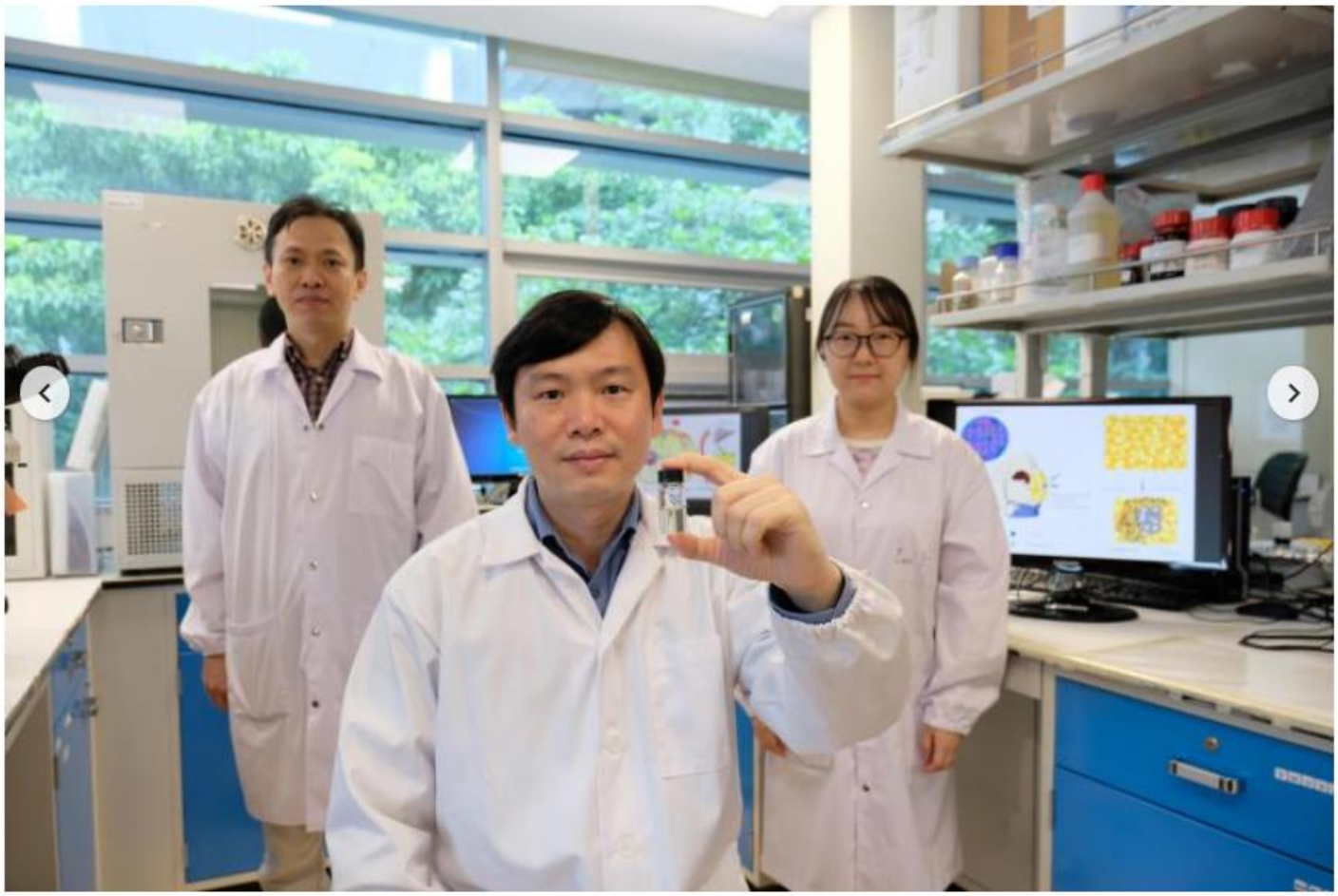
New therapy to tackle obesity by NTU team uses gel and infrared light, safety shown in trials on mice



1 of 2 (From left) NTU's School of Chemical and Biomedical Engineering's Dr Than Aung, Professor of Bioengineering Chen Peng and Dr Zan Ping. PHOTO: NTU

Shabana Begum

PUBLISHED 2 HOURS AGO

SINGAPORE - Scientists from Nanyang Technological University (NTU) have developed a therapy that uses a gel and infrared light to burn fat - a possible safer treatment for people working to control their weight.

Drugs that tackle obesity are meant to accompany exercise and a healthy diet in helping people who are severely obese, including those who have metabolic disorders, but many in the market come with side effects.

Laboratory trials by the NTU team from the School of Chemical and Biomedical Engineering show that mice on a high-fat diet that underwent its therapy weighed 5.5 per cent lighter after two weeks, and lost between 40 per cent and 50 per cent of body fat.

In the therapy, a transparent gel - called a hydrogel - developed by the scientists, is injected into a layer of fat under the mice's skin.

A near-infrared light is then shone on the injection site for five minutes a few times a day to trigger the hydrogel's fat-burning ability.

Infrared light refers to wavelengths of light that are not visible to the human eye, but can be felt as heat.

When exposed to the infrared light, nanoparticles in the hydrogel convert light into heat to activate a protein in the body that kick-starts the fat-burning process.

In this process, white fat - which stores excess calories and leads to weight gain - is converted to calorie-burning tissue.

"Fat cells become energy-burning instead of energy-storing," said bioengineering professor Chen Peng, who led the study.

After two weeks of the treatment - which includes eight days of rest - the mice lost 40 per cent of the fat under their skin and 54 per cent of the fat surrounding their internal organs.

The rodents also had lower cholesterol levels and reduced resistance to insulin, suggesting that the procedure has the potential to reduce the risk of metabolic disorders, said NTU in a statement on Tuesday (Jan 25).

Touching on the therapy's safety, the research team said the hydrogel nanoparticles - made of copper sulphide - have negligible toxic effects on vital organs and tissues.

And although the process uses heat converted from the infrared light to burn fat under the skin, the team found no thermal injury to the mice's skin, said Prof Chen.

The hydrogel also contains substances that are approved by the United States Food and Drug Administration (FDA). For instance, the gel contains an FDA-approved drug for people with overactive bladders, which the NTU team repurposed for its therapy.

The team envisions the therapy being used as a home treatment one day.

Hydrogel is injected into pig skin to prove that the nanoparticles in the hydrogel can activate a protein when exposed to infrared light. PHOTO: NTU

Similar to an insulin shot, patients with obesity can inject the hydrogel into their belly fat, for instance, in multiple places once a week. They can then light a hand-held laser at the injection sites for five minutes a few times a day, and repeat this over several days, to activate the fat-burning process.

The scientists are hopeful that their therapy could be an alternative to costly fat reduction procedures that only target fat under the skin and obesity drugs approved by the FDA that often come with side effects.

According to the National Institute of Diabetes and Digestive and Kidney Diseases in the United States, the common side effects associated with weight-loss drugs include diarrhoea, constipation, nausea and headaches.

"All FDA-approved medications for obesity indirectly act on the brain to suppress appetite, or on the digestive system to reduce fat absorption. Most of them have been withdrawn from the market due to their serious side effects," said Prof Chen.

"In contrast, our therapeutic approach focuses on remodelling white fat tissue, which is the root of the evil."

In February 2020, the FDA requested that a weight-loss drug called Belviq be voluntarily removed from the US market because a safety clinical trial showed an increased occurrence and risk of cancer.

The NTU team is now looking to collaborate with partners to conduct clinical trials - with one or two patients as a start - to further test its therapy.

The test on mice found no abnormalities in their internal organs and tissues. The animals did not show any abnormal behaviour as well, said Prof Chen.

But he noted that careful studies must be done to observe the possible side effects of the therapy on humans.

"We don't have a 100 per cent sure answer yet. But my guess is that serious side effects would not be a concern for our method, particularly when you compare it with the current drugs that are used," he added.

The study's findings were published in scientific journal ACS Nano in December last year.

Although the cost of the therapy is still uncertain, Prof Chen said it is likely to be much less costly compared to weight loss or fat reduction surgery.

Senior research fellow Than Aung, who is also part of the research team, said each hydrogel jab could cost between $10 and $20. As several jabs a week are likely required for the treatment, the cost may be comparable to existing obesity and weight loss drugs, which cost several hundred dollars a month.

Commenting on the NTU team's therapy, Alexandra Hospital's head of general surgery Asim Shabbir said the method is promising as it triggers fat loss by converting white fat into calorie-burning tissue, and also breaks down fat deep within the body.

Dr Asim noted that available anti-obesity treatments are unable to burn fat in regions outside the areas of treatment.

"This technology adds to the growing number of tools available to treat obesity. However, it will need rigorous human testing before one would know if the results are the same in humans as in mice," added Dr Asim, who specialises in obesity treatment and metabolic surgery.

In 2019, Singapore researchers developed an appetite-curbing pill that inflates into a balloon in the stomach to induce a sense of fullness, so that less food is eaten. The capsule is still being developed for commercialisation.