with the infant's developing microbiome."

Researchers found that levels of insulin and leptin in the breast milk were positively associated with greater microbial diversity and families of [bacteria](#) in the infants' stool. Insulin and leptin were associated with bacterial functions that help the intestine develop as a barrier against harmful toxins, which help prevent [intestinal inflammation](#). By promoting a stronger intestinal barrier early in life, these hormones also may protect children from chronic low-grade inflammation, which can lead to a host of additional digestive problems and diseases.

In addition, researchers found significant differences in the intestinal microbiome of breastfed infants who are born to mothers with obesity compared to those born to mothers of normal weight. Infants born to mothers with obesity showed a significant reduction in gammaproteobacteria, a pioneer species that aids in normal intestinal development and microbiome maturation.

Gammaproteobacteria have been shown in mice and newborn infants to cause a healthy amount inflammation in their intestines, protecting them from inflammatory and autoimmune disorders later in life. The 2-week-old infants born to obese mothers in this study had a reduced number of gammaproteobacteria in the infant gut microbiome.

"I eagerly anticipate our follow-up studies to know whether these early results will help us understand what factors help make up a healthier

immune system in infants born to obese mothers over the first year of life," said Jed Friedman, corresponding author and professor of pediatrics at CU Anschutz. "What happens if you restore these bacteria in the infant born to an obese mother remains an open question."

To examine the role of breast milk hormones, leptin and insulin, researchers analyzed the bacteria present in stool samples from 30 two-week-old infants who were exclusively breastfed - 18 infants born to normal weight mothers and 12 born to obese mothers. The researchers not only analyzed what bacteria were growing, but the metabolism of the bacteria that were active in the infants' intestines.

"Just like children learn language and social cues as they grow, their digestive system learns how to regulate itself," said co-first author Dominick Lemas, now an assistant professor at the University of Florida. "What we've found is that hormones in [breast milk](#) are linked to the development of infants' microbiome, potentially having long-term effects on children's intestinal and autoimmune health."

Young and Lemas hypothesize that human milk hormones affect the microbiome by binding to specific receptors in the [infants'](#) intestines. These hormones may stimulate the body to produce proteins, called anti-microbial peptides, which kill off certain types of bad bacteria and may stimulate infant intestinal cells to secrete molecules that allow good bacteria to flourish.

More information: D. J. Lemas et al, Alterations in human milk leptin and insulin are associated with early changes in the infant intestinal microbiome, *American Journal of Clinical Nutrition* (2016). [DOI: 10.3945/ajcn.115.126375](https://doi.org/10.3945/ajcn.115.126375)

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