MedicalXpress

Laser can spot illness before symptoms appear

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It may not rank among the top 10 causes of death, but decompression sickness can be fatal. Instead of waiting for symptoms to appear, a University of Houston professor is developing a laser-based system that can diagnose the sickness in a matter of seconds.

Kirill Larin, assistant professor of biomedical engineering and mechanical engineering, is using a $400,000 grant from the U.S. Navy to develop the first optical non-invasive tool to test those most likely to suffer from decompression sickness, such as scuba divers, submariners and airplane pilots. Decompression sickness affects those who experience sudden, drastic changes in the air or water pressure surrounding their bodies. It can cause anything from joint pain – known as the bends – to seizure, stroke, coma and, in the most extreme cases, death.

“Most of the time, decompression sickness isn’t addressed until the person starts showing clinical symptoms,” Larin said. “It would be better, of course, to treat the problem before the symptoms appear. That would allow individuals to take the appropriate medical actions to reduce the side effects of decompression sickness.”

Larin’s optical device can locate the presence of nitrogen gas – or microbubbles – in blood and tissues, which can restrict the flow of blood throughout the body and cause damage. Larin is developing the tool, which works much like an ultrasound machine, with Dr. Bruce Butler of the UT Health Science Center in Houston. Instead of getting readings

using sound waves, however, Larin's system uses light waves in the form of lasers that bounce back when they encounter resistance, thereby providing a high-resolution image.

The Navy could eventually use this technology on all divers or pilots returning to the surface. By shining the laser on one of these individuals, it would provide an image that would reveal the presence of any microbubbles in the blood or tissue – all in a matter of seconds. If microbubbles are found, then medical steps, such as time in a decompression chamber, could be taken before the symptoms appear.

An early version of the tool has been able to locate microbubbles as small as six micrometers, or six thousandths of a millimeter. Most microbubbles are between five and 15 micrometers, about the size of a red blood cell.

The device also could be used at the International Space Station, where individuals moving from a ship to the station have suffered from the effects of decompression sickness. With continued research, everyone from highly trained naval divers and pilots, to astronauts and seaside vacationers could benefit.

Source: University of Houston