# Asymptomatic viral infections in newborns linked to respiratory infections later in life

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Asymptomatic viral infections in the first days and weeks of a baby's life are associated with an increased risk of respiratory infections later in life, research suggests.

Viruses were found to interact with newborns' immune systems and microbiomes—the community of microbes that live in our body—in a way that affected both a child's risk and number of subsequent infections.

Prevention of such early viral infections, or strengthening immune systems with specially designed probiotics, may avert this risk, experts say.

The microbiome of a newborn baby can be influenced by many things, including delivery method—vaginal or cesarean section—breastfeeding, antibiotics and the hospital environment.

Respiratory infections are a major health concern. They are responsible for 15 percent of deaths for children under the age of five globally and are one of the three main causes of doctors' visits and hospital admittance in the first years of life.

## Microbe interactions

Researchers from the University of Edinburgh and University Medical Center Utrecht examined mucosa—tissue that lines the nasal cavity —samples taken from inside the noses of 114 babies at various stages of life as part of the Microbiome Utrecht Infant Study, which has been running for six years.

The team analyzed the gene activity of the babies' nasal mucosa , the microbes present in the lining of the nose and any viruses that infected the children.

When a viral infection was detected in the first days after birth, which largely occurred asymptomatically, the team found that specific mucosal genes were activated, coinciding with a change in the composition of the

microbiome, promoting the growth of potentially harmful microbes.

## Immune changes

The investigators found in particular changes in immune system genes in response to early viruses in affected babies, with especially in genes involved with interferons—proteins released by immune cells to defend against viruses—over the first year of life.

The interferon-related gene activity caused by an early first viral infection is thought to create a pro-inflammatory environment that makes babies susceptible to future infections, experts say.

The research has been published in *Nature Microbiology*. The cohort study was carried out in close collaboration with the Spaarne Hospital, The Netherlands. The work was funded by Scotland's Chief Scientist Office and the Netherlands Organisation for Scientific Research.

"We were surprised to see viral infections occur so early in life, and go mostly unnoticed, probably because the infants immune system is in what as known as a state of tolerance after birth. Despite this, these infections seem to affect a normal immune development, which is important to know. Only from birth onwards will an infant start to develop its microbiome. Limiting the number of viral encounters in those first days to weeks of life might be essential for a healthy immune and microbiome development, and consequently long term respiratory health," says Professor Debby Bogaert, chair of pediatric medicine at the University of Edinburgh

"Although further work will be needed to confirm the causality of our findings, the data from this study indicate that early-life encounters with respiratory viruses—especially during the first days of life—may set the tone for subsequent non-beneficial host-microbe interactions, which are

related to an infection risk and possibly long term respiratory health," says Dr. Wouter de Steenhuijsen, post-doctoral investigator at University Medical Center Utrecht

**More information:** Wouter A. A. de Steenhuijsen Piters et al, Early-life viral infections are associated with disadvantageous immune and microbiota profiles and recurrent respiratory infections, *Nature Microbiology* (2022). DOI: 10.1038/s41564-021-01043-2

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