# Fabrication of Dissolvable Microneedle Patches

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#### Introduction

#### <u>What is microneedle patch?</u>

This is a patch which has needles in micron scale. Those needles contain drug and they transfer the drug by dissolving under the layers of skin.

#### Advantages of Microneedle Patch

Considering the alternative ways for drug transmission such as syringes, topical creams and pills :

## **3.** Fabrication of the Microneedle Patch







Microneedle Patch, fabricated from chitosan polymer



- Healthier
  - preclude needle stick injuries
  - rule out the need for the cold chain
- More effective even in small dosage
- Can be also used for local drug delivery

# Aim of the Study

To fabricate a dissolvable microneedle patch considering the production cost, effort and effectiveness.

### **Materials & Methodology**

## **1. Micromilling of Mastermold**



PDMS Production Mold

Vacuumed at 26.5 degree Celsius

Microneedle Patch, fabricated from PLA (microscope view)

#### <u>Results</u>



Designed

Height = 0.47mmWidth = 0.26mm

Height = 0.345mm Width = 0.238mm

Reality

Dimensions of designed microneedle



Examination of the physical quality of the master mold via microscope

## **Discussions**

- Dimension difference can be caused by
  - Manufacturing errors



Creation of Solidworks design





Production of master mold using plexiglass and CNC milling

2. Fabrication of the Production Mold





Empty master mold

PDMS filled master mold

- Measurement errors
- Master Mold is not suitable for PDMS production mold
  - hard to take out PDMS from small gaps
  - need for bigger gaps on the master mold
  - need for mold holder for first female molds
- New polymers should be tested
  - Chitosan solution and master mold should be modified.





Old master mold

Trial for new master mold

Mold holder for first female molds

## **Conclusions**

# Work done:

- Literature review
- Design of the master mold
- Manufactured the plexiglass master mold by micromilling
- Fabricated the production mold by micromolding with PDMS using vacuum desiccator and oven





Front view of the production mold

Cross section of the production mold

PDMS Production mold, fabricated using vacuum desiccator and oven (60°C) by micro molding



Micro molding PDMS production mold from master mold

- Design of the parts which will be used in fabrication of the microneedle patches
- New master mold design

#### **Future Work:**

- Fabrication of microneedle patches from CMC hydrogel
- Clinical Trials



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