



FACT SHEET

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Defence Technology Prize 2022 Team (Research & Development) Award Winner

PLATELET CRYOPRESERVATION STUDY TEAM

Army Medical Service, DSO National Laboratories, Health Sciences Authority, Singapore General Hospital

CITATION

The Platelet Cryopreservation Study Team, led by the Army Medical Service, with members from DSO National Laboratories, Health Sciences Authority and the Singapore General Hospital, has developed new cryopreservation and thawing protocols to increase the storage shelf life of pooled blood platelets from 7 days to 2 years while maintaining clinical efficacy. This technological achievement sets a new benchmark in the medical field and enables stockpile and transportation of platelets to meet military and civil emergency use, minimising reliance on short notice live donor support. In recognition of its outstanding achievements and contributions, the team is awarded the DTP2022 Team (R&D) Award.

ABOUT THE PLATELET CRYOPRESERVATION TEAM

Haemorrhage is the leading cause of preventable death in trauma. The challenge is to ensure enough blood products are transported to the field hospitals and transfused to the patients in the right ratios during bleeding emergencies. To achieve this, HSA and the SAF require a reserve of Red Blood Cells (RBC), plasma and platelets. Of the 3 main blood components, platelets have the shortest shelf life, preventing its stockpiling and forward transportation capabilities. The platelet cryopreservation team aimed to identify a cryopreservation method to extend the shelf life of platelets while maintaining its clinical efficacy.

The success of the platelet cryopreservation is the result of close collaboration between the four organisations - made up of complementary expertise that spanned R&D; *in vitro* diagnostic testing; cryopreservation, thawing and reconstitution workflow validation and operationalization; and clinical study in patients with low platelet counts to prevent bleeding.

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TECHNICAL INNOVATION AND OPERATIONAL IMPACT

Liquid-stored platelets collected from donors are kept on agitators and given to patients within 7 days. Platelets not consumed within this period will expire. By using a platelet cryoprotectant in the cryopreservation phase; and thawed plasma in the reconstitution phase, the team ensured that platelets stored up to 2 years at -80°C were comparable in clinical efficacy and safety to liquid-stored platelets. There were no major adverse reactions from the frozen platelets. Only mild reactions such as mild hives were observed in some patients which resolved quickly, and this was comparable to liquid-stored platelets. The frozen platelets were also as effective as the liquid-stored platelets in preventing significant bleeding in these patients.

The innovation contributed to improving Singapore's blood supply resilience in the following ways:

Thorough utilisation of resources (surplus pooled platelets)

Surplus pooled platelets can now be cryopreserved to prevent unused expired platelets.

Ability to stabilise supply of platelets and stockpile for crises

A 2 year shelf-life for cryopreserved platelets has given Singapore an avenue to prepare sufficient pooled platelets as stockpile for emergencies, especially if the shelf life can be extended further. A national stockpile will serve as a reserve pool when there are supply issues due to drop in blood donation rates.

Decreased reliance on live donor support in civil-military operations

A stockpile reduces strain on last mile donations required in preparation for emergencies. This translate to an increase in resilience of platelet supply in Singapore with extended lead time for stockpiling ahead of protracted periods of tension, allowing for gradual build-up of stockpile rather than on-demand call for platelet donations.

Flexibility in logistical transport and demand centric blood utilisation during military and humanitarian operations

Cryopreserved platelets can be stored at -80°C freezers and thawed/reconstituted when needed. This allows platelets to be transported to operational medical facilities frozen, and used when needed, reducing the supply chain strain and time restrictions on transport of thawed blood products.

The innovation provides life-saving platelets for better medical care during peacetime and preserves Singapore's resilience fighting force during civil and national emergencies.

The success of the platelet cryopreservation team is an outcome of the strong inter-agency partnership and synergy of local research capabilities built over the years. The innovation offers many possibilities from overcoming supply shortage to providing scalable throughput and adaptability.

PROFILE OF TEAM MEMBER (INTERVIEWEE)

Name	MAJ (DR) Jasper Wang 王祥玮
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Age	31

PROFILE OF TEAM LEADER

Name	Associate Professor Lu Jia 陆佳博士
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