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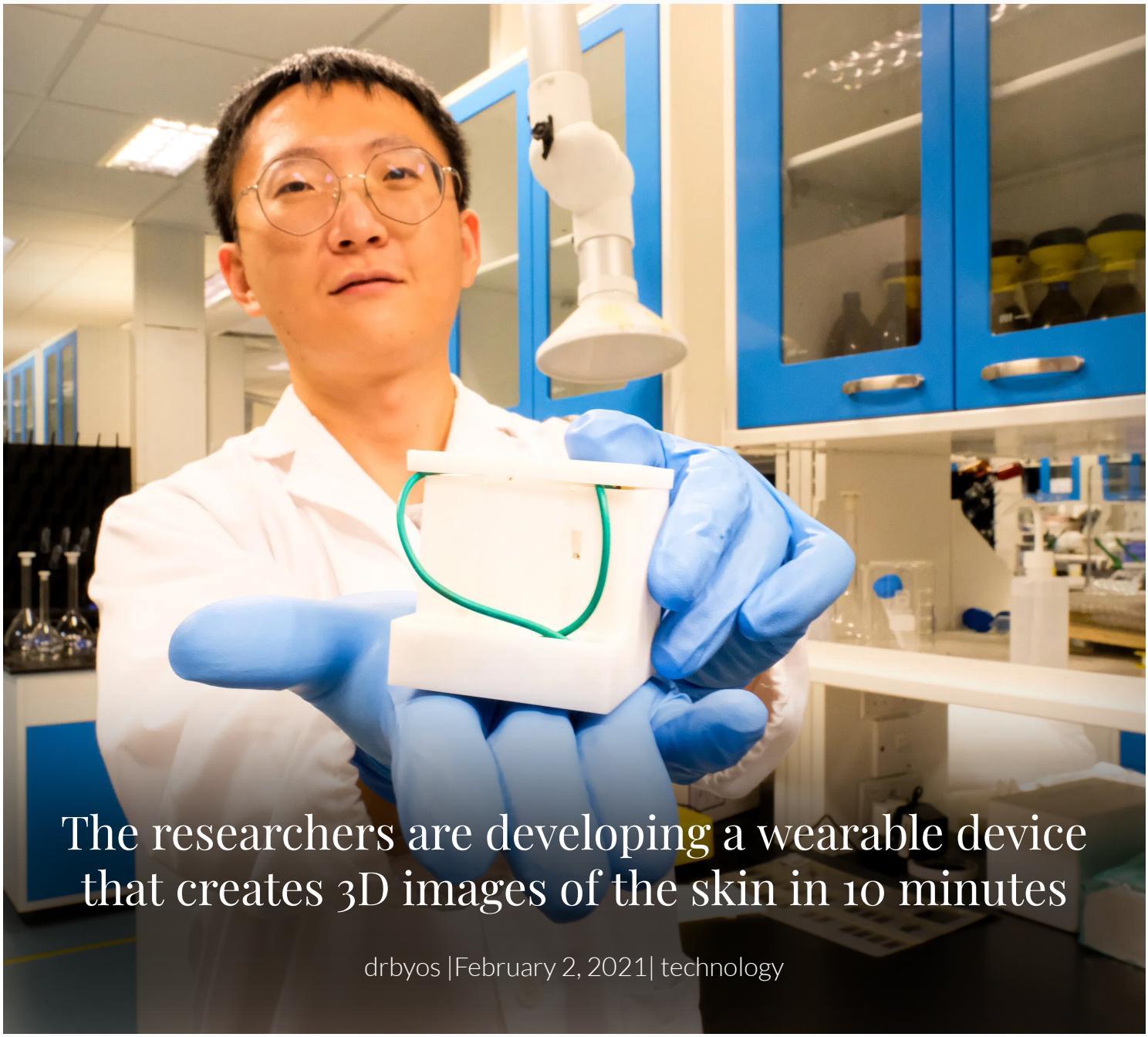

The researchers are developing a wearable device that creates 3D images of the skin in 10 minutes

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Mr. Fu Xiaoxu holds up the portable skin mapping device, which weighs only 100 grams and is the size of a credit card. Photo credit: Nanyang Technological University

A team from Nanyang Technological University, Singapore (NTU Singapore) has developed a wearable device that creates high-resolution 3D images of human skin in 10 minutes. The team says the portable skin mapping device could be used to help determine the severity of skin conditions like eczema and psoriasis.

3-D skin Mapping could be useful to clinicians as most skin condition assessment devices only provide 2D images of the skin's surface. Since the device also maps the depth of the ribs and grooves of the skin down to 2 mm, it can also help in monitoring wound healing. The device presses a specially developed film onto the subject's skin to create an impression of up to 5 x 5 centimeters, which is then subjected to an electrical charge, creating a 3D image.

Researchers designed and 3D printed a prototype of their device using polylactic acid (PLA), a biodegradable bioplastic. The battery-operated device, which measures 7 x 10 cm, weighs only 100 grams.

The prototype made in NTU is developed at a fraction of the cost of devices with comparable technologies, such as B. OCT (Optical Coherence Tomography) machines which cost thousands of dollars and can weigh up to 30 kilograms.

Assistant Professor Grzegorz Lisak of the NTU's Faculty of Civil and Environmental Engineering, who led the research, said: “Our non-invasive, simple and inexpensive device could be used to complement current methods of diagnosing and treating skin diseases in rural areas and non-medical trained personnel who do not have direct access to health care can use the device to create skin maps and send them to doctors for assessment. "

Dr. Yew Yik Weng, Consultant Dermatologist at the National Skin Center and Assistant Professor at NTU's Lee Kong Chian School of Medicine, made an independent comment on how the device can be useful to clinicians: “The technology is an interesting way It could be a useful one Be a method to map the skin structure and wound healing in 3D, which is particularly important in research and clinical studies. Since the device is battery-operated and portable, there is great potential for the development of an instrument for the assessment of treatment points in a clinical setting. "

Assistant Professor Dr. Yew said, “The device could be particularly useful in wound healing studies as we currently lack a tool to map the length and depth of the skin ridges. Currently, we are basing our studies on photos or measurements, which only a 2-D assessment could provide. "

Study lead author, Mr. Fu Xiaoxu, Ph.D. The NTU School of Civil and Environmental Engineering student said, “The 3-D skin mapping machine is easy to use. In addition, only a 1.5V dry cell battery is required to operate the device. This is an example of a basic but very effective application of electrochemistry as it does not require expensive electronic hardware. "

Published in the scientific journal *Analytica Chimica Acta* earlier this month, the technology was developed by Asst Prof. Lisak, who is also director of the Residues & Resource Reclamation Center at the Nanyang Environment and Water Research Institute (NEWRI) and has received his Ph.D. Student, Mr. Fu Xiaoxu.

Photo credit: Nanyang Technological University

The “golden” solution for 3D skin mapping

The key component of the NTU device is a polymer called PEDOT: PSS [1], often used in solar panels to convert light into electricity. However, the team found another use for its electrical conductivity - reproducing skin patterns on gold-coated film. Gold is used because it has excellent electrical conductivity and flexibility.

To use the device, a person presses a button to press the gold-coated film onto the subject's skin and obtain an impression. This transfers sebum, an oily substance produced by the skin, to the film, creating an imprint on the surface of the skin.

Next, the imprint of the skin is transferred to the mobile device where a set of electrodes is immersed in a solution. With another push of a button, the device triggers an electrical charge flow, causing PEDOT: PSS to deposit on the surfaces of the gold-coated film in areas that are not covered with sebum. This results in a high-resolution 3D map of the skin that reflects the ribs and grooves of the subject's skin.

Using pig skin as a model, the researchers showed that the technology could map the pattern of various wounds such as punctures, cuts, grazes and incisions.

The team also showed that even the complex network of wrinkles on the back of a person's hand can be captured on film. The thin film is also flexible enough to image features on uneven areas of skin such as elbow folds and fingerprints.

Assistant Professor Lisak added, "The device has also been shown to be effective at taking fingerprints and provides a high-resolution 3D image of its properties." (See picture 2)

Dr. Commenting on the possible uses of the device, Yew said, “The device can be useful in fingerprint identification, which is commonly done in forensic analysis. The device could provide a higher degree of accuracy due to the accuracy of distinguishing between similar prints. on the 3-D nature of his images. "

To further validate efficacy, the team is considering conducting clinical trials later this year to test the feasibility of their device studies, as well as other potential therapeutic uses.

Skin contact with fathers can help newborn babies after caesarean section

More information:

Xiaoxu Fu et al. Diagnosis of skin features through 3D skin mapping based on the electro-controlled deposition of conductive polymers on metal-sebum-modified surfaces and their possible applications in skin treatment. *Analytica Chimica Acta* (2020). DOI: 10.1016 / J.ACA.2020.10.056

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Quote : Researchers develop wearable devices that create 3D images of the skin in 10 minutes (2021, February 2) that will be available on February 2, 2021 from https://phys.org/news/2021-02-portable-device- d-images-skin .html