

## Babies' susceptibility to colds linked to immune response at birth

May 17 2012

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Innate differences in immunity can be detected at birth, according to new research at Washington University School of Medicine in St. Louis. And babies with a better innate response to viruses have fewer respiratory illnesses in the first year of life.

"[Viral respiratory infections](#) are common during childhood," says first author Kaharu Sumino, MD, assistant professor of medicine. "Usually they are mild, but there's a wide range of responses — from regular cold symptoms to severe lung infections and even, in rare instances, death. We wanted to look at whether the innate [immune response](#) — the response to viruses that you're born with — has any effect on the risk of getting respiratory infections during the baby's first year."

Reporting in the May issue of the *Journal of Allergy and Clinical Immunology*, Sumino and her colleagues found that newborns with a diminished immune response to viruses experienced more respiratory infections in their first year of life than newborns whose immune response was more robust.

Using umbilical cord blood samples taken in the delivery room, the researchers measured a specific immune system response to viral infection known as interferon-gamma (IFN-gamma). IFN-gamma is released by some cells of the immune system when they encounter a virus. An important weapon in the immune system's arsenal, IFN-gamma helps fight viruses by stopping them from replicating.

The researchers studied cord blood samples from 82 [babies](#) in St. Louis enrolled in the Urban Environment and Childhood Asthma (URECA) trial. Eighty-five percent of the infants were African-American, and all lived in an area where at least 20 percent of the residents were below the poverty level. All had at least one parent with allergies, asthma or eczema, putting them at higher risk for these conditions themselves.

As reported by their caregivers, the babies averaged four colds in their first year with 88 percent of them suffering at least one cold. But the range varied widely with some caregivers reporting no colds and a few reporting as many as nine or 10.

To measure the [innate immune](#) response, the [blood samples](#) were taken at birth, before any exposure to the environment could influence the child's immunity. The researchers isolated monocytes, a specific type of white blood cell, from the babies' cord blood, and infected these cells with a common respiratory virus. They then measured the amount of IFN-gamma produced by the monocytes in response to the virus.

In general, babies whose monocytes responded to the virus by producing higher levels of IFN-gamma had fewer reported colds. Likewise, babies whose monocytes produced lower IFN-gamma levels had more reported colds.

The scientists also found that newborns whose monocytes produced less IFN-gamma also experienced more ear infections, sinus infections, pneumonia, and hospitalizations due to respiratory illness during their first year. But low IFN-gamma levels were not associated with croup or "stomach flu," indicating that this system may be closely associated with respiratory viruses and not other types of infections.

In an effort to identify other indicators of viral response, the researchers measured amounts of two other immune molecules: chemokine CCL5

and STAT1. Unlike IFN-gamma, neither showed any correlation with the number of illnesses the babies experienced.

This study in infants, as well as research in mice and human cells, supports the idea that dialing up the body's IFN-gamma signaling system may help protect against viral infection. The report's senior author Michael J. Holtzman, MD, the Selma and Herman Seldin Professor of Medicine, is working on drug discovery in this area. Unlike a vaccine, which protects against a specific virus, a drug that improves the body's innate immunity could help fight a broad range of viruses, including the constantly evolving seasonal flu.

"Ideally, if these results are confirmed, we would like to be able to intervene based on knowledge of the innate IFN-gamma response," Sumino says. "We're not there yet — measuring IFN-gamma levels is complex. But in the future, if we can develop a relatively easy way to find out if someone has a deficiency in this system, we would like to be able to give a drug that can boost the innate [immune](#) response."

**More information:** Sumino K, Tucker J, Shahab M, Jaffee KF, Visness CM, Gern JE, Bloomberg GR, Holtzman MJ. Antiviral interferon-gamma responses of monocytes at birth predict respiratory tract illness in the first year of life. *Journal of Allergy and Clinical Immunology*. Vol 129. No 5. May 2012. Online March 29, 2012.

Provided by Washington University School of Medicine

Citation: Babies' susceptibility to colds linked to immune response at birth (2012, May 17) retrieved 19 April 2024 from

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