



3D Printed Microneedle Patch

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INTRODUCTION

Microneedles are safe and effective devices for vaccination. Microneedles can deliver a wide range of drugs painlessly, including influenza vaccines, without compromising patient immunity. This device provides an innovative solution to drug delivery, acting as a potential replacement for traditional hypodermic needles due to its disposability and simplicity in utilization. More people can be vaccinated by introducing microneedles to the market due to a reduction in needle phobia, leading to increased protection from lethal pathogens.

MISSION STATEMENT

EasyVaxx is committed to making easy-to-administer microneedle arrays for vaccine delivery accessible to all.

FUNCTIONAL SPECIFICATIONS

- More vaccinations
- Easy application
- Painless and noninvasive

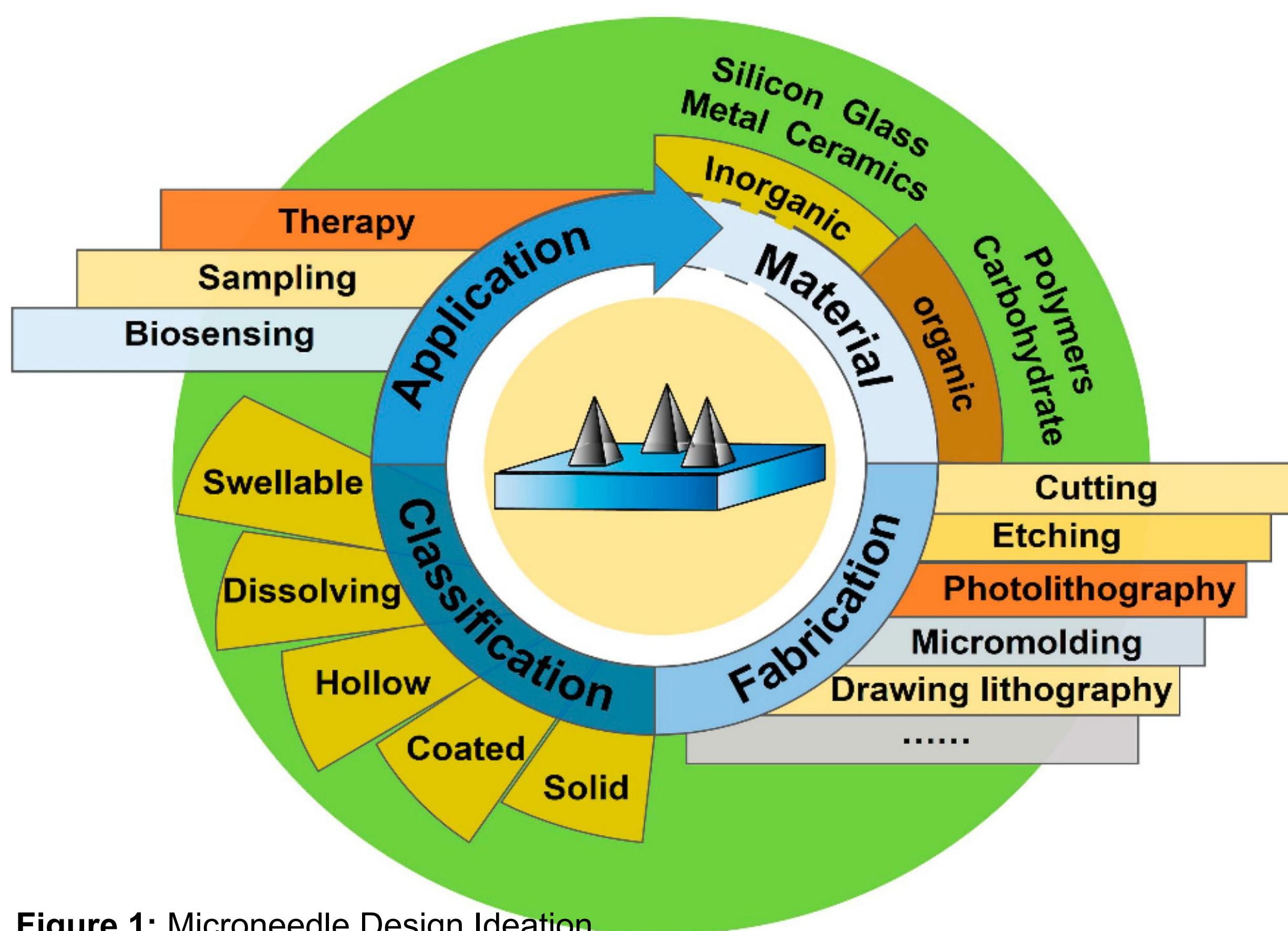


Figure 1: Microneedle Design Ideation

FINAL PRODUCT

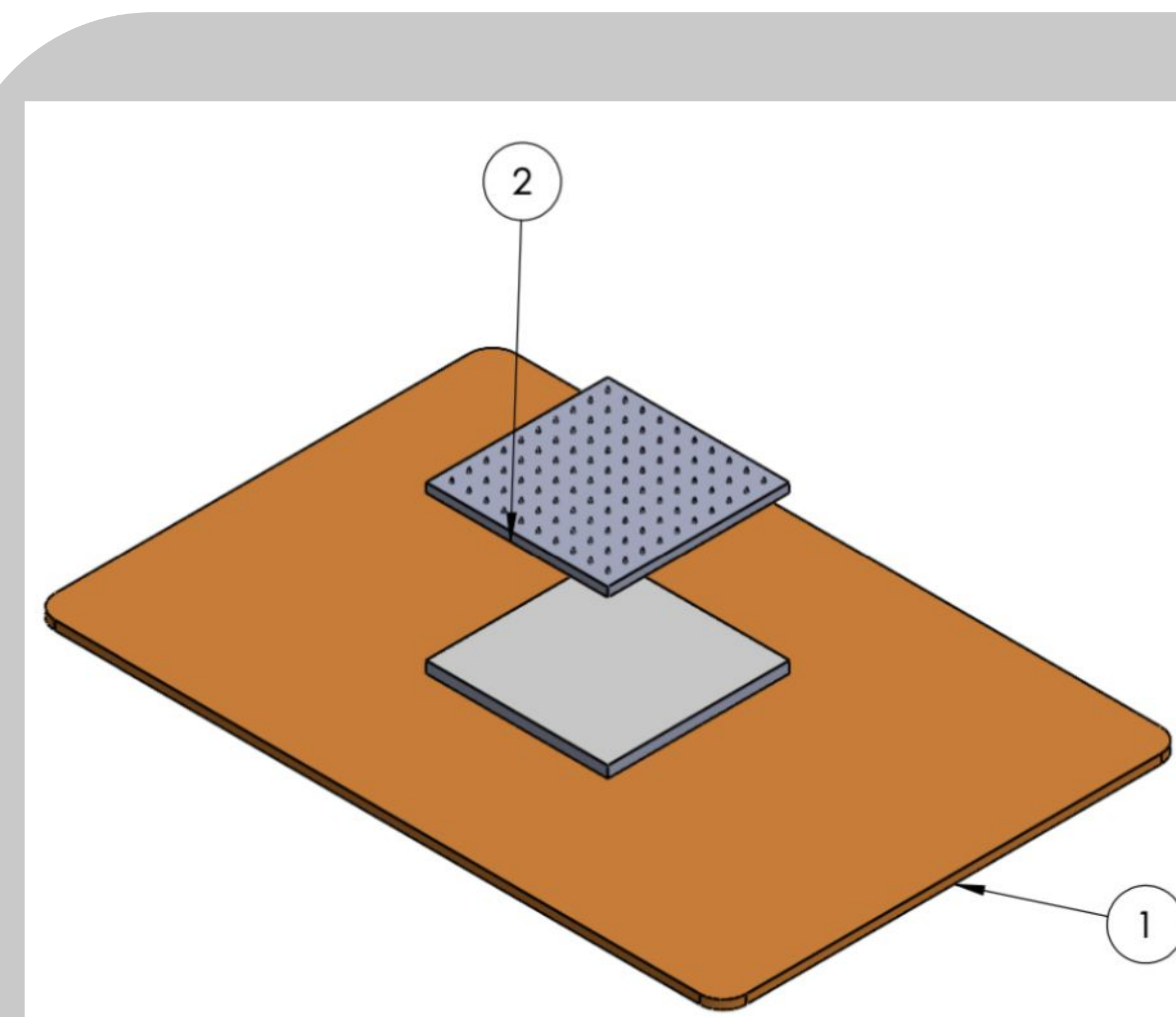


Figure 2: Rendered image of exploded view of device

MANUFACTURING COSTS

Total Prototype Cost: \$82.50

ITEM NO.	DESCRIPTION	MATERIAL	QTY.
1	ADHESIVE BANDAGE	WOVEN COTTON	1
2	MICRONEEDLE ARRAY (100 NEEDLES)	316L STAINLESS STEEL	1

Table 1: Product Assembly Table

PERSONNEL AND REPORTING

Labor Category	Hourly Rate	Total Payout
Senior Project Manager	\$200	\$12,000
Engineer	\$100	\$9,500
Technician	\$50	\$1,200

Table 3: Calculated Personnel time and Reporting Costs over the Design Process

CLAIMS

According to the CDC, up to 2 in 3 children and 1 in 4 adults have intense fears of needles. At EasyVaxx, we believe that this concern could be alleviated with the right messaging and a smoother vaccination process for the general population.

CONCLUSIONS

- Ensure manufacturing process keeps needle range strictly at or below 500 μm
- Utilize an efficient dipping process for uniform drug distribution
- Explore different materials for 3D metal printing, including Titanium

TEAM MEMBERS & MENTORS

Team Members	Mentors
Ghufran Ali	Mr. Zac Bujnoch
Andrew Montez	Dr. Teja Guda
Duke Podder	Dr. Lyle Hood
Raha Shanehbandi	Dr. Settimio Pacelli

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REFERENCES

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2. Meng-Hsuan Hsiao, Hsiu-Feng Ye, Ta-Jo Liu, Jane Wang. Drug Loading on Microneedles.

TESTING RESULTS

Force Compression Testing

Measured load bearing capabilities under compressive loads:

Stiffness was 1006 N/mm under a load of 250 N – measure of resistance to elastic deformation

Young's Modulus was 1.28 MPa: ratio of uniaxial stress ($\sigma = F/A$) & measure of material deformation, or strain ($\epsilon = dl/l$)



Figure 3: Microneedle Array Close-Up Shot

TRACEABILITY MATRIX

Device	Category	Contact	Duration	Cytotoxic Score	Irritation Score	Acute Toxicity
			A Limited (<24h)	Sensitization		
			B Prolonged (>24-30d)			
			C Permanent (>30d)			
Bandage	Surface Device	Skin	A	X	X	
Microneedle Array	Surface Device	Punctured Skin	A	X	X	0

Table 2: Traceability matrix allows one to determine the proper testing required to ensure that customer requirements are satisfied