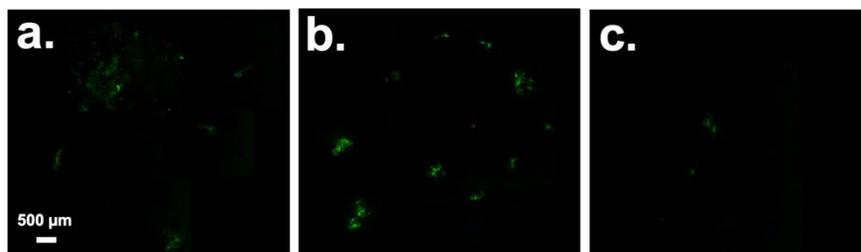


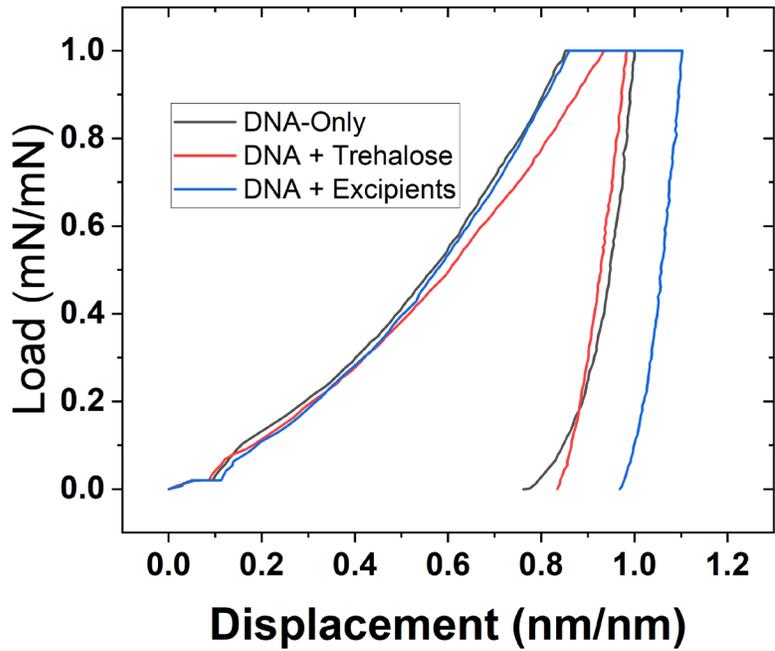
Supplementary Information for Microneedle arrays coated with Middle East respiratory syndrome coronavirus DNA vaccine via electrospray deposition

Supplementary Table 1: Experimental conditions of efficiency spray samples.

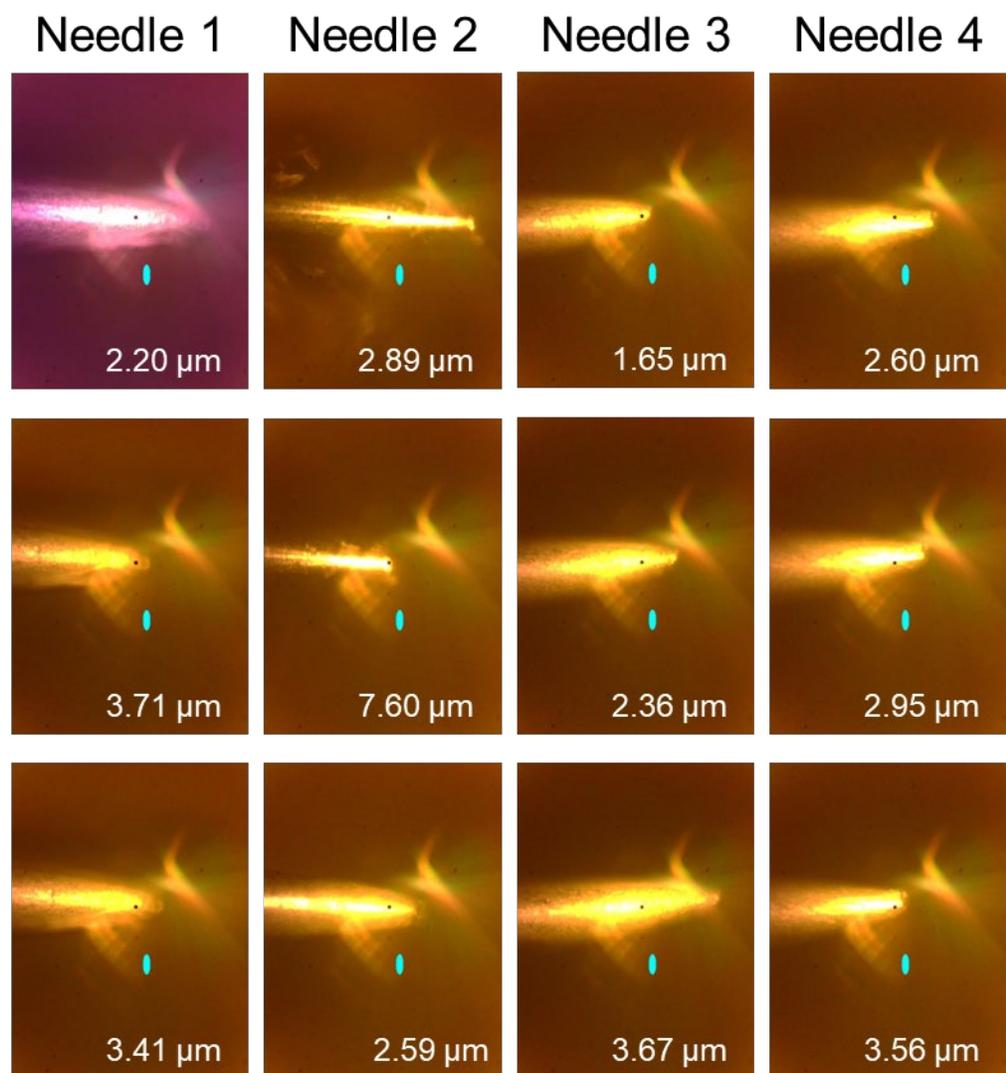
Material	DNA Conc.	Time (min)	Flow rate (mL/hr)	Voltage 1 (kV)	Voltage 2 (kV)	Temperature (°C)	Spray distance (cm)	Humidity (%RH)
DNA only MNA	0.25 w/v%	60	0.1	9.7	0.41	23.3	4	20
				8.8		24.1		21
				9.1		24.7		21
				9.1		25.3		21
				9.5		25.9		21
				9.5		25.9		21
DNA + excipients MNA	0.25 w/v%	60	0.1	7.2	0.41	25.8	4	21
				7.6		26.3		21
				7.5		26.1		21
				7.7		25.4		21
				8.2		26		21
				8		26.4		20



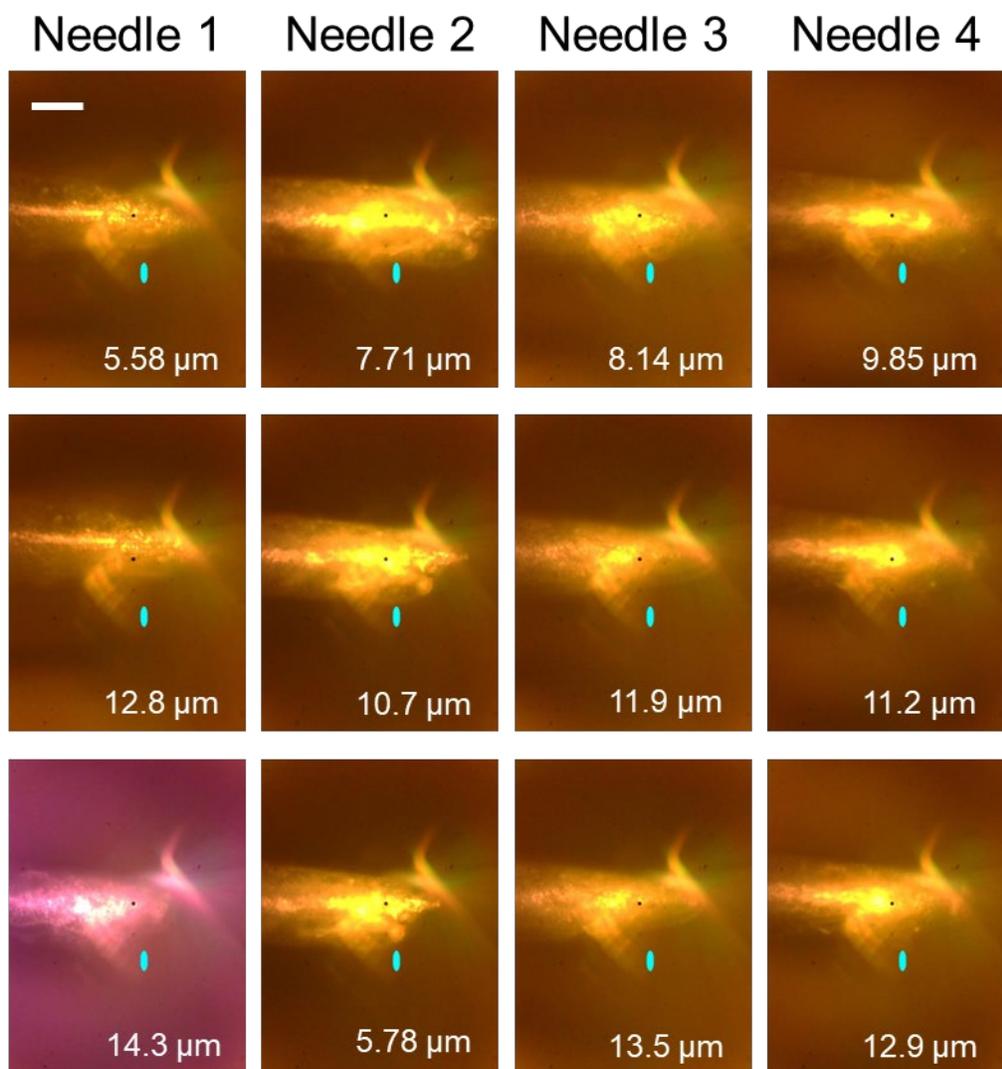
Supplementary Figure 1: Fluorescent images of in vivo transfection in rat skin using pEGFP-N1 coated MNAs. No additional images were taken for DNA-only MNAs as expression was not detected other than one insertion site. **a-c** Each image is a separate MNA coated with DNA + excipients inserted into one rat. Rat was sacrificed 24 h after experiment.



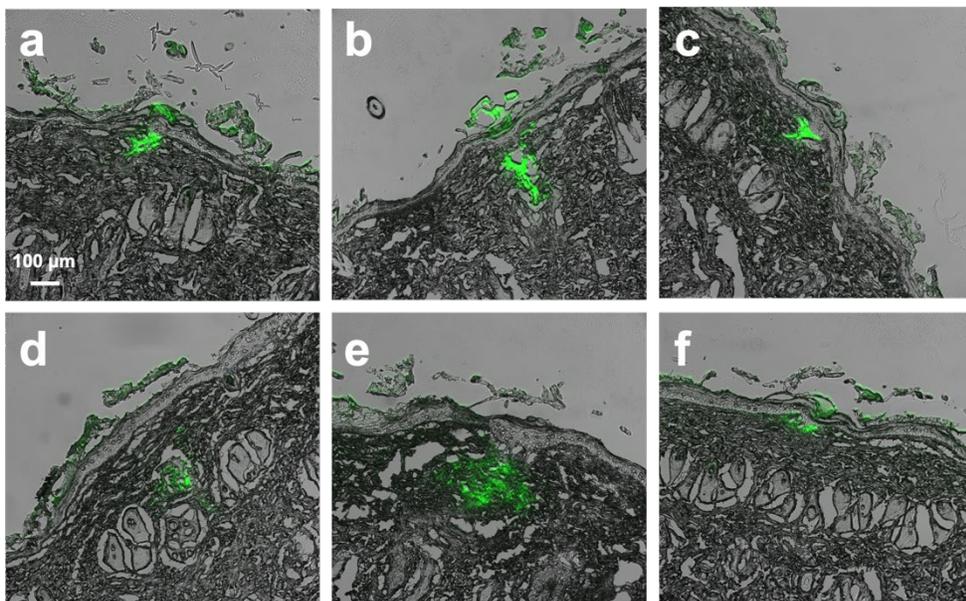
Supplementary Figure 2: Characteristic loading and unloading curves from vaccine DNA-Only (black trace), DNA blended with trehalose (red trace), and DNA + excipients (blue trace). Data is normalized to DNA-Only maximum load and displacement. Creep can be seen as the excess displacement at maximum load and is highest for the DNA + Excipients. All 100 curves of each sample can be found in the supplementary dataset.



Supplementary Figure 3: CCD images and microreflectometer readings for one row of a DNA-Only MNA. Readings are collected from the 6 μm aperture, visible as a black dot near the center of the image. The teal oval is dead pixels in the CCD to be ignored. The scale is the same in each image and the scale bar is 100 μm .



Supplementary Figure 4: CCD images and microreflectometer readings for one row of a DNA + Excipients MNA. Readings are collected from the 6 μm aperture, visible as a black dot near the center of the image. The teal oval is dead pixels in the CCD to be ignored. The scale is the same in each image and the scale bar is 100 μm .



Supplementary Figure 5: Fluorescent images of rat tissue cross sections for **a-c** vaccine only MNA and **d-f** vaccine + excipients MNA. Both coating formulations included green, fluorescent beads to help locate the insertion site of the microneedles. Each image is a profile of microneedle insertions in three different locations for each composition. For **d-f** vaccine + excipients, the latex beads appear to be more diffuse and dispersed while **a-c** vaccine-only appears to resemble the shape of the coating on the microneedle more.