Microneedle contact lens targets the eye for drug delivery

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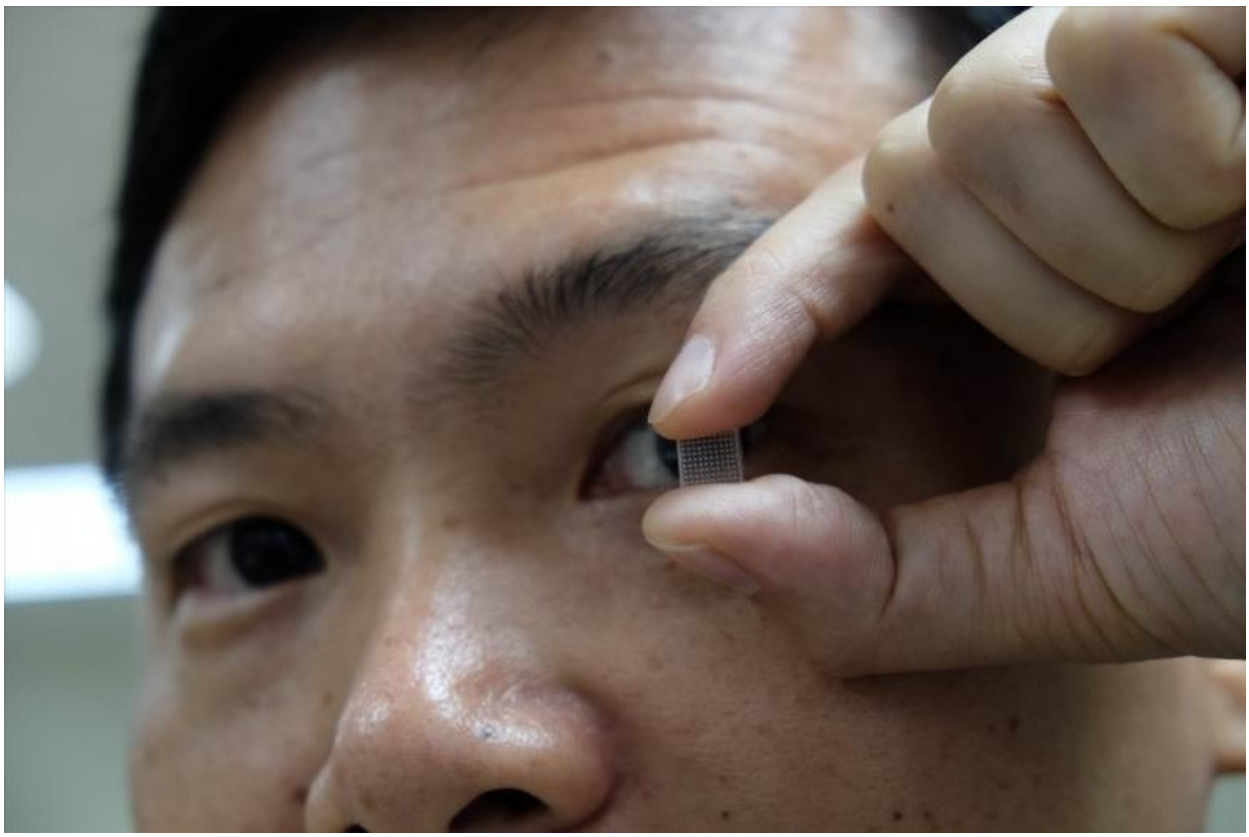
Researchers at NTU Singapore have developed a contact lens eye patch that uses microneedles to painlessly penetrate the eye and deliver drugs more efficiently.

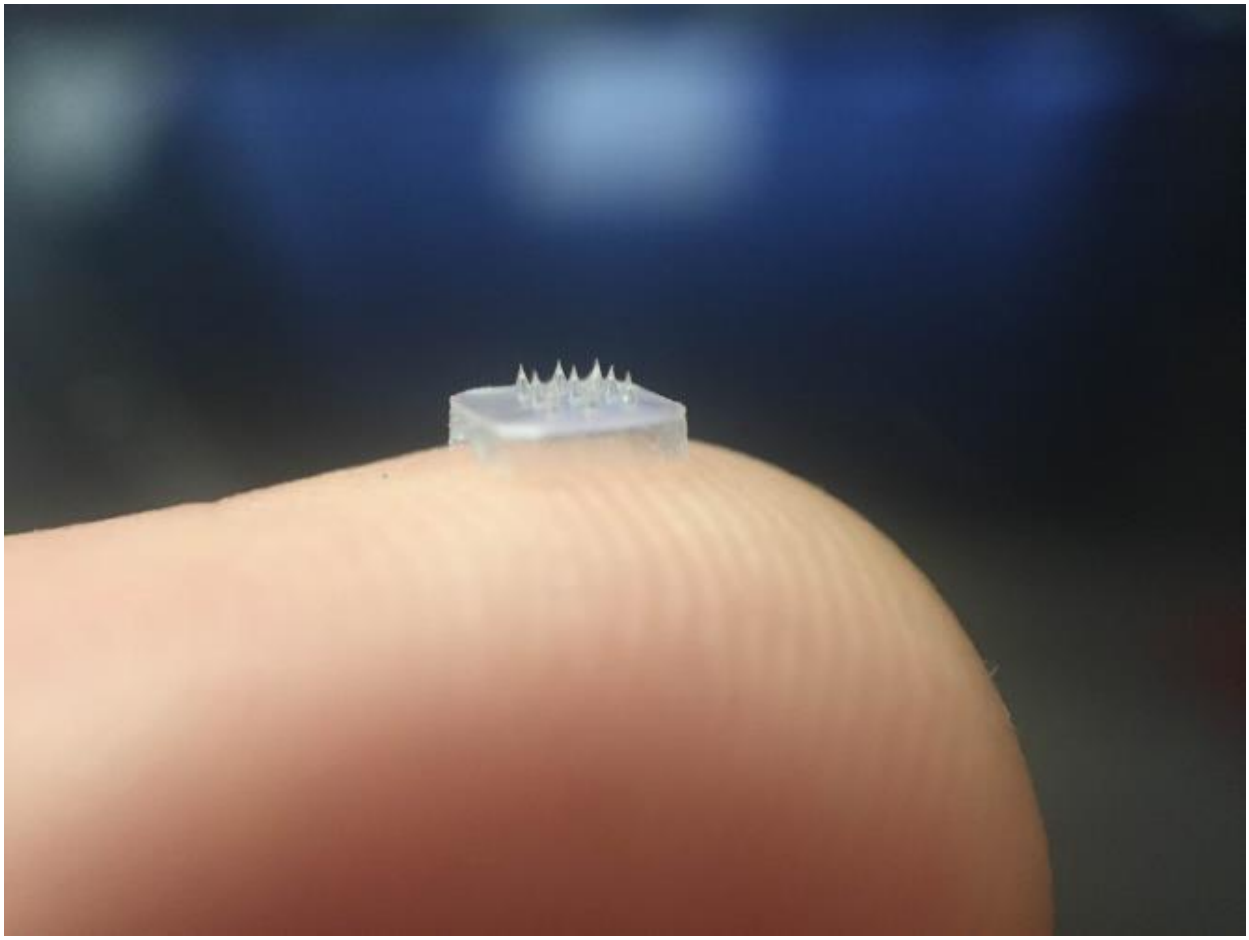


The eye is generally treated with drops or ointments, but its natural defences of blinking and tears are very effective at clearing these away relatively quickly. Injections can be given to the eye, but these can be painful and carry a risk of infection. Due to these factors, many patients with eye conditions do not keep to their prescribed regime, particularly when a condition requires long-term treatment.

"These two current methods only produce a burst release of drug with a short effective duration," said Prof Chen Peng from NTU's School of Chemical and Biomedical Engineering (SCBE). "This is not ideal, especially when treating chronic progressive eye diseases that require slow and sustained treatment, such as glaucoma."

Measuring 2mm by 2mm, the contact lens patch features nine microneedles made from hyaluronic acid, a substance found in the eye which is used often in eye drops. Each needle, thinner than a strand of hair, is shaped like a pyramid for optimal tissue penetration. When the patch is applied, the needles detach themselves and remain in the cornea where they slowly release their drugs. When tested on mice with corneal vascularisation, a single application of the patch was 90 per cent more effective in

alleviating the condition than applying a single eye drop with 10 times more drug content. The work is published in *Nature Communications*.



"The microneedles are made of a substance found naturally in the body, and we have shown in lab tests on mice that they are painless and minimally invasive," said Chen. "If we successfully replicate the same results in human trials, the patch could become a good option for eye diseases that require long-term management at home, such as glaucoma and diabetic retinopathy.

"Patients who find it hard to keep up with the regime of repeatedly applying eye drops and ointments would also find the patch useful as well, as it has the potential to achieve the same therapeutic effect with a smaller and less frequent dosage."
The team has filed a patent and is currently working on further improving the eye patch technology. They are also looking to partner with clinician scientists to explore the feasibility of conducting medical trials, which will require a bigger patch measuring 20mm by 20mm.