Scientists pioneer 3-D-printed drug delivering micro-needles

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Researchers have developed a new technique to produce a 3D 'micro-printed' array of needles capable of drug delivery. The technique would offer a pain-free drug delivery device that would allow drugs to diffuse within the body as the biomaterial device degrades in the body. This offers treatments for a wide range of diseases, including melanoma cancers.

The results are published today, Wednesday 30th September, in the journal *Biofabrication*.

The researchers, based at the University of Akron and the University of Texas, report producing a drug-loaded array for transdermal delivery of a chemotherapeutic drug, fabricated using microstereolithography. The arrays consisted of 25 poly(propylene fumarate) microneedles, each needle having a tip and base diameter of 20 µm and 200 µm, respectively, and a height of 1 mm.

Constructing the array was challenging, says Jae-Won Choi, an author on the paper.

"3D printing this array was difficult, as the printable biomaterial contains some non-printable solvents and drugs."

Dacarbazine, commonly used to treat skin cancer, was blended into the solution prior to crosslinking (a final part of the 3D printing process).

The needles were then tested and shown to be able to withstand the stresses and strains they would likely be submitted to when inserted into the body.

Drug-release profiles remain a challenge for the future, concedes Choi.

"We'd like to have a faster drug release, but this will require more material research. Once we improve this process we can look at developing more controlled drug release."

"I'd hope we'll see this being used clinically in 5-10 years" Choi concludes.

More information: 'Microstereolithography and characterization of poly(propylenefumarate)-based drug-loaded microneedle arrays' *Biofabrication* 7 045001. iopscience.iop.org/1758-5090/7/4/045001

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