

# Breastfeeding protects babies from bacteria resistant to antibiotics

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In a study carried out at the University of Helsinki, it was found that infant formula is associated with roughly 70% higher occurrence of genes associated with antibiotic resistance in the gut of newborns, more than the other factors studied. The study also demonstrates that breastfeeding newborns is associated with a reduced proliferation of

opportunistic pathogens resistant to antibiotics in the infant, which may lessen the risk of difficult infections.

The increasing prevalence of bacteria resistant to [antibiotics](#) constitutes a significant risk to human health. Usually, the occurrence of [antibiotic resistance](#) is thought to result from abundant antibiotic use, as exposure to antimicrobial drugs promotes the enrichment of microbes that are resistant to them. However, according to recently obtained evidence, bacterial [genes](#) which confer resistance can already be found in abundance in the gut microbiota of newborns and [infants](#) even before exposure to antimicrobials. In a joint study, Finnish and American researchers investigated factors linked to the proportion of bacteria carrying genes that confer antibiotic resistance in the gut microbiota of newborns.

## **Feeding infants with formula significantly affects the number of antibiotic-resistant bacteria**

According to the researchers, the diet of newborns was found to be the primary factor associated with the relative abundance of resistance genes present in the gut. A considerably higher abundance of resistance genes was seen in children whose diet consisted at least partially of [infant formula](#) compared to children who were exclusively breastfed or consumed donated [breastmilk](#). At the same time, infant fortifier based on cow's milk, which is routinely used to improve the diet of breastfed infants, did not have any perceptible effect on the number of resistance genes. The effect of infant formula exposure was markedly more significant than that of antibiotic regimens given to the mother or infant, or of other factors affecting the composition of the gut microbiota, such as delivery mode, the duration of the pregnancy or the infant's age.

"The results were confirmed and the model further honed by reanalysing the gut microbiota data of more than 600 newborns collected in prior

studies. In this dataset too, infant formula was associated with a roughly 70%, increased the occurrence of antibiotic resistance genes in the infant gut, more than the other factors," says Dr. Katariina Pärnänen, describing the results of her doctoral thesis.

Preterm infants who received infant formula had approximately twice the number of resistance genes in their gut compared to infants who were fed nothing but breastmilk. The effect of formula feeding was particularly pronounced in [premature infants](#) and infants who had been exposed to antibiotics.

## **Bacteria in the gut microbiota differ in breastfed and formula-fed infants**

The protective effect of breastmilk against antibiotic resistance, and the corresponding exposing effect of infant formula, appear to be transmitted by certain bacteria found in the gut microbiota. Prior research has shown that a diet based on breastmilk alone increases the number of bifidobacteria, which are beneficial to infant health, in the infant gut. In contrast, infants fed entirely or partially with formula had more bacteria of the *Enterobacteriaceae* family and other potential pathogens in their intestines, providing an explanation for the larger number of resistance genes. Pärnänen's research findings indicate that the number of the ESBL and MRSA superbacteria was higher in formula-fed premature infants compared to premature infants whose diet consisted only of breastmilk.

Pärnänen says that the findings shed more light on the health effects of breastmilk.

"Breastmilk is the primary source of nutrition for all infants, and its health benefits are of particular importance to premature infants. The new findings indicate that breastfeeding premature and newborn infants

also reduces the proliferation of bacteria resistant to antibiotics in the infant gut, thus potentially reducing the risk of difficult infections, which I consider a particularly important find due to the ever-increasing prevalence of antibiotic resistance," Pärnänen says.

Based on the study, the current practice of improving the diet of premature infants using specifically designed fortifier appears to be safe also in terms of antibiotic resistance. The researchers assume that fortifier given to premature infants does not increase the number of resistant bacteria as much as conventional [formula](#), even though both are dairy-based products. This is due to differences in composition and the method of mixing the fortifier administered to the infants with breastmilk. However, the effect of fortifier could not be comprehensively surveyed in this study due to the small number of infants who received it.

Some researchers specializing in antibiotic resistance believe that [bacteria](#) resistant to antibiotics will continue to gain in prevalence even if the use of antibiotics were to be radically curtailed. Consequently, measures not based on reducing antibiotic use can be particularly useful in the fight against superbugs, while breastmilk may turn out to be an exceedingly effective weapon for protecting premature infants and newborns.

The reserach appears in *The American Journal of Clinical Nutrition*.

**More information:** Katariina M M Pärnänen et al, Early-life formula feeding is associated with infant gut microbiota alterations and an increased antibiotic resistance load, *The American Journal of Clinical Nutrition* (2021). [DOI: 10.1093/ajcn/nqab353](https://doi.org/10.1093/ajcn/nqab353)

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