

Fabrication process

The patch will be fabricated with six parts (named in DWG file) from top to bottom. ESI Tables provides the materials of each layer and the parameters used by the laser cutter. The supplementary DWG file provides the designed names and shape of each material.

The fabrication process will be divided into 6 steps as follow:

1. Taking precut double-sided plastic adhesive tape (A1), remove middle covering around hexagons.
2. Place precut hexagons of hydrogel (B1) onto the plastic hexagons pattern (A1).
3. Adhere the Rayon (B2) above the first layer of hydrogel.
4. Remove backing from one side of the double-sided medical tape (C1) and adhere to the outer ring of the collection device on the same side as the hydrogel (A1).
5. Remove inner ring of backing layer from opposite side of medical tape (C1) and place sealing ring of hydrogel here (D1).
6. Place rayon ring (D2) above hydrogel sealing ring (D1).

ImageJ java code

```
imp = FolderOpener.open("D:\file position\", "");  
//IJ.setTool("line");  
imp.setRoi(new Line(set a known distance on picture));  
IJ.run(imp, "Set Scale...", "known=known distance number unit=cm global");  
IJ.run("Colour Deconvolution", "vectors=H&E");  
IJ.setAutoThreshold(imp, "Default dark");  
Prefs.blackBackground = true;  
IJ.run("Close");  
IJ.run(imp, "Analyze Particles...", "size=0.1-Infinity show=Outlines summarize stack");  
IJ.saveAs("Results", "D:/save position/Summary.csv");
```

Human test operation

Devices:

1. The G16 device is a 3D-printed device with an attached o-ring that has an interior diameter of 16mm.
2. The o-ring acts as a barrier to sweating from outside of the area and only collects and measures the sweat produced from that local area. To ensure a fluid tight seal, a strap is used to apply manual compression of the device and o-ring against the skin.
3. The absorbent textile (Technical Absorbent #2734) is used to collect sweat from the surface of the skin. The absorbent textile is laser-cut to 16mm diameter circle in order to fit inside the interior diameter of the o-ring of the G16 device.

For this testing we placed the devices on the mid-forearm as well as the mid-upper arm. The processes are as follow:

1. We paired the location of the NDL device with one of Eccrine's G16 devices that measures sweat rate. This allowed a direct comparison of sweat rate between the NDL device and Eccrine's G16 sweat measurement device.
2. The absorbent textile discs are pre-weighed inside of 1.5ml tubes before testing (one textile disc per tube).
3. The absorbent textile disc is then placed inside of the G16 device during exercise testing.
4. Subjects were then directed to exercise on an exercise bike at an intensity to produce sweat.
5. The disc is then changed every 8 minutes for a total of 48 minutes of exercise on an exercise bike.
6. Pictures of the NDL devices are taken at the same time as the changing of the absorbent textiles.
7. The absorbent textiles are then post-weighed and subtracted from their pre-weights. This provides us with a sweat weight produced during the 8-minute intervals. From this we can calculate sweat rate and cumulative sweat volumes locally.