

How a skin patch could prevent weight gain

By Honor Whiteman | Published Today

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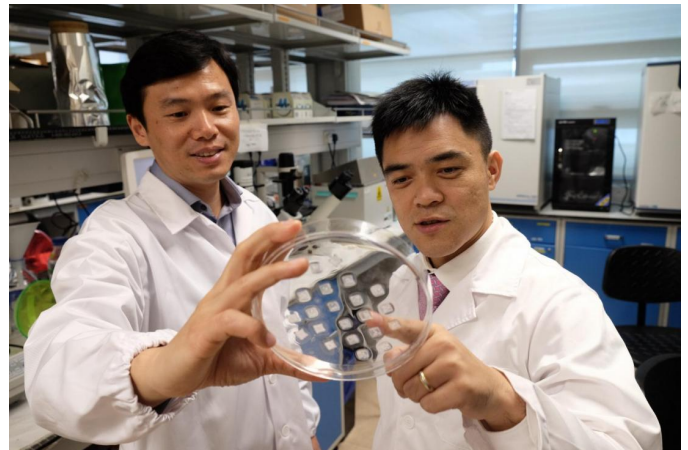
If you've fallen victim to holiday weight gain, it's highly likely that adopting a healthful diet and increasing exercise are on your list of New Year's resolutions. According to a new study, however, a simple skin patch could one day help us to shed the pounds.

Scientists at Nanyang Technological University, Singapore (NTU Singapore) have created a skin patch that can convert potentially harmful white fat into energy-burning brown fat.

In a [recent study](#) published in the journal *Small Methods*, the researchers reveal how the patch reduced fat mass and weight gain over 4 weeks in mice fed a high-fat diet.

Study co-author Chenjie Xu, from the School of Chemical and Biomedical Engineering at NTU Singapore, and colleagues say that their novel creation could offer a noninvasive strategy for the treatment and prevention of obesity.

According to the Centers for Disease Control and Prevention (CDC), obesity now affects around 37.9 percent of adults in the United States, putting them at risk of heart disease, stroke, type 2 diabetes, and even some forms of cancer.



The skin patch (held by the NTU Singapore researchers here) could help in the fight against obesity.

Image credit: NTU Singapore

And although a healthful diet and exercise are key to losing weight, these strategies do not work for everyone. Some people who are obese may turn to weight loss medication or surgery, which can pose serious side effects.

With this in mind, Xu and colleagues created a skin patch that can aid weight loss by increasing the amount of brown fat in the body.

White fat vs. brown fat

Brown fat, or brown adipose tissue, is often referred to as "good" fat because it burns the calories that we consume to generate heat. Babies have higher levels of brown fat than adults; as we age, levels of brown fat reduce, but the brown fat that adults do have is most commonly found around the neck.

White fat, or white adipose tissue, is considered the "bad" fat, as it is a result of the body storing the excess calories that we consume.

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Excess white fat can be harmful to health, particularly when it is stored around the abdomen. In fact, research has shown that people with higher levels of belly fat are at greater risk of cardiovascular disease and cancer.

During recent years, studies have discovered how to convert white fat into brown fat, and scientists suggest that this could be an effective way to treat obesity. The new study brings this strategy one step closer to reality.

The skin patch from Xu and colleagues consists of hundreds of microneedles that contain one of two drugs: beta-3 adrenergic receptor agonist, which is currently used to treat overactive bladder, and T3 triiodothyronine, which is used to treat an underactive thyroid gland.

Both of these drugs have been shown to convert white fat into brown fat in previous studies, the researchers note.

The patch is placed on the skin for approximately 2 minutes, and the needles become embedded and start to degrade. The drugs are gradually delivered to white fat under the skin, and they convert the white fat to brown fat.

Promising results in mice

When the researchers tested the skin patch in mice that were fed a high-fat diet for 4 weeks, they saw promising results.

"With the embedded microneedles in the skin of the mice, the surrounding fats started browning in 5 days, which helped to increase the energy expenditure of the mice, leading to a reduction in body fat gain," says Xu.

In fact, the researchers witnessed a 30 percent reduction in weight gain and fat mass in the rodents.

The team notes that when beta-3 adrenergic receptor agonists and T3 triiodothyronine are given orally, they can produce severe side effects. However, their patch provides a safer alternative.

"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 minimizes its side effects," Xu explains.

Overall, the researchers believe that their findings could offer a new way to fight obesity — one of the biggest public health burdens of our time.

"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."

— Melvin Leow, Lee Kong Chian School of Medicine, NTU Singapore



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