FACT SHEET

Visit http://www.mindef.gov.sg for more news and information about MINDEF and the SAF

Date of issue: 26 Oct 2021

Defence Technology Prize 2021 Team (Engineering) Award Winner

RESOLUTE DIRECT PCR DIAGNOSTIC KIT FOR COVID-19 TEAM
*DSO National Laboratories, Diagnostics Development Hub (DxD Hub), A*STAR, and HQ Medical Corps, Singapore Armed Forces*

CITATION

To enhance Singapore's diagnostic capabilities against the COVID-19, the team developed the RESOLUTE Direct PCR Kit. RESOLUTE is able to bypass the RNA extraction process required in conventional PCR, reducing the testing time from 3 hours to within 90 minutes.

Developed in just 3 months after the first reported case in Singapore, RESOLUTE overcame the issue of global shortage in testing materials, enabled the scaling of testing capacity and simplified the diagnostic workflow. RESOLUTE also reduces the exposure to testers and requires only basic laboratory equipment and entry-level technicians to conduct the test. In recognition of their outstanding achievements and contributions, the team is awarded the DTP2021 Team (Engineering) Award.

ABOUT THE RESOLUTE TEAM

Building on the direct PCR technology that DSO National Laboratories (DSO) started developing since 2013, DSO and the Agency for Science, Technology and Research (A*STAR) jointly developed the RESOLUTE Direct PCR kit in just 3 months. DSO contributed their expertise in diagnostic assay design and optimisation, and capability to provide analytical and clinical validation in their high-containment facilities.

A*STAR worked on the in vitro diagnostic device development and productisation, analytical and clinical validation and clinical onboarding to testing laboratories. A*STAR also transferred the tech know-how to a local medtech company for scaled-up production and commercialisation.

MINDEF Communications Organisation
Public Communications Directorate
MINDEF Building, 303 Gombak Drive, #01-26 Singapore 669645 Tel: 9228 6190 Fax: 6769 5139

TECHNICAL INNOVATION AND OPERATIONAL IMPACT

At the start of COVID-19 pandemic, rapid and extensive testing was recognised as one of the important measures to contain the spread of the disease, but Singapore faced several challenges to implement this strategy. DSO decided to explore the use of the direct PCR technology, a capability which they developed in the last seven years, to contribute to the crisis response.

The rapid development and deployment of RESOLUTE is the result of close collaboration between the three organisations, made up of complementary expertise that spanned R&D, *in vitro* diagnostic assay development and manufacturing, diagnostic workflow validation and operationalisation. Within four months of initial development, two kits were productised and deployed to testing labs across Singapore. Within the next few months, further development and validation culminated in a kit that allowed testing to be conducted with various specimen types such as the use of deep throat saliva for COVID-19 diagnostics.

Real-time PCR testing is recognised as the gold standard for COVID-19 diagnostics. In conventional PCR testing, RNA is extracted from the samples before undergoing PCR analysis. The initial sample processing step (RNA extraction) ensured that PCR inhibitors are removed. However, this can be time-consuming and required specific equipment and reagents. Built on DSO's proprietary formulation, RESOLUTE bypass the RNA extraction process, enabling PCR analysis to be performed directly on patients' swab samples.

The innovation contributed to the fight against COVID-19 in the following ways:

a) Overcoming the supply chain issue

- RESOLUTE eliminates the need for sample processing (bypasses the RNA extraction required in conventional PCR test). This simplifies the testing workflow and removes the need for sample processing reagents, saving time, cost and logistics.
- The test can be performed by entry level technicians using generic PCR machines, easing equipment shortage challenges.

b) Enabling testing with various clinical specimen types

- Different clinical specimen types can be tested, useful for patients who have difficulty with particular sample collection methods.
- Use of non-invasive samples such as deep throat saliva, which can be self-administered, alleviates discomfort and also reduces risk of exposure to the personnel receiving the samples.

c) Expanding testing capacity

- Testers without biomedical background can be quickly recruited and trained, enabling effective scaling to meet the required testing capacity.
- Samples can be pooled for testing, further mitigating the capacity and supply chain crunch, and increasing the testing throughput.
- Part of the testing workflow can be automated, which will remove the exposure to testers, ensures test accuracy and increase testing throughput.

The success of RESOLUTE is an outcome of the strong inter-agency partnership and synergising of local research capabilities built over the years. The innovation offers many possibilities from overcoming supply shortage to providing scalable throughput and adaptability with various patient samples, and contributing as one of the success factors behind the FDLs.

PROFILE OF TEAM LEADER

Name	Ng Sock Hoon 黄素云
Appointment	Laboratory Director (Verification and Attribution Laboratory) 实验室署长 (验证归因实验室) Defence Medical & Environmental Research Institute (DMERI) 国防医药及环境性研究学院
Organisation	DSO National Laboratories
Age	46

AWARDS

- DTP Team (R&D) Award, Biological Defence Programme Team, 2020

###