Infant immune systems learn fast, but have short memories

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Forgetful immune systems leave infants particularly prone to infections, according to a new Cornell University study. Upending the common theory that weak immune cells are to blame, the study has found that infants' immune systems actually respond to infection with more speed and strength than adults, but the immunities they create fail to last.

Published in the *Journal of Immunology*, the discovery reveals a new angle immunizations could take in protecting infants and children from infectious diseases.

"The perfect vaccine would be a single dose given at birth that generates long-lasting immunity," said immunologist Brian Rudd at Cornell's College of Veterinary Medicine, the study's lead author. "No such vaccine exists because we haven't understood why infants rapidly lose

immunities. Our finding could change the way we immunize infants and ultimately lead to more effective ways of enhancing immunity in early life."

Immunity against most microbes depends on forming "memory T cells" that remember specific pathogens and can rapidly respond to future infections. Adults almost always generate large numbers of effective memory T cells during infection, around 10 percent of which stay in a long-lived memory pool to rapidly respond next time.

Rudd found that newborn T cells generated in response to infection met dramatically different fates. When faced with the same pathogen, newborn immune systems made T cells that responded more rapidly to infection than adult cells, but quickly became terminally differentiated, never making it into the memory pool.

"So the immune system is forced to start the learning process over again when infected by the same pathogen later in life." Rudd said.

"We hope to find a way to make neonatal cells behave more like adult cells in how they learn from vaccines and respond to infection. Knowledge gained from these studies could be used to design more effective therapeutic interventions and vaccines that can be safely administered in early life."

Provided by Cornell University

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