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The impact of maternal immune activation on fetal brain development

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Western BrainsCAN
Transforming brain research.

Project **Summary**

KNOWLEDGE MOBILIZATION & IMPACT

The impact of maternal immune activation on fetal brain development

Background

Disruptions during early brain development are leading causes of cognitive deficiencies and severe neurological disorders. Research has shown that viruses or bacteria that infect a mother during early pregnancy can impact fetal brain development and increase the child's risk of developing serious neurological disorders later in life, including Autism Spectrum Disorder (ASD) and schizophrenia.

The Problem

How maternal infection causes fetal brain maldevelopment is not well understood. In many cases, the pathogen is not even transmitted to the fetus, suggesting that the infection itself is unlikely to be directly impacting the developing brain. We suspect that it is the mother's immune response to an infection, known as maternal immune activation (MIA), that is increasing the risk of neurological disorders in affected offspring.

Cytokines are a group of proteins produced by a variety of cells, and a subset of specific cytokines are produced in large quantity by immune cells during viral and bacterial infections. It is already understood that altered levels of these cytokines can impact fetal brain development. What is not known is the process by which these cytokines impact early brain development, or their source - are they produced by the mother's immune system or are they made by immune cells that infiltrate the fetus' brain?

The Project

We will be studying the contribution of two distinct immune cell subtypes to fetal brain development: the mother's main immune cells present in the uterus (known as uterine natural killer cells), and the fetal brain's main immune cells (fetal microglial cells).

We think that uterine natural killer cells and/or fetal microglial cells are responding to MIA or MIA-induced cytokines, and that at least one of them is disrupting normal fetal brain development following exposure to a viral stimulus. Identifying which immune cells contribute to MIA-induced fetal brain maldevelopment is a crucial first step for developing targeted interventions to protect the fetal brain from the detrimental consequences of maternal immune activation, which will potentially help prevent neurodevelopmental disorders in children.

Western Researchers

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