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Banish love handles with NTU scientists' weight-loss patch?

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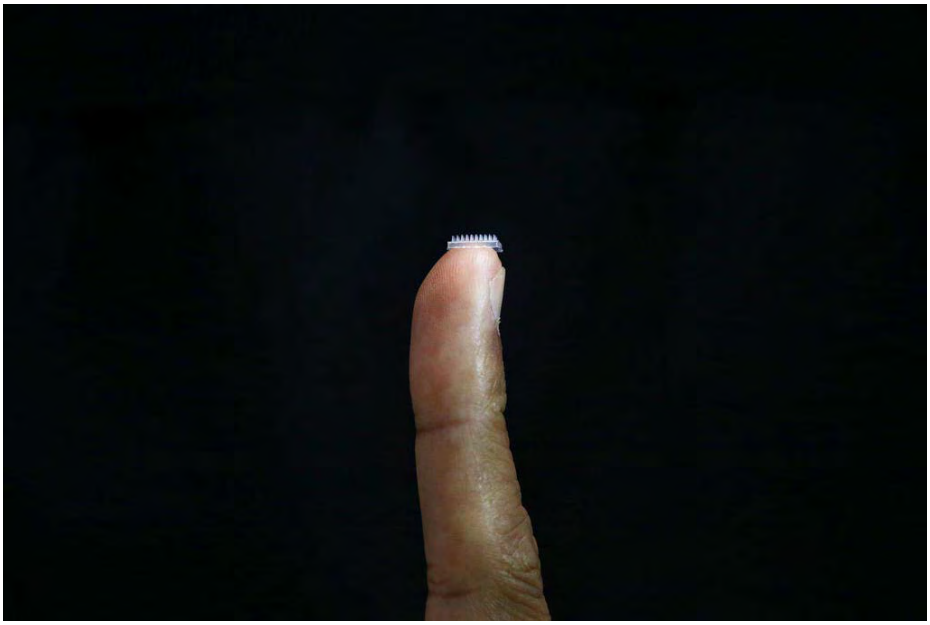

A new patch developed by scientists from Nanyang Technological University aims to turn energy-storing fats into energy-burning fats. Photo: Nuria Ling/TODAY

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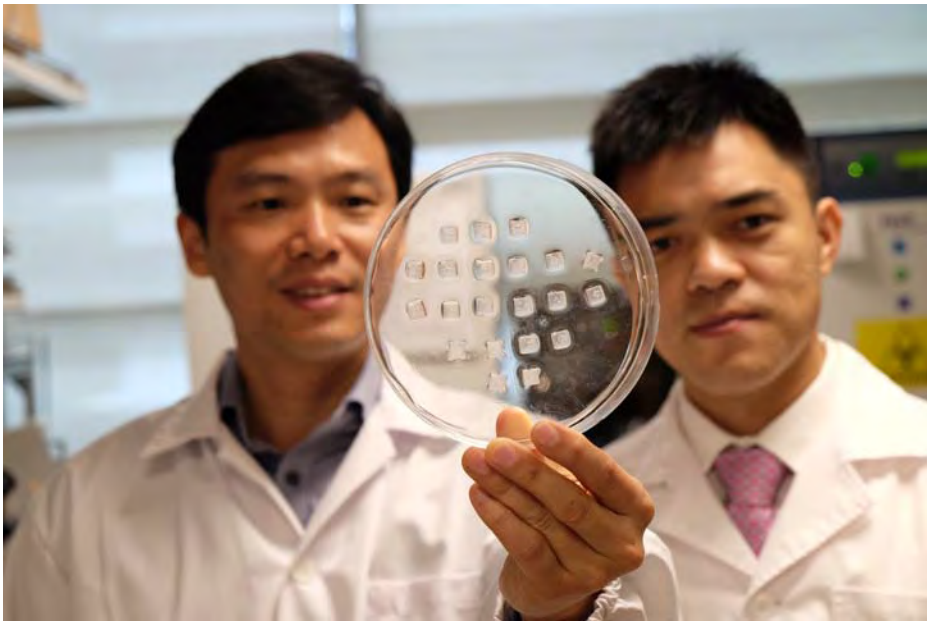
SINGAPORE — Losing weight could soon be as easy as sticking a patch onto your skin. Scientists from the Nanyang Technological University of Singapore (NTU) have developed a new stick-on skin patch that could potentially reduce unwanted fats, and target love handles, without having to resort to surgery or oral medication.

The non-invasive skin patch targets the fat underneath the skin, delivering metabolism-altering drugs to the area via hundreds of micro-needles. The patch aims to help those with obesity, or wanting to shed weight, by making the fat-burning process more efficient, thereby speeding up the weight-loss process. It is also less likely to cause side-effects as it is administered through the skin on a localised area.



Above: NTU School of Chemical and Biomedical Engineering Professor Chen Peng (left) holding the drug-laden microneedle fat burning patch with Assistant Professor Xu Chenjie. Photo: NTU

Professor Chen Peng and Assistant Professor Xu Chenjie from the NTU School of Chemical and Biomedical Engineering said the approach, which was published last month in the journal, Small Methods, could provide an alternative for obese patients.

“Our solution aims to use a person’s own body fats to burn more energy, which is a natural process in babies,” said Prof Chen.

“What we aim to develop is a painless patch that everyone can use easily, is unobtrusive and affordable.”

The human body generally produces two types of fat tissue, white and brown, and the patch turns energy-storing visceral white fat into energy-burning brown fats.

White fat cells store energy in the form of a single large, oily droplet. In contrast, brown fat cells are made up of many smaller droplets, and they contain metabolic components like mitochondria, which burns up the oil droplets to generate heat.

The patch is placed on the skin for about two minutes to allow the micro-needles, which are each thinner than a human hair, to be embedded in the skin. As the needles degrade, the drug molecules then diffuse into the white fat tissues, turning them into brown fats. Researchers at Columbia University Medical Center and the University of North Carolina had done similar research studies using the micro-needle delivery method, but the United States study had experimented with a different drug.

NTU scientists used the drugs Beta-3 adrenergic receptor agonist and T3 triiodothyronine (T3 thyroid hormone), which are both hormone-based and cause the white fat cells to produce mitochondria to increase energy production and fat metabolism, thereby transforming it into a fat-burning cell.

The Beta 3 adrenergic receptor agonist is a drug approved by the Federal Drug Administration of the United States, but if taken in high doses, can cause side effects such as increased blood pressure, cold symptoms and headaches.

The T3 thyroid hormone can also cause side-effects like stomach upset and heart palpitations.

Compared to experimental weight-loss drugs which are taken orally and in higher dosages, the amount of drug administered via microneedles will be significantly reduced, thus reducing the risk of side effects. For example, in a previous human study, a very high

oral dosage of Beta-3 adrenergic receptor agonist of 1500mg daily failed to reduce body weight and fat mass. Using the skin patch, researchers aim to use only 5mg of the drug on each patch.

Above: A new patch developed by scientists from Nanyang Technological University aims to turn energy-storing fats into energy-burning fats. Photo: Nuria Ling/TODAY

However, the researchers cautioned that the patch is a complement, rather than a replacement for diet and exercise.

“Fat is not only under the skin. There are fat found in the intestines, liver, for example, that this skin patch cannot target,” said Assoc Prof Xu.

Prof Chen said that each individual's metabolic rate also fluctuates and responds differently to weight-loss methods, and he added that "beyond dealing with obesity, there are other potential uses for the patches, including reducing cholesterol levels and other fat associated conditions."

While researchers have yet to test the patch on humans, trials on mice showed that the patch suppressed weight gain in mice on a high fat diet, and reduced fat mass by over 30 per cent over a period of less than four weeks. The treated mice also had significantly lower blood cholestrol and fatty acid levels as compared to mice that did not receive any treatment.

Prof Chen said that they expect better results in human beings as a human body has more white fat tissue than mice, and the skin's larger surface area will mean that the patch can better target a larger area of fat deposit underneath.

The NTU team, consisting of eight researchers, spent more than two years studying the effectiveness of the patch. They have received keen interest from biotechnology companies and are looking to partner clinician scientists to conduct human trials over the next two years. The prototype patch using the Beta-3 adrenergic receptor agonist costs about S$5 to make, and it is combined with Hyaluronic acid, a substance commonly used in skin products like moisturisers. The researchers hope that the product can debut on the market in five to ten years' time.