SINGAPORE: A team of scientists at Nanyang Technological University (NTU) has found a new approach to reducing bulging tummy fats.

In a press release on Thursday (Dec 28), NTU said the scientists have developed a patch which delivers drugs that are known to turn energy-storing white fat into energy-burning brown fat, via micro-needles.

In tests by research fellow Dr Aung Than, the patches were able to reduce the fat mass in mice on a high-fat diet by more than 30 per cent over four weeks. The rodents also had significantly lower blood cholesterol and fatty acids levels compared to the untreated mice.
The treated mice also had significantly lower blood cholesterol and fatty acids levels compared to the untreated mice.

NTU said the new type of skin patch contains hundreds of micro-needles, each thinner than a human hair, which are loaded with the drug Beta-3 adrenergic receptor agonist or another drug called thyroid hormone T3.

When the patch is pressed into the skin for about two minutes, these micro-needles become embedded in the skin and detach from the patch, which can then be removed.

As the needles degrade, the drug molecules then slowly diffuse to the energy-storing white fat underneath the skin layer, turning them into energy-burning brown fats.

Brown fats are found in babies and they help to keep the baby warm by burning energy. As humans grow older, the amount of brown fats lessens and is replaced with visceral white fats.

Published in the journal Small Methods last month by NTU Professor Chen Peng and Assistant Professor Xu Chenjie, NTU said this approach could help to address the worldwide obesity problem without resorting to surgical operations or oral medication which could require large dosages and could have serious side effects.

“With the embedded microneedles in the skin of the mice, the surrounding fats started browning in five days, which helped to increase the energy expenditure of the mice, leading to a reduction in body fat gain,” said Asst Prof Xu, who focuses on research in drug delivery systems.

“The amount of drugs we used in the patch is much less than those used in oral medication or an injected dose. This lowers the drug ingredient costs while our slow-release design minimises its side effects,” said Asst Prof Xu.

Obesity which results from an excessive accumulation of fat is a major health risk factor for various diseases, including heart disease, stroke and type-2 diabetes.

The World Health Organisation estimates that 1.9 billion adults in the world are overweight in 2016 with 650 million of them being obese.

“What we aim to develop is a painless patch that everyone could use easily, is unobtrusive and yet affordable,” said Prof Chen, a biotechnology expert who researches on obesity. “Most importantly, our solution aims to use a person’s own body fats to burn more energy, which is a natural process in babies.”

Being able to deliver the drug directly to the site of action is a major reason why it is less likely to have side effects than orally delivered medication.
The team estimates that their prototype patch had a material cost of about S$5 (US$3.50) to make.

NTU’s Lee Kong Chian School of Medicine Associate Professor Melvin Leow, who was not affiliated with this study, said it is exciting to be able to tackle obesity via the browning of white fat, and the results were promising.

“These data should encourage Phase I Clinical studies in humans to translate these basic science findings to the bedside, with the hope that these microneedle patches may be developed into an established cost-effective modality for the prevention or treatment of obesity in the near future,” added Assoc Prof Leow, an endocrinologist.

Since the publication of the paper, the team has received keen interest from biotechnology companies and is looking to partner clinician scientists to further their research.

According to the team, it may take five to 10 years before the patch is available commercially.

Source: CNA/ms/bk

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