

Breast milk promotes a different gut flora growth than infant formulas

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The benefits of breast milk have long been appreciated, but now scientists at Duke University Medical Center have described a unique property that makes mother's milk better than infant formula in protecting infants from infections and illnesses.

The finding, published in the August issue of the journal *Current Nutrition & Food Science*, explains how breast milk, but not infant formula, fosters colonies of microbiotic flora in a newborn's intestinal tract that aid nutrient absorption and immune system development.

"This study is the first we know of that examines the effects of infant nutrition on the way that [bacteria](#) grow, providing insight to the mechanisms underlying the benefits of breast feeding over formula feeding for newborns," said William Parker, PhD, associate professor of surgery at Duke and senior author of the study. "Only breast milk appears to promote a healthy colonization of beneficial biofilms, and these insights suggest there may be potential approaches for developing substitutes that more closely mimic those benefits in cases where breast milk cannot be provided."

Earlier studies have shown that breast milk lowers the incidence of diarrhea, influenza and respiratory infections during infancy, while protecting against the later development of allergies, type 1 diabetes, multiple sclerosis and other illnesses. As scientists have learned more about the role intestinal flora plays in health, they have gained appreciation for how an infant's early diet can affect this beneficial microbial universe.

In their study, the Duke researchers grew bacteria in samples of infant formulas, cow's milk and breast milk. For the infant formula, the researchers used three brands each of popular milk- and soy-based products, and they purchased whole milk from the grocery store. Breast milk was donated and processed to separate different components, including proteins, fats and carbohydrates. They

also tested a purified form of an antibody called secretory immunoglobulin A (SIgA), which is abundant in breast milk and helps establish an infant's immune system.

The infant formulas, the milk products and the SIgA were incubated with two strains of *E. coli* bacteria – necessary early inhabitants of the gut that are helpful cousins to the dangerous organisms associated with food poisoning.

Within minutes, the bacteria began multiplying in all of the specimens, but there was an immediate difference in the way the bacteria grew. In the breast milk, bacteria stuck together to form biofilms—thin, adherent layers of bacteria that serve as a shield against pathogens and infections. Bacteria in the infant formula and cow's milk proliferated wildly, but it grew as individual organisms that did not aggregate to form a protective barrier. The bacteria in SIgA had mixed results, suggesting that this antibody by itself isn't enough to trigger the beneficial biofilm formation.

"Knowing how breast milk conveys its benefits could help in the development of infant formulas that better mimic nature," Parker said. "This could have a long-lasting effect on the health of infants who, for many reasons, may not get mother's milk."

Parker said additional studies should explore why human whey has the clumping effect on the bacteria, and whether it has a similar effect on strains of bacteria other than *E. coli*.

"This study adds even more weight to an already large body of evidence that breast milk is the most nutritious way to feed a baby whenever possible," said Gabriela M. Maradiaga Panayotti, M.D., co-director of the newborn nursery for Duke Children's and Duke Primary Care. "We know that babies who receive [breast milk](#) have better outcomes in many ways, and mother who breast feed also have improved health outcomes, including decreased

risks of cancer. Whenever possible, promoting breast feeding is the absolute best option for mom and baby."

Provided by Duke University Medical Center

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