Genetic immune deficiency could hold key to severe childhood infections

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Some healthy children become critically ill from common cold viruses. Credit: University of Queensland

A gene mutation making young children extremely vulnerable to common viruses may represent a new type of immunodeficiency, according to a University of Queensland researcher.

An international study analysed genetic data from previously healthy children with severe respiratory infections due to common cold viruses who became critically ill and required life support.

Associate Professor Luregn Schlapbach from the Mater Research Institute-UQ and Lady Cilento Children`s Hospital said the study discovered a fault in the gene IFIH1, which plays a role in the immune system's ability to recognise viruses.

The gene fault leads to an insufficient immune defence when faced with certain common cold viruses, human respiratory syncytial virus (RSV) and rhino/enterovirus.

"We tested cells from patients with this gene fault in the laboratory to observe how they responded to the viruses," said Dr Schlapbach (pictured).

"The experiments confirmed that if this gene is not working well, the cells struggle to mount a response and the virus could therefore expand much more quickly."

The study involved 100 Australian children aged from birth to four requiring life support in paediatric intensive care units at the former Mater Children`s Hospital and the former Royal Children`s Hospital (now Lady Cilento Children's Hospital) in Brisbane, and 20 from Switzerland.

Dr Schlapbach said viral infections were common in otherwise healthy young children but fewer than one in 1000 required intensive care.

He said he had always been intrigued about why some children were much more vulnerable to becoming extremely ill with common infections.

"In the past we believed children who become seriously ill from infections were just unlucky or maybe the bug was particularly aggressive," Dr Schlapbach said.

"In the modern era of genomics we have a much better opportunity to understand what the host factors are, opening up new options for developing treatments.

"Our findings confirm that children with common infections who develop into unexpectedly severe cases may have underlying immunodeficiencies that were not previously understood.

"While only a small number of participating families harboured this mutation, the study allows us to gain a dramatically different insight into the causes of severe viral infections."

Dr Schlapbach said the study could possibly lead to the development of diagnostic tests to identify vulnerable children.

"Parents could then decide to keep their child at home during an epidemic, or to seek medical attention if their child catches a cold," he said.

The research, led by Professor Jacques Fellay from the École Polytechnique Fédérale de Lausanne, was the first to use genome-wide exome sequencing in a large cohort of paediatric intensive care patients.

It is published in *PNAS*.

More information: Samira Asgari et al. Severe viral respiratory infections in children with IFIH1 loss-of-function mutations, *Proceedings of the National Academy of Sciences* (2017). DOI: 10.1073/pnas.1704259114

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