RESEARCH IMPACT CASE STUDY

Canadian Blood Services
BLOOD PLASMA STEM CELLS ORGANS & TISSUES

IVIg use in immune thrombocytopenia: Preventing platelet destruction and exploring IVIg alternatives

What was achieved?

Our research has helped us better understand the biological mechanisms driving platelet destruction in patients with immune thrombocytopenia (ITP) so that intravenous immunoglobulin (IVIg) — or an IVIg alternative — can be used most effectively.

ITP is a condition in which the immune system mistakenly attacks and destroys platelets. This condition can lead to a low platelet count, which increases risk of bleeding and easy bruising and, in severe cases, can cause life-threatening internal bleeding. About five out of 10,000 people in Canada have ITP. A specific type of ITP that occurs in newborns is a condition called fetal and neonatal alloimmune thrombocytopenia (FNAIT). In this condition, maternal antibodies cross the placenta and destroy the baby's platelets. FNAIT can result in severe bleeding in the newborn and requires careful monitoring and medical intervention to manage the condition and prevent complications.

Immunoglobulin therapies are an important treatment option for patients with ITP or FNAIT because they reduce the risk of bleeding by increasing the number of platelets. Little is known about exactly how IVIg increases platelet counts in patients with ITP or FNAIT. IVIg therapies are also more effective for some patients than others, even among those with the same disorder, and their effectiveness can vary from treatment to treatment even in the same patient. Demand for IVIg keeps growing because its immune-boosting properties make it an effective treatment for a number of medical conditions. However, IVIg is a costly and limited resource so understanding how and why it works is crucial to using it wisely.

How was this achieved?

Our research has revealed previously unknown factors contributing to platelet destruction in ITP and miscarriage in FNAIT (Yougbaré et al., 2015), offering insights into how these bleeding disorders may be diagnosed and treated. Our collaboration with international researchers has also helped us understand what happens when the immune response mistakenly attacks healthy platelets in patients with ITP and FNAIT, and what factors may influence how they respond to IVIg treatment (Zeng et al., 2012).

What was the impact and outcome?

Understanding how IVIg works in the body paves the way to the development of IVIg alternatives. These findings bring us closer to reducing our dependence on IVIg and pave the way to more effective, personalized and cost-efficient treatments.

Canadian Blood Services researchers are exploring a range of IVIg alternatives, including:

- Small-molecule drugs that can inhibit phagocytosis, a process some cells use to engulf and remove platelets in the body (Loriamini et al., 2023; Purohit et al., 2014).
- A monoclonal antibody that binds to a critical adhesion molecule on a type of white blood cell (Norris et al., 2021).
- Engineered monoclonal antibody fusion proteins, which are designed to block Fc receptors (proteins found on the surface of immune cells) and improve the immune response (Yu et al., 2016; Crow et al., 2019).
- A synthetic protein (the recombinant protein Fc hexamer) that shows much greater efficacy in treating ITP than IVIg therapies (Lewis et al., 2019).
- Sialidase inhibitors, originally designed as anti-influenza drugs, which may help block platelet destruction in the liver (Li et al., 2015).
- A novel approach that uses an engineered antibody to block platelet destruction by interfering with the receptor (Fc receptor III) and mediating platelet engulfment by macrophages (Gonzalez et al., 2024).

Our research network has also highlighted cost-effective alternatives to IVIg therapies. Alternatives include the oral medication eltrombopag, which stimulates platelet production and may be an effective option for ITP patients requiring surgery (Kaur et al., 2022). Fostamatinib, another medication with proven efficacy, may also be an option for some ITP patients (Podolanczuk et al., 2009).

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