

Microneedle Technology

Shaun Russell

ELE 282 Biomedical Engineering Seminar I

Biomedical and Computer Engineering, University of Rhode Island

March 27th, 2004

Modern biotechnology has produced many useful, potent drugs that can not be delivered effectively via traditional methods.

Researchers have developed a hybrid drug delivery system which incorporates the good characteristics of hypodermic injection and transdermal patches.

This feat has been accomplished by using microlithography and etching technologies originally developed for the microelectronics industry to create arrays of up to 400 microneedles.

There are two types of microneedles; solid and hollow.

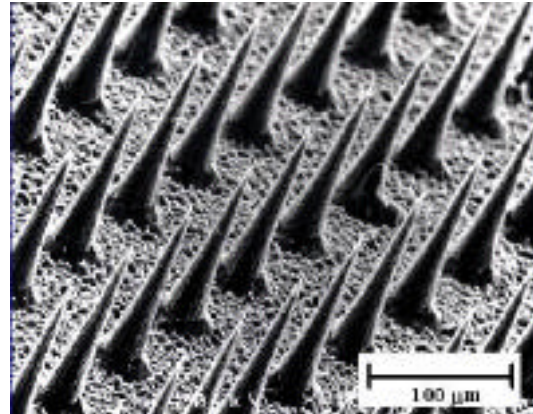
The solid type has been developed to enhance the transdermal interaction between a patch and the skin by increasing the permeability of the skin by up to 4 orders of magnitude.

The hollow type works much the same as a hypodermic needle. It can penetrate the skin, injects its cargo and take samples.

Neither type causes any pain. This is because they penetrate the skin very minimally. The impermeable layer of skin is the first layer the stratum corneum, which is only 10-15 microns thick. The nerves endings are located much deeper within the skin.

The microneedles are up to 150 microns long. This is all they need, it is long

enough to permeate the stratum corneum while being short enough to not bother any nerve endings.



These microneedle arrays are very versatile. They can be produced from a variety of inexpensive material such as silicon, metal and plastic polymers in many different shapes and sizes.

Researches have tested this technology extensively and have verified the painlessness and level of effectiveness.

When the technology eventually gets approved by the FDA and is applied commercially it will prove to be a success. There are many possible appliances. It can be used to inject vaccinations or medicines or to take blood or other fluid samples. It could be used to administer medicine with pinpoint accuracy to an individual cell or group of cells. This could be useful in cancer treatment.

Sources:

- <http://gtresearchnews.gatech.edu/newsrelease/NEEDLES.html>
- http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=9687334&dopt=Abstract&holding=f1000
- http://abcnews.go.com/sections/SciTech/FutureTech/microneedles_futuretech_031216-1.html
- <http://users.ece.gatech.edu/~alan/11-20-Gossett%20Microneedles.pdf>
- <http://www.newscientist.com/news/news.jsp?id=ns99992121>