Probiotic gets a boost from breast milk

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Supplementation with probiotics can improve a person's gut health, but the benefits are often fleeting, and colonization by the probiotic's good microbes usually doesn't last. Breast milk may help sustain those

colonies in the long run, say researchers at the University of California, Davis.

In a study out this week in *mSphere*, they report that breastfeeding babies who received a three-week course of a probiotic that consumes human milk still had colonies of those beneficial gut microbes 30 days after the end of probiotic treatment.

The study is the first to show that a combination of breast milk and a probiotic organism can lead to lasting changes in the gut microbiome, says neonatologist Mark Underwood, who led the study.

"Even though we stopped giving the probiotic on day 28 of life, the particular organisms we gave stayed in their fecal community out to 60 days and even longer," he says. "They were surviving and dominating, and that's something we really have not seen before."

For the study, Underwood and his colleagues recruited 66 breastfeeding mothers. In one group, 34 mothers fed their newborns a three-week course of *Bifidobacterium longum* subspecies *infantis* EVC001, a probiotic supplement. In the other group, the mothers did not administer probiotics. Analyses of fecal samples from the infants, collected during the first 60 days of life, revealed stark differences.

Genetic sequencing, PCR analysis, and mass spectrometry revealed larger populations of *B. infantis*, which improves gut health, in the infants who received supplementation than in the infants who did not. Those colonies persisted for at least 30 days after the end of supplementation, suggesting that the changes were durable, say the researchers. They hypothesize that because the benefit is linked directly to breastfeeding, once the infant stops breastfeeding the colonies will diminish.

Underwood says he and his group suspected *B. infantis* would pair well with the sugars in breastmilk to shape the gut microbiota. "Compared to all the bugs we've tested, this one is a really good consumer of milk oligosaccharides," he says. "It's able to use the sugar molecules in mom's milk better than any other gut microbe, including commensal and pathogenic bugs." Accordingly, the study's analysis showed that infants who received supplementation had lower levels of human milk oligosaccharides in their feces, which meant more had been consumed by *B. infantis*.

Studies conducted over the last decade or so have shown deep connections between disease and dysbiosis, which is an imbalance in gut microbial populations. Disruption of the microbiota, particularly early in life, may increase risk for many diseases both inside and outside the gut, including diabetes, allergies and asthma, irritable bowel syndrome, and some cancers, says Underwood. Finding ways to colonize an infant's intestines with beneficial bacteria might lower those lifelong risks.

Further comparisons of the two groups of infants showed other benefits. Fecal samples from infants who received supplementation had lower numbers of potential pathogens and higher levels of lactate and acetate, which are beneficial products of fermentation of human milk sugars by *B. infantis*.

Underwood says formula could be developed to include oligosaccharides , which might extend the benefits to children who aren't breastfed as well. "If mom can't breastfeed for whatever reason, our hypothesis would be if you give that baby a 3-week course of this probiotic and a formula with added human milk oligosaccharides, colonization should happen and persist as long as they're on that formula," he says.

The researchers next plan to study how the combination of breast milk and probiotics affects the gut health of premature babies, who are at

increased risk of dysbiosis.

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