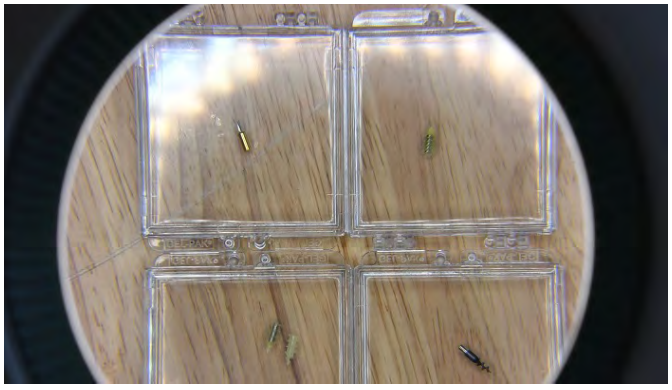
From Sci Fi to Reality: It is now possible to send tiny bullet-shaped robots on voyage into brain

It's long been science fantasy to send microscopic robots deep within the human skull to treat brain diseases. However, Bionaut Labs, a California-based start-up, claims that this might be a reality soon.

In only two years, the company plans to begin human clinical trials for its small injectable robots, which can be precisely steered around the brain using magnets. Just as cell phones now contain extremely powerful components that are smaller than a grain of rice, the tech behind micro-robots "that used to be science fiction in the 1950s and 60s" is now "science fact," said co-founder and CEO Michael Shpigelmacher.

"We want to take that old idea and turn it into reality," the 53-year-old scientist said to AFP. Working with Germany's famed Max Planck research institutes, Bionaut Labs chose magnetic energy over optical or ultrasonic means to drive the robots since it is safe to be used in the human body.

Magnetic coils placed outside the patient's skull are linked up to a computer that can remotely and delicately maneuver the micro-robot into the affected part of the brain, before removing it via the same route. The entire apparatus is easily transportable, unlike an MRI, and uses 10 to 100 times less electricity. In a simulation watched by AFP, the robot — a metal cylinder just a few millimetres long, in the shape of a tiny bullet — slowly follows a pre-programed trajectory through a gel-filled container, which emulates the density of the human brain. Once it nears a pouch filled with blue liquid, the robot is swiftly propelled like a rocket and pierces the sack with its pointed end, allowing liquid to flow out.



When clinical trials begin in two years, the inventors want to use the robot to penetrate fluid-filled cysts in the brain. The method might be used to cure Dandy-Walker Syndrome, a rare brain abnormality that affects youngsters, if it is effective. Bionaut Labs has previously tested its robots on large animals like lambs and pigs, and according to Shpigelmacher, "the evidence suggests that the technology is safe for people." If authorised, the robots might provide significant benefits over currently available therapies for brain illnesses.

Last year, the US Food and Drug Administration (FDA) awarded Bionaut Labs clearance to begin clinical studies for Dandy-Walker Syndrome and malignant gliomas, which are cancerous brain tumours that are frequently considered incurable.

According to Shpigelmacher, current therapy procedures include subjecting the whole body with medications, which can result in significant side effects and a loss of effectiveness. While within the brain, the micro-robots may also take measurements and gather tissue samples.

Apart from cosmetics and blood, microplastics present in lungs of humans

A team of researchers from Hull York Medical School and the University of Hull have conducted research where findings have revealed that inhaling microplastics is a route of exposure. Their studies will help direct future studies on the impact microplastics could have on respiratory health.

Synthetic fibres have previously been found in lung tissue, but there are limited studies confirming the

presence of microplastics – and none as robust as this. The study found 39 microplastics in 11 of the 13 lung tissue samples tested –considerably higher than any previous laboratory tests.

Dr Laura Sadofsky, Senior Lecturer in Respiratory Medicine at Hull York Medical School and lead author on the paper, said: "Microplastics have previously been found in human cadaver autopsy samples – this is the first robust study to show microplastics in lungs from live people."

"It also shows that they are in the lower parts of the lung. Lung airways are very narrow so no one thought they could possibly get there, but they clearly have. "This data provides an important advance in the field of air pollution, microplastics and human health.

"The characterisation of types and levels of microplastics we have found can now inform realistic conditions for laboratory exposure experiments with the aim of determining health impacts."

Lung tissue was collected from surgical procedures carried out on patients who were still alive, as part of their routine medical care. It was then filtered to see what was present. Of the Microplastics detected, there were 12 types, which have many uses and are commonly found in packaging, bottles, clothing, rope/twine, and many manufacturing processes. There were also considerably higher levels of microplastics in male patients compared to females.

The study showed 11 microplastics were found in the upper part of the lung, seven in the mid part, and 21 in the lower part of the lung – which was an unexpected finding.

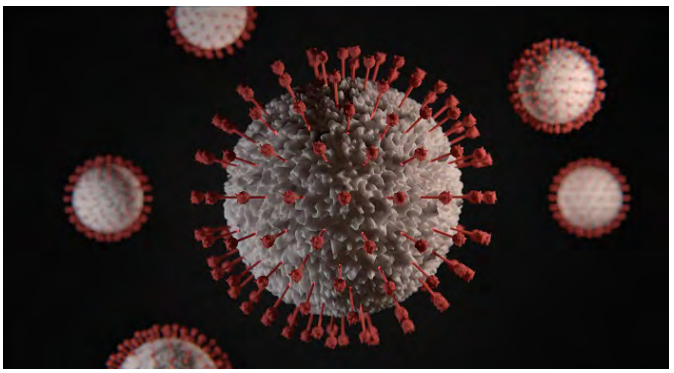
Dr Laura said in a news release, "We did not expect to find the highest number of particles in the lower regions of the lungs, or particles of the sizes we found. This is surprising as the airways are smaller in the lower parts of the lungs, and we would have expected particles of these sizes to be filtered out or trapped before getting this deep into the lungs."

The study follows research published in March by the University of Hull and Hull York Medical School in which scientists recorded high levels of atmospheric microplastics during a year-long study at a site close to a busy northern trunk road to establishing what particles, and their characteristics, people may be exposed to every day.

Researchers found the most abundant microplastics were polyethylene, from for example degraded plastic packaging or carrier bags; and nylon, which may be from clothes; as well as resins, which could come from degraded roads, paint marking or tire rubber. Researchers also found microplastics of the size and shape which are inhalable by humans. The new study has been published in Science of the Total Environment.

Rapid virus clearance obtained through Japan's Covid oral antiviral pill

An oral antiviral pill, S-217622, developed by Japanese pharma company Shionogi & Co, has shown rapid clearance of the infectious SARS-CoV-2 virus. The pill can be orally administered once – daily mainly in vaccinated patients, with no risk factors for severe complications, within five days of onset of Covid symptoms.



On day four of treatment (following the third dose), the proportion of patients with positive viral titer decreased by approximately 90 per cent versus placebo. The pill also shortened infectious virus shedding by 1-2 days versus a placebo.

The clinical trials showed that S-217622 was well-tolerated, and no reports of serious adverse events. "These results demonstrate that S-217622 rapidly eliminates SARS-CoV-2 in patients versus placebo, marking its potential, if approved, as an effective treatment option for Covid-19," said Isao Teshirogi, President and CEO at Shionogi, in a statement.