

SINGAPORE

Help or horror? Scientists develop 'diving suits' to help cyborg cockroaches conduct underwater search-and-rescue (VIDEO)



The Straits Times reported that the suit allows the insects to survive and move underwater for up to three hours by supplying oxygen directly to their respiratory system. — NTU pic

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By Malay Mail

First Published: Monday, 06 Jul 2026 4:24 PM MYT

SINGAPORE, July 6 — Cyborg cockroaches may soon be able to operate in flooded or partially submerged disaster zones, thanks to a new flexible "diving suit" developed by researchers from Nanyang Technological University (NTU) and Japan's Waseda University.

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The Straits Times reported that the suit allows the insects to survive and move underwater for up to three hours by supplying oxygen directly to their respiratory system. The innovation aims to overcome a key limitation: cyborg cockroaches, despite being equipped with infrared cameras, sensors and electrodes, cannot breathe when fully submerged.

The suit consists of a tiny chemical oxygen-generation tank, a soft waterproof shell and four silicone tubes that channel oxygen to the cockroach's spiracles — small openings that connect to its respiratory system. Diluted hydrogen peroxide is injected into the 3D-printed tank, where it reacts with manganese dioxide to release oxygen. Researchers said the tubes can be removed without harming the insects, which were treated in accordance with research guidelines.

The system was tested on Madagascar hissing cockroaches, a species commonly used in cyborg insect research due to their size, robustness and wingless bodies. Findings were published in *Nature Communications* on June 29.

NTU professor Hirotaka Sato, who led the study, said the suit works like a diver's oxygen tank, enabling the insects to operate in environments previously inaccessible due to heavy rain or flooding. Waseda University's Shinjiro Umezaki added that the challenge was designing a system small and flexible enough for the insect to wear while still producing sufficient oxygen for extended underwater movement.

The team is now testing the suit in simulated disaster environments and plans to improve durability and integrate navigation systems and sensors. Beyond search-and-rescue missions, the suit could allow cyborg insects to inspect flooded pipes, tunnels and other confined spaces. Researchers also believe the technology can be adapted for other cyborg insects, including locusts and beetles.

NTU is separately studying the use of cyborg cockroaches to check utility pipes for corrosion and leaks, part of a broader push to deploy insect-based robotics in real-world infrastructure and emergency scenarios.



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