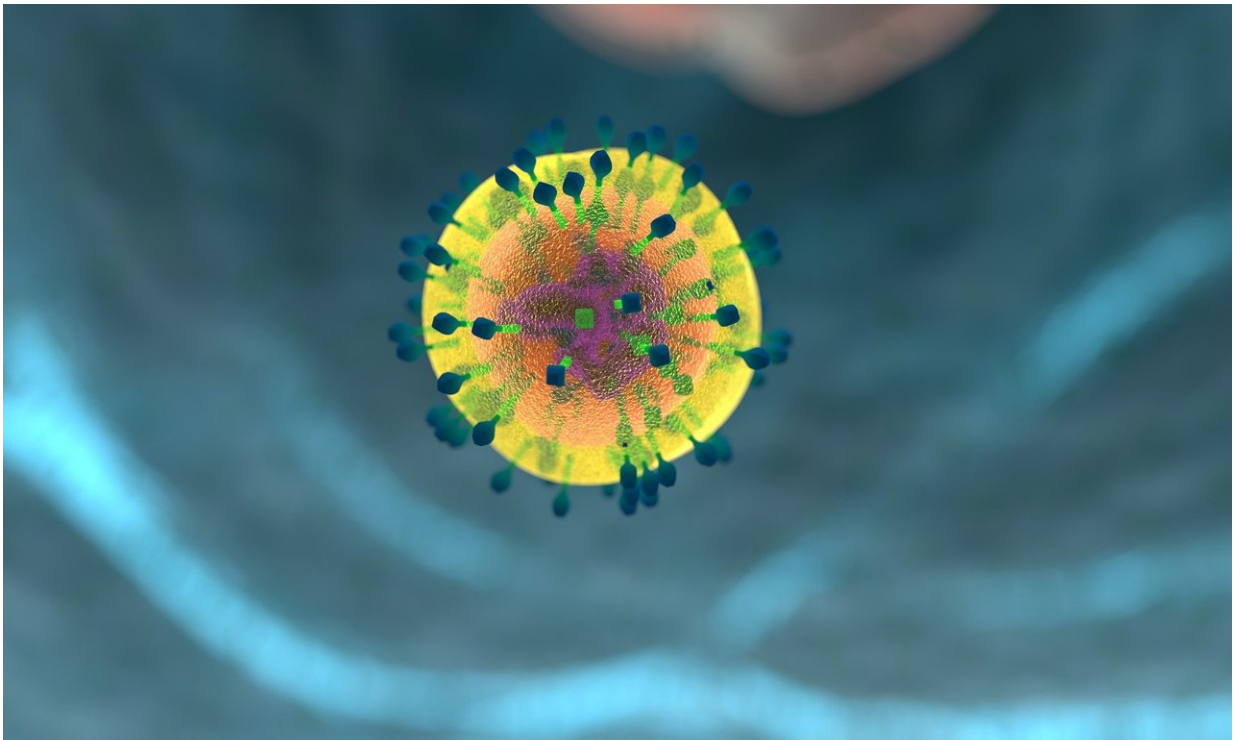


Dramatic development of immune system after birth

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As soon as a baby is born, its immune system starts to change dramatically in response to the pathogens in its new environment, a phenomenon that is common to all babies, researchers from Karolinska Institutet in Sweden write in a paper published in *Cell*. The study was made possible using new techniques of immune cell analysis.

Examining changes in the neonatal immune system has been difficult, since the analyses are made from samples taken from the umbilical cord directly after delivery. Researchers have now exploited a new technique of immune cell analysis to monitor how babies develop for the first few weeks of life outside the womb.

"This is the first time we've pinned down how the human immune system adapts itself to birth and the new environment," says Dr. Petter Brodin, researcher at the Science for Life Laboratory (SciLifeLab) and the Department of Women's and Children's Health, Karolinska Institutet. "We saw drastic changes in the babies' immune systems between each sampling, which shows that it is highly dynamic early in life."

The study compared blood samples from 100 babies, both premature and full-term, taken during the first, fourth and 12th week. The comparison was achieved using an advanced technique of immune cell analysis—mass cytometry in combination with extensive plasma protein analyses.

Just a few drops of blood from each baby are needed to analyse all the white blood cells and hundreds of proteins circulating in the blood. The researchers were also able to show that the babies with abnormal gut flora development during the first weeks also demonstrated a disorder of the immune system.

"Our results are important for better understanding the infection sensitivity of newborn babies and the risks of premature birth," says Dr. Brodin. "If we can monitor the development of the immune system and steer it in different directions, we make it possible to prevent autoimmune diseases and allergies, which are partly related to the development of the immune system, and to develop better vaccines tailored to the neonatal immune system."

The adaptation of the immune system is thought to be triggered by the microbes, bacteria, fungi and so forth that the baby encounters outside the womb. The process begins primarily in the lungs, gut, skin and mucosa, the body's points of contact with the outside world.

"What surprised us was how similar the changes were amongst babies," says Dr. Brodin. "It seems as if all babies follow one and the same pattern, with their immune systems responding with exactly the same sequence of dramatic changes. It's almost like a well-choreographed dance, a practised routine."

The researchers will now broaden the study to encompass more [babies](#), all of whom will be monitored into childhood. This will enable the team to see which of them develop diabetes, allergies, asthma and inflammatory bowel disease. "Many of these diseases can definitely be traced back to how a baby is born and how its immune system adapts to the external environment," explains Dr. Brodin. "What we're bringing to the table is the specific changes in the [immune system](#) that underlie this. It's a piece of the puzzle that was formerly missing."

The study was made possible through the close collaboration of Karolinska University Hospital. "For ethical, practical and logical reasons, it's difficult to put together a study like this," says Dr. Brodin. "The key to our success is that those of us leading the study also work as doctors, and when we manage to combine patient-end work with the most advanced techniques, we make wonderful discoveries."

More information: "Stereotypic immune system development in newborn children", Axel Olin, Ewa Henckel, Yang Chen, Tadeally Lakshmikanth, Christian Pou, Jaromir Mikes, Anna Gustafsson, Anna Karin Bernhardsson, Cheng Zhang, Kajsa Bohlin, Petter Brodin. *Cell*, online 23 August 2018, [DOI: 10.1016/j.cell.2018.06.045](https://doi.org/10.1016/j.cell.2018.06.045)

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