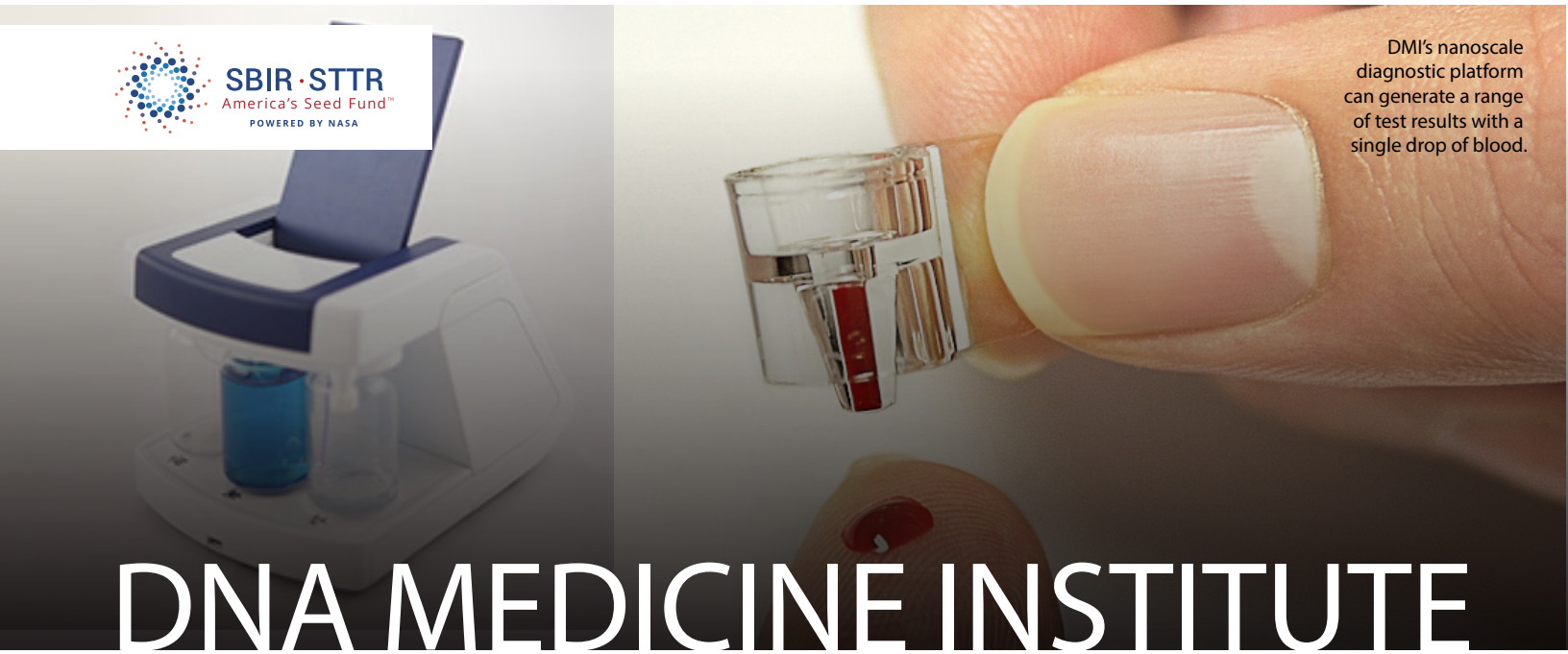


DMI's nanoscale diagnostic platform can generate a range of test results with a single drop of blood.

DNA MEDICINE INSTITUTE

Getting timely medical attention while traveling in outer space has its complications. Astronauts encounter delayed communications from mission control due to the incredibly long distance from Earth. This could increase health risks if a medical consultation is needed. What if astronauts could conduct their own health check during a mission to Mars and administer treatment right on the spacecraft?

PROJECT
Easy and non-intrusive nanoscale diagnostic platform comprised of fluorescence-based test strips and a hand-held sensor

MISSION DIRECTORATE
Science

PHASE III SUCCESS
$525,000 Grand Prize winner of the Nokia XChallenge. Over several million dollars in funding from private investors, and multiple biotech and pharmaceutical partners.

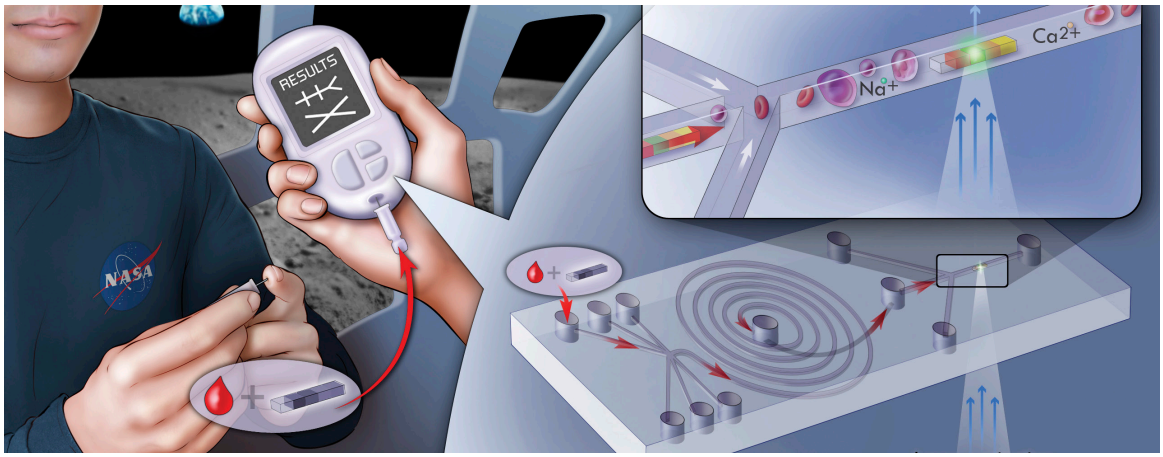
SNAPSHOT
Self-diagnosis for astronauts on long missions in outer space is possible using an innovative blood analysis system which can generate comprehensive medical test results within minutes using a single drop of blood.

DNA MEDICINE INSTITUTE
727 Massachusetts Ave
Cambridge, MA 02139
dnamedinstitute.com

DNA Medicine Institute (DMI), through NASA's Small Business Innovation Research (SBIR) program, is making self-diagnosis in outer space a reality and revolutionizing the overall approach to medical testing. NASA had been searching for ways to monitor the health of astronauts during long missions using tests that would be easy to administer and are not intrusive. NASA also wanted to enable astronauts to address medical issues immediately without waiting for guidance from mission control. DMI, a med-tech incubator, laboratory, and biomedical technology service provider based in Cambridge, MA, developed a comprehensive nanoscale diagnostic platform to meet these stringent requirements.

DMI's solution includes fluorescence-based test strips, a hand-held sensor and software to generate a medical results dashboard. This innovative blood analysis system is easy to use. An astronaut simply applies one drop of blood to a small receptacle where reagents and the test strips react to the blood's contents. Using DMI's single point of care device, referred to as Reusable Handheld Electrolytes & Lab Technology for Humans (rHEALTH), the astronaut scans the test strips like a bar code in the receptacle to detect a whole host of disease-markers. The test strips are conceptually similar to pH or urinalysis test strips. However, the design allows for multiple, simultaneous measurements.

"Our system requires fewer samples to generate a comprehensive set of results and saves time by reducing the number of tests conducted. With the same test, astronauts can conduct a bone loss diagnosis, an immune system assessment, and rapid diagnosis of cardiac events within minutes," according to Dr. Eugene Chan, DMI Chief Executive Officer and Head Scientist.



Two different lasers are used to detect the test strip and the targets in the blood sample to generate a comprehensive health profile.

DMI's test strips, the size of 165 by 33 micrometers, are produced to handle a microliter (tiny drop) of blood. To get an idea of the scale of the strip, the width of a single human hair ranges from approximately 10 to 200 micrometers. The nanostrips each have the mass and volume at the nano range, occupying no more than the volume of a few blood cells.

A benefit of the test strip's small size is that it reduces the need for bulky lab equipment. The nanoscale diagnostic platform is designed to make conducting traditional medical tests, currently performed on large machines with trained personnel, possible without a lab by consumers or clinicians in resource challenged settings.

Encoded with fluorescent tags, the test strips incorporate several sensor pads that emit light in response to different proteins in the blood sample. The target in question will glow if it's in the sample and its fluorescent intensity indicates how much is present. The rHEALTH sensor uses two different lasers to detect the fluorescence, or light emissions. One laser identifies the test strip and the other measures the target on the test strip. The data gathered from the sensor is then rapidly analyzed to generate a comprehensive report on the patient's overall health.

"SBIR provided DMI with the opportunity to help astronauts understand their medical status on space flights. Now, we are working to make that same system available to the everyday consumer using readily available technology."

DMI
FOUNDER
DR. EUGENE CHAN

The rHEALTH sensor was designed to perform flawlessly in a zero gravity, low humidity and high radiation environment, while at the same time preserving the integrity of the biological fluids during testing. DMI determined the viability of the rHEALTh sensor in outer space by conducting reduced-gravity experiments for NASA's Facilitated Access to the Space Environment for Technology (FAST) program. FAST provides opportunities for emerging technologies to be tested in the space environment. A joint team from DMI and NASA's Glenn Research Center flew the device aboard a Boeing 727 at repeated parabolic trajectories to test the device functionality at zero, lunar, and 1.8 g conditions with promising results.

The rHEALTH sensor earned DMI the distinction of being the 2014 winner of the Nokia XChallenge, a $2.25 million global competition which aims to accelerate innovation and availability of hardware sensors and software sensing. DMI was also one of five finalists in the Qualcomm Tricorder XPRIZE, a $10 million global competition aimed to stimulate innovation and integration of precision diagnostic technologies to help consumers make their own reliable health diagnoses.

DMI is now making inroads to provide real-time health monitoring for patients on Earth. DMI is performing preliminary testing of its rHEALTH devices to determine blood cell counts and levels of immune markers. This consumer testing, as part of SBIR Phase III, is funded from DMI's XPRIZE award, private investors, and multiple biotech and pharmaceutical partners which amounts to over several million dollars of investment. DMI is almost half-way through the device development process for Federal Drug Administration approval.

left: Samuel Bearg (DMI Special Projects Scientist), middle: Dr. Eugene Chan (DMI CEO/Founder), and right: Carlos Barrientos (DMI Graphic Designer/Media Specialist).