# New research shows babies use immune system differently, but efficiently

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Scientists have long believed that a newborn's immune system was an immature version of an adult's, but new research from Cornell University shows that newborns' T cells—white blood cells that protect

from disease—outperform those of adults at fighting off numerous infections.

These results help clarify why adults and infants respond differently to infections and pave the way for controlling T cells' behavior for therapeutic applications.

This discovery was described in a paper published in *Science Immunology* on Feb. 23, co-led by Brian Rudd, associate professor of microbiology and immunology, and Andrew Grimson, professor of molecular biology and genetics.

For example, adult T cells outperform newborn T cells at tasks including recognizing antigens, forming immunological memory and responding to repeat infections, which has led to the belief that infant's T cells were just a weaker version of the adult ones. But during the COVID-19 pandemic, many were surprised by the apparent lack of illness in infants, bringing this long-standing belief into question.

Interested in understanding these age-related differences, Rudd and Grimson discovered that newborn T cells are not deficient: Instead, they are involved in a part of the immune system that does not require antigen recognition: the innate arm of the immune system. While adult T cells use adaptive immunity—recognizing specific germs to then fight them later—newborn T cells are activated by proteins associated with innate immunity, the part of the immune system that offers rapid but nonspecific protection against microbes the body has never encountered.

"Our paper demonstrates that neonatal T cells are not impaired, they are just different than adult T cells and these differences likely reflect the type of functions that are most useful to the host at distinct stages of life," Rudd said.

Neonatal T cells can participate in the innate arm of the immune system. This enables newborn T cells to do something that most adult T cells cannot: respond during the very first stages of an infection and defend against a wide variety of unknown bacteria, parasites and viruses.

"We know that neonatal T cells don't protect as well as adult T cells against repeat infections with the same pathogen. But neonatal T cells actually have an enhanced ability to protect the host against early stages of an initial infection," Rudd said. "So, it is not possible to say adult T cells are better than neonatal T cells or neonatal T cells are better than adult T cells. They just have different functions."

Following up on his discovery, Rudd wants to study the neonatal T cells that persist into adulthood in humans. "We are also interested in studying how changes in the relative numbers of neonatal T cells in adults contributes to variation in the susceptibility to infection and outcomes to disease," he said.

**More information:** Neva Watson et al, The gene regulatory basis of bystander activation in CD8+ T cells, *Science Immunology* (2024). DOI: 10.1126/sciimmunol.adf8776.
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