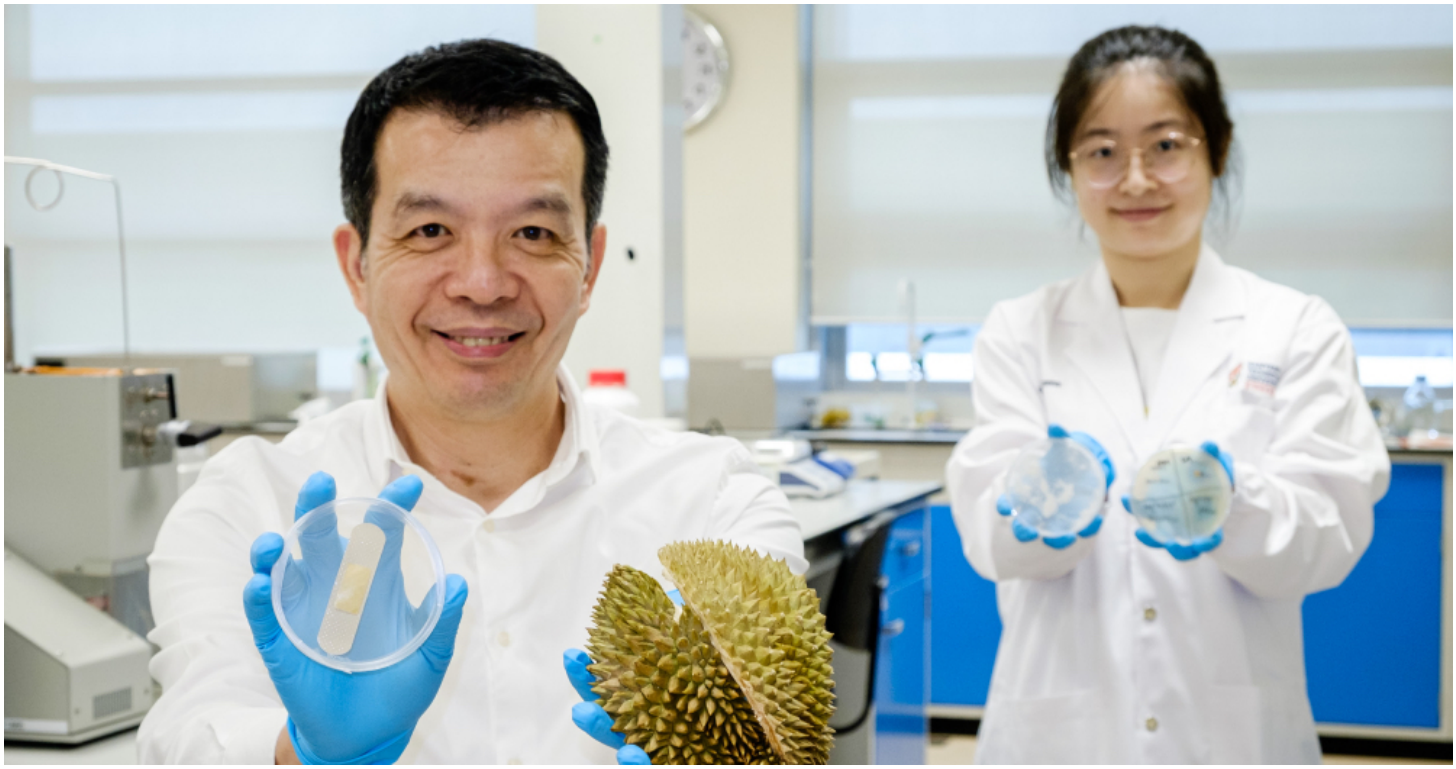
NTU scientists use discarded durian husk to make odourless antibacterial gel bandage

Another reason for you to love the King of Fruits.

Karen Lui | March 25, 2021, 02:01 PM



Follow us on Telegram for the latest updates: https://t.me/mothershipsg

Durians are irresistible to many Singaporeans, but the husks that make up 60 to 70 per cent of the fruits are usually discarded and incinerated.

To combat such unsustainable wastage, food scientists at Nanyang Technological University (NTU) have made an antibacterial gel bandage using the discarded durian husks.

How the durian husk hydrogel bandages are made

A soft gel is made with high-quality cellulose extracted from the durians husks, as well as glycerol, which is a waste by-product from the biodiesel and soap industry.

This gel can be cut into bandages of various shapes and sizes.

Photo by NTU.

Natural yeast phenolics, which are organic molecules produced from baker's yeast, are then added to make the bandage deadly to bacteria.

Hydrogel patches help reduce scarring

The durian husk hydrogel bandage is applied by simply laying it across the wound, just as with existing commercially-available silicone gel sheets for wound dressing.

Hydrogel patches, which can be found in pharmacies, cover wounds from surgery to minimise formation of excessive scar tissue, resulting in a softer and flatter scar.

As compared to band-aids or gauze bandages, these patches keep the skin hydrated instead of drying up.

Chen said that antimicrobial bandages were an effective way to protect open wounds, adding that this was "especially important for diabetic patients suffering from chronic wounds."

However, conventional hydrogel patches on the market are made from synthetic materials such as polymers, and those with antimicrobial properties also use metallic compounds such as silver or copper ions, Chen said.

The new hydrogel made from natural waste materials can be produced at a lower cost, as compared to the ones made with synthetic materials.

It is also non-toxic and biodegradable, and is expected to have a smaller environmental footprint.

Director of NTU's Food Science and Technology Programme Professor William Chen said,

> "By using waste products which are currently discarded in large quantities – durian husks and glycerol – we could turn waste into a valuable biomedical resource that can enhance the speedy recovery of wounds and to reduce chances of infections."

2kg of durian husk can make 1,600 plasters

To put things into perspective, 2kg worth of husk after water removal will yield about 200g of durian husk powder, including 40g of pure cellulose.

40g of cellulose is sufficient to make approximately 66 pieces of 7x7cm hydrogel, which can make 1,600 1x2cm sized plasters.

The antimicrobial hydrogels were tested as a wound dressing on pig's skin and showed good antimicrobial effects for up to 48 hours.

The natural yeast phenolics help to prevent the growth of bacteria such as Gram-negative *E. coli* and Gram-positive *S. aureus.* and the subsequent formation of biofilms — a layer of slime that can lead to antimicrobial resistance within a bacteria colony.

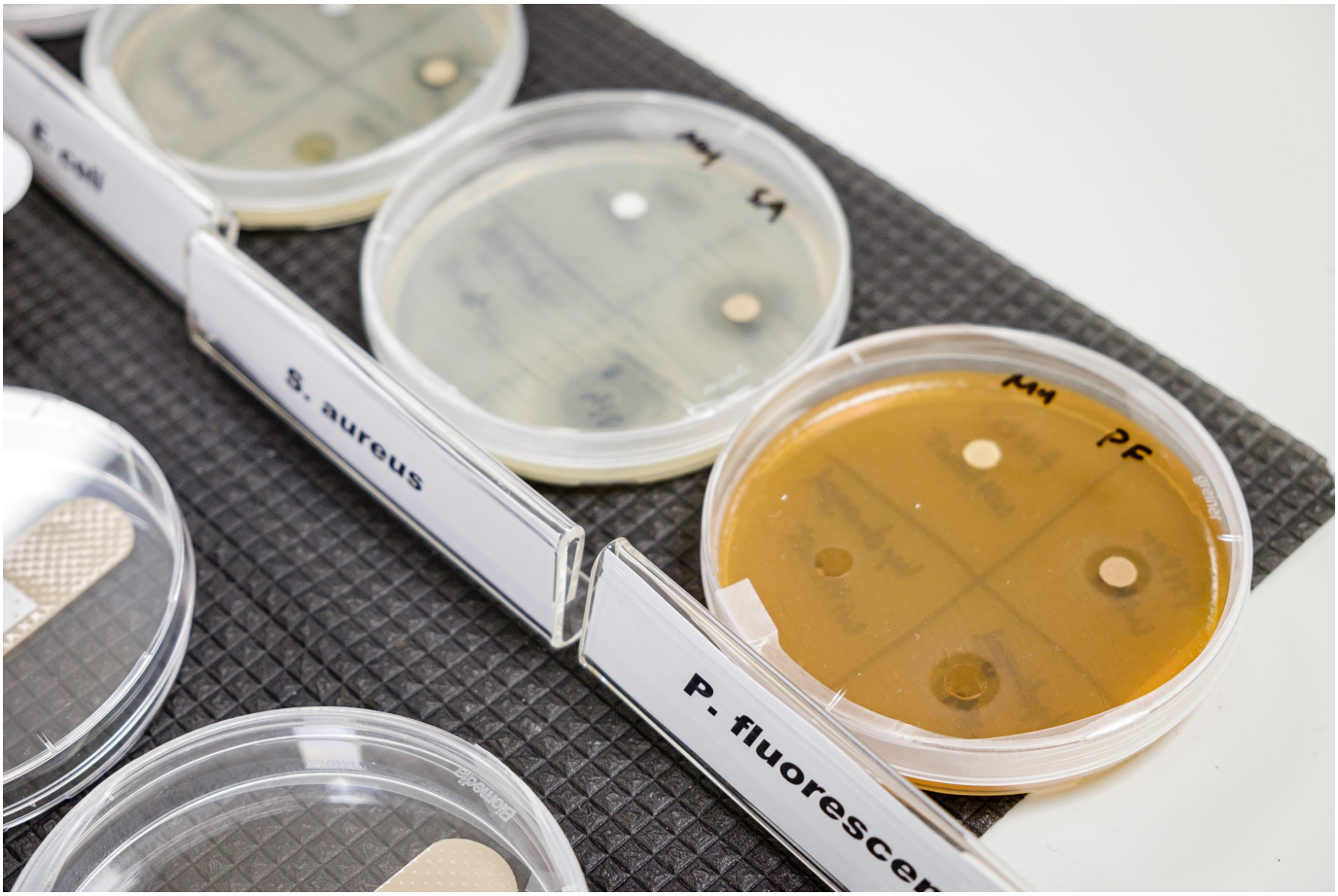


Photo by NTU.

Why durian?

Speaking to the media via a Zoom conference call, Chen explained that durian was chosen as the raw material for the hydrogel as there was a high, sustainable supply of durian husks, which in turn had high amounts of the fibre required.

Chen also said that the durian husk bandages built on his previous work, by using similar methods.

Earlier in January 2019, Chen led a three-year research project that developed an all-natural food stabiliser from the seeds of the durian fruit.

Making hydrogel bandages out of durian husks offered another way of upcycling durian waste products to reduce the environmental impact from such wastage.

NTU Prof William Chen (left) and PhD student Cui Xi holding their antibacterial hydrogel bandage made from durian husk. Photo by NTU.

How does it smell?

Durian lovers and haters alike are more than familiar with the fruit's pungent smell.

But Chen said that the hydrogel bandage made from durian husk has no smell or flavour of any kind.

Chen explained that durian's distinctive smell comes from its flesh, and not the husk.

As the husks undergo impurity removal before the cellulose extraction, the residual durian flesh is also removed so the smell is not present in the final product.

However, Chen also cheekily added that they are able to add in flavour or smell if there is a demand for it.

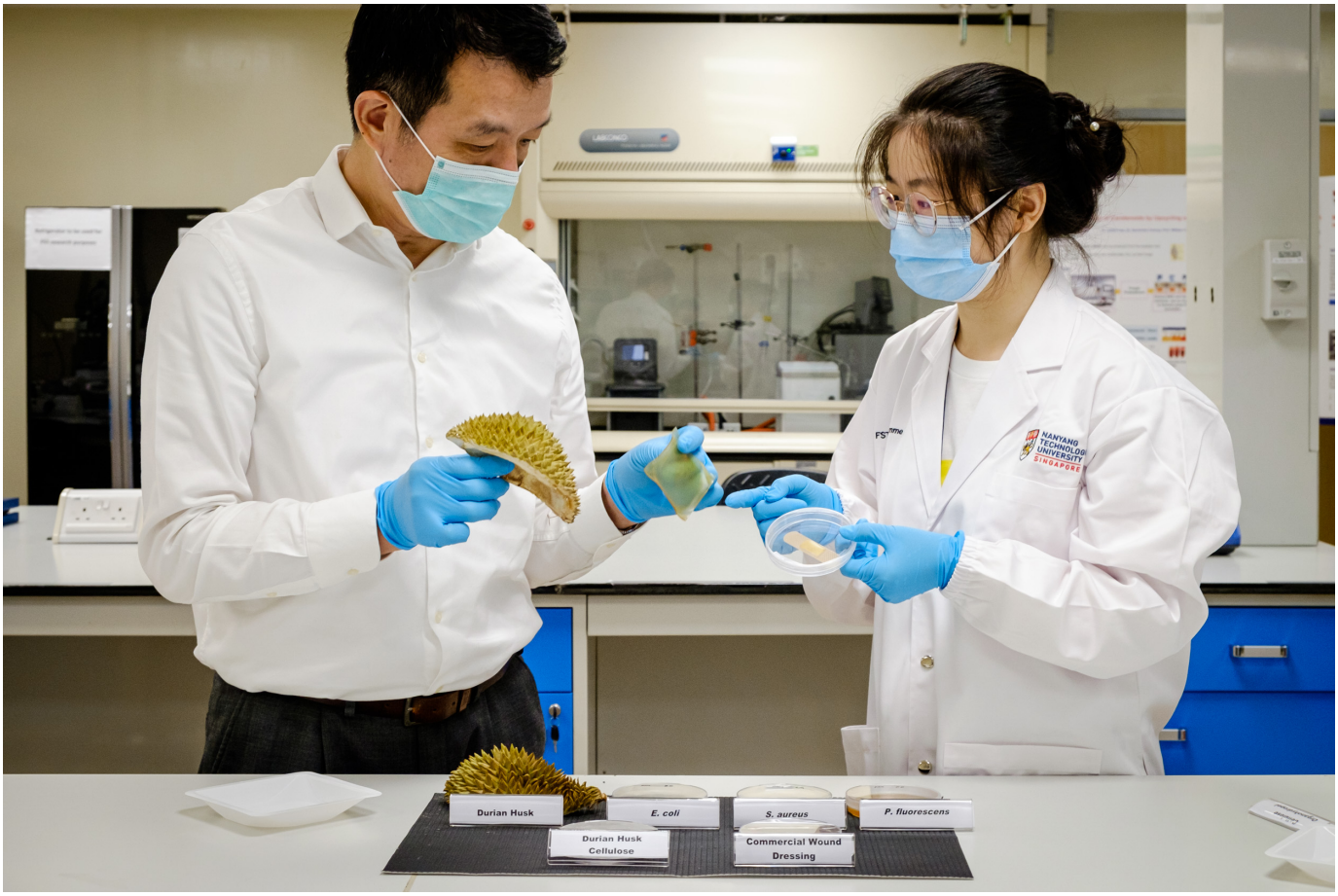


Photo by NTU.

The team of four NTU researchers took two years to research and publish their findings, and is now looking for industry partners who may be keen to take their antibacterial gel bandage to market.

Other applications of hydrogels

Besides wound dressing, organic hydrogels are also useful for wearable electronics, as they are flexible and stretchable.

Wearable electronics can consist of small sensors that can detect heart rate and physical activities, much like current smart bands, and could aid healthcare workers in monitoring the health of the elderly in remote communities.

Chen has previously conducted research on the use of organic hydrogels in flexible electronics.

His 2019 project involved a prototype hydrogel that could conduct electrical signals, which was made with cellulose obtained from Okara — the waste leftover from soybean pulp during the making of soy milk.