

TapeTech Microfluidic Connectors: Adhesive Tape-Enabled Solution for Organ-on-a-Chip System Integration

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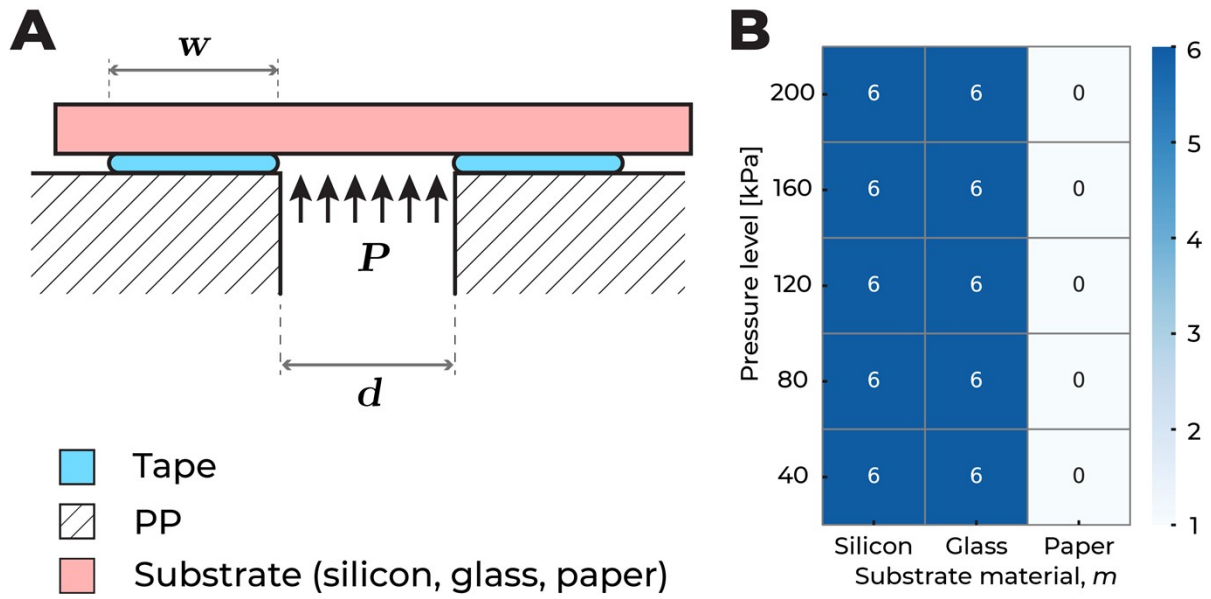
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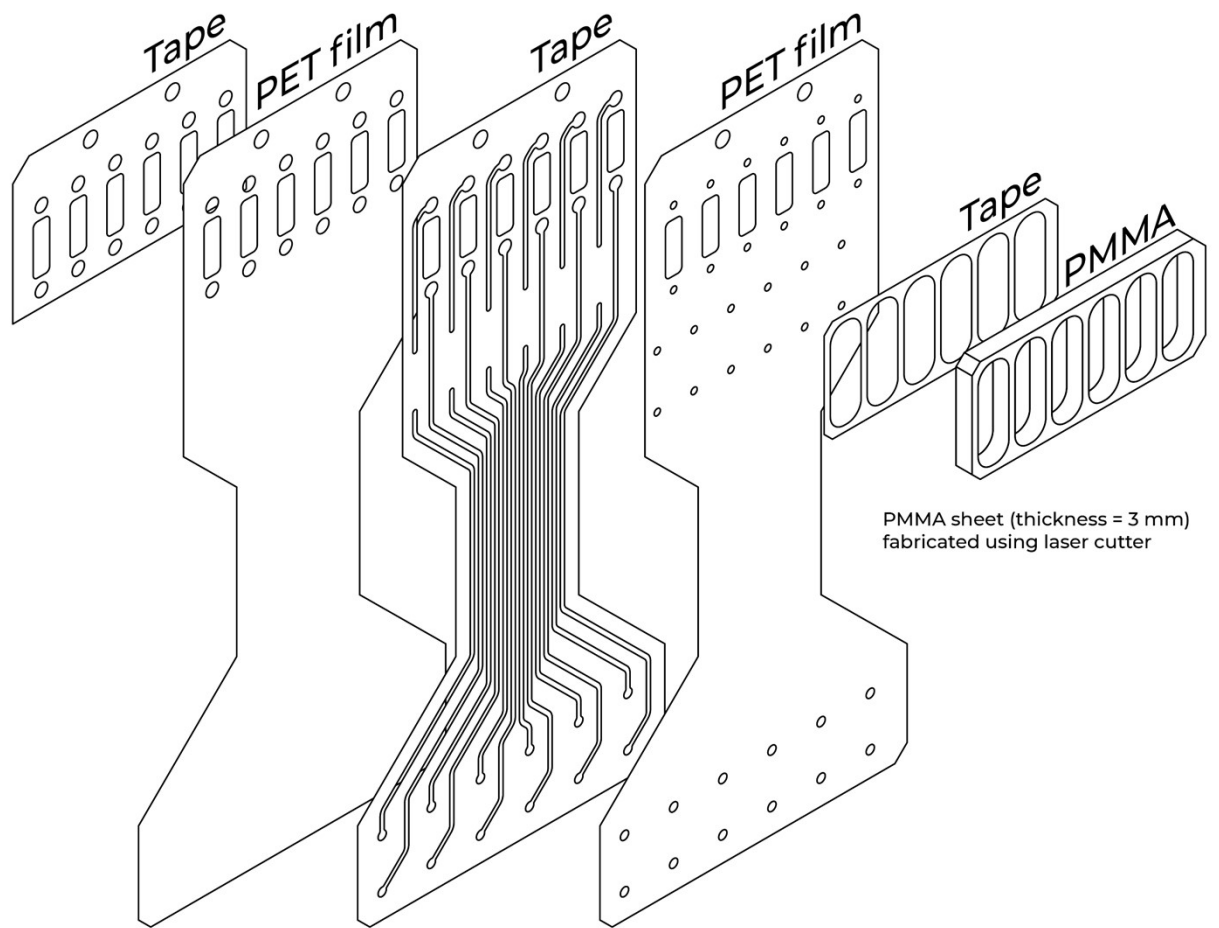
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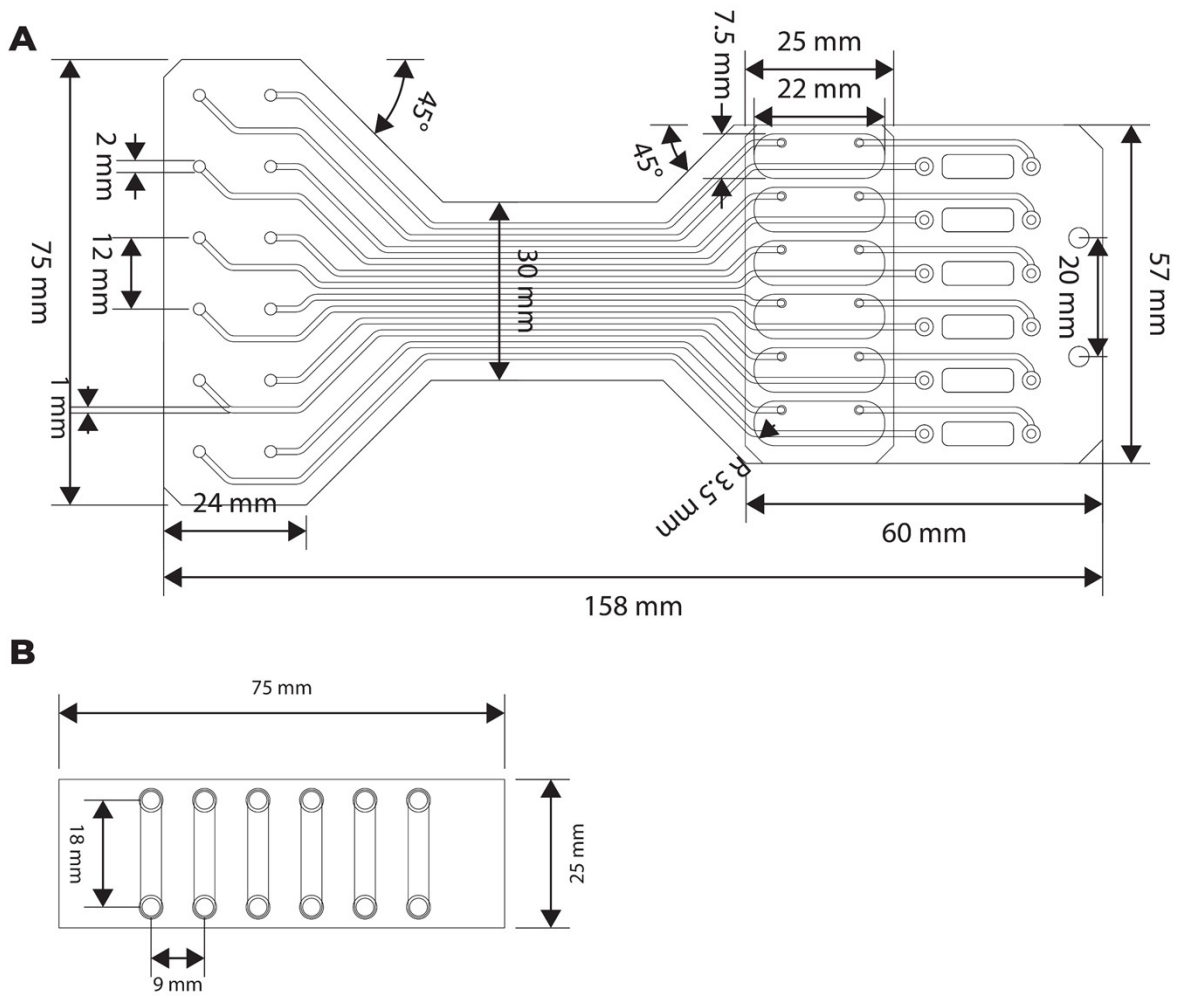
Supplementary documents



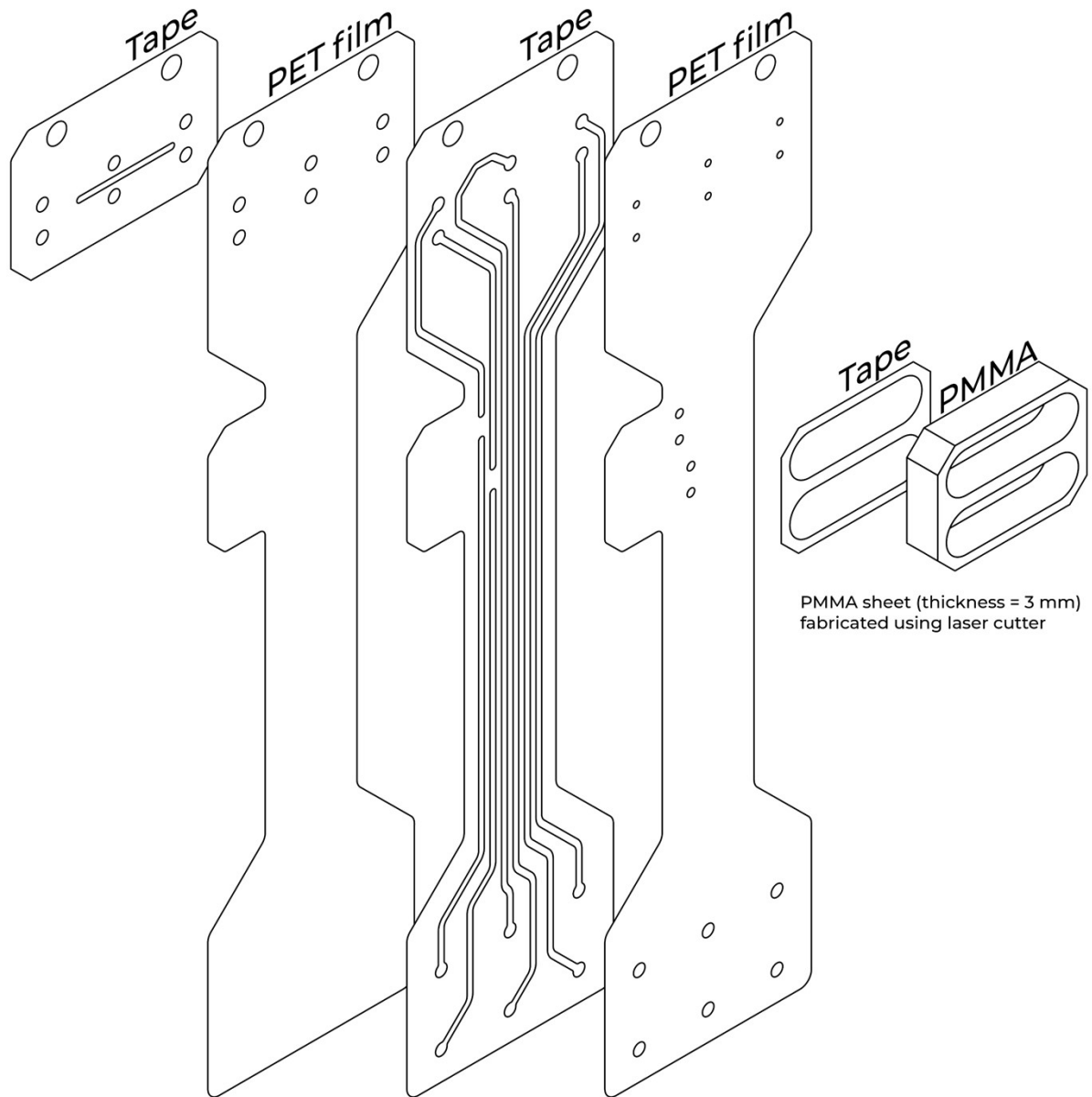
Supplementary Figure 1. Durability test of adhesive performance on various substrates A) Cross-sectional illustration of the durability test performed on silicon, glass, and paper substrates. B) Heatmap showing the survivability ($n = 6$) of samples subjected to a five-step pressure ramp profile (40 kPa to 200 kPa) for varying substrate materials.



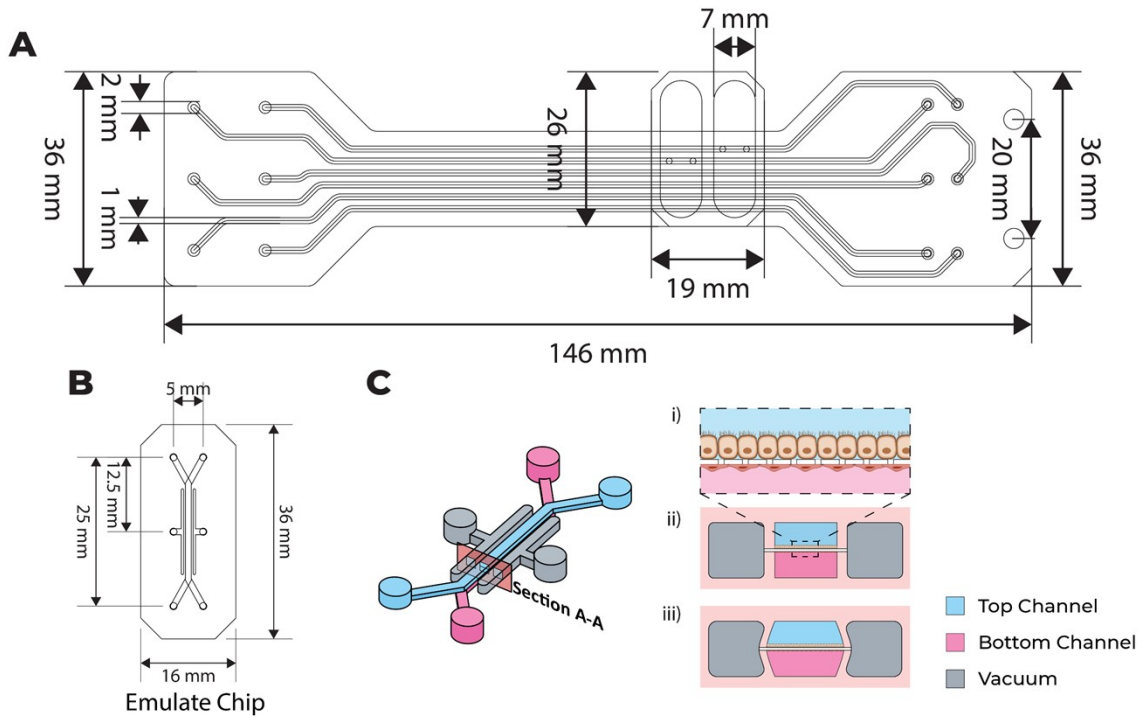
Supplementary Figure 2. Exploded-view of TapeTech assembly designed for interfacing with the ibidi 6-channel chip. Tape and PET film layers are fabricated using xurography (CAMEO Silhouette 4, Silhouette America, Utah, USA). PMMA layer was fabricated using laser cut machine.



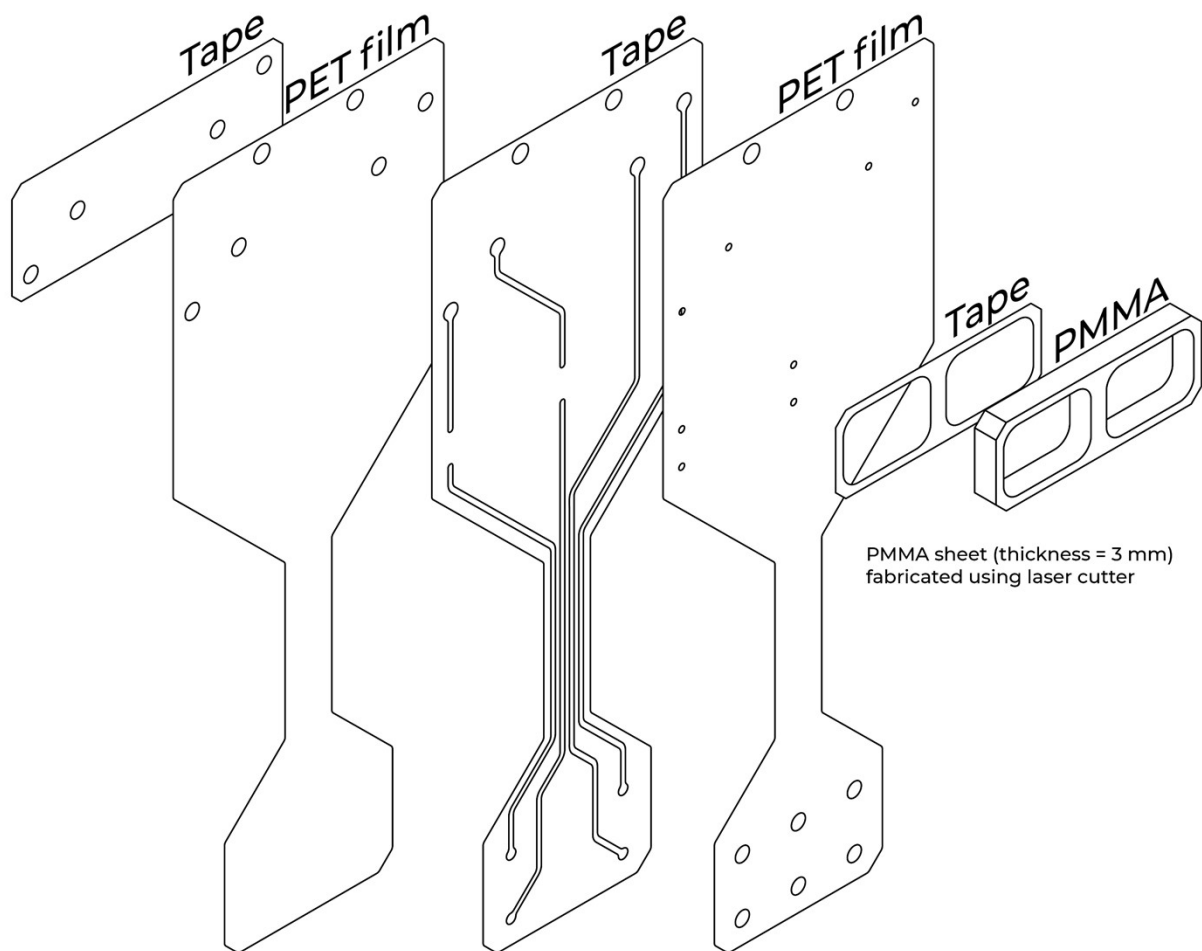
Supplementary Figure 3. A) Dimension of TapeTech assembly ribbon designed for interfacing with the ibidi 6-channel chip. B) Dimension of ibidi 6-channel chip (μ -Slide VI – Flat)



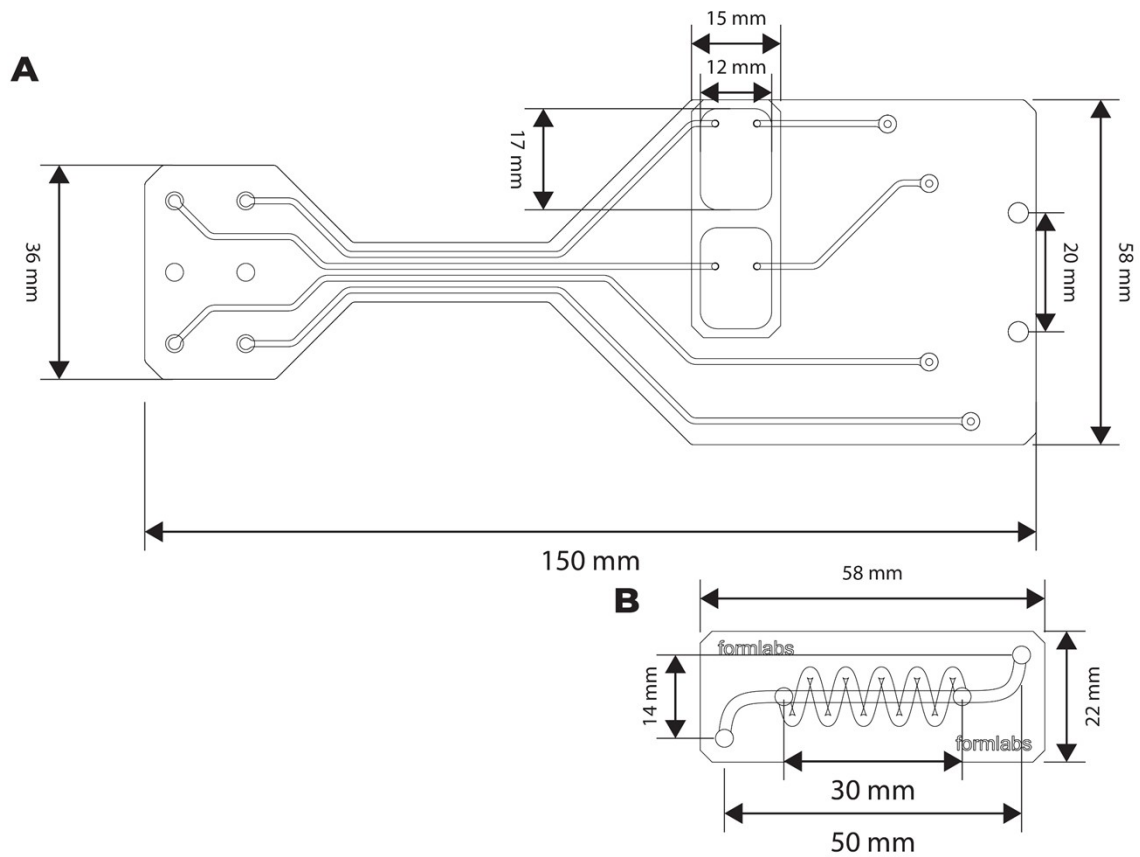
Supplementary Figure 4. Exploded-view of TapeTech assembly designed for interfacing with the Emulate lung chip. Tape and PET film layers are fabricated using xurography (CAMEO Silhouette 4, Silhouette America, Utah, USA). PMMA layer was fabricated using laser cut machine.



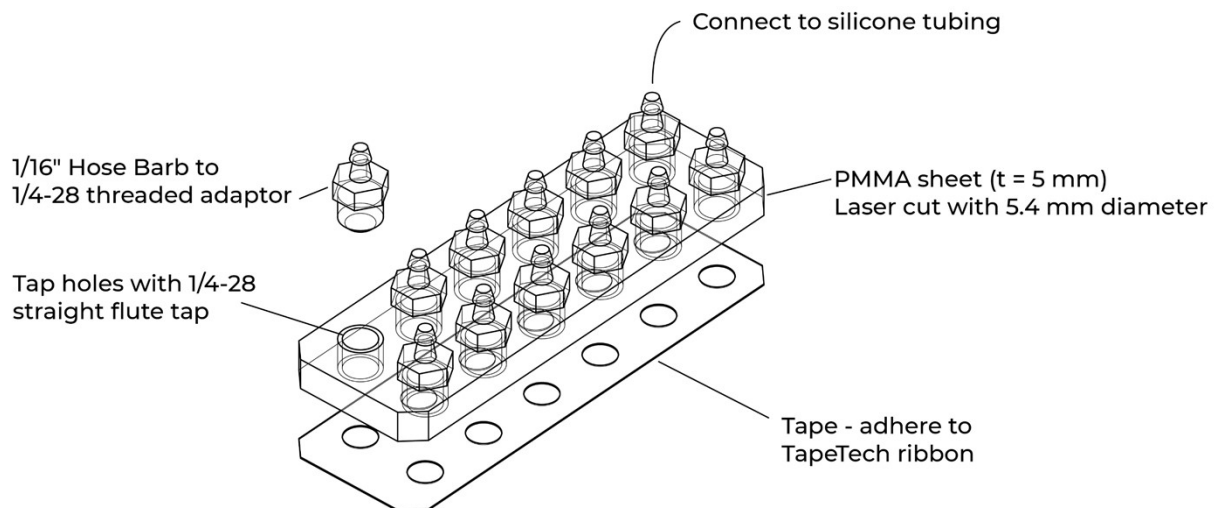
Supplementary Figure 5. A) Dimension of TapeTech assembly ribbon designed for interfacing with the Emulate lung chip. **B)** Dimension of Emulate Lung Chip. **C)** 3D illustration highlighting the chambers in the Emulate lung chip, accompanied by cross-sectional views of the channels in ii) a relaxed state and iii) a stretched state. Reproduced with permission from T. Ching et al., Trends Pharmacol. Sci., 42(9), 715-728.



Supplementary Figure 6. Exploded-view of TapeTech assembly designed for interfacing with a 3D-printed fluidic chip (Formlabs). Tape and PET film layers are fabricated using xurography (CAMEO Silhouette 4, Silhouette America, Utah, USA). PMMA layer was fabricated using laser cut machine.



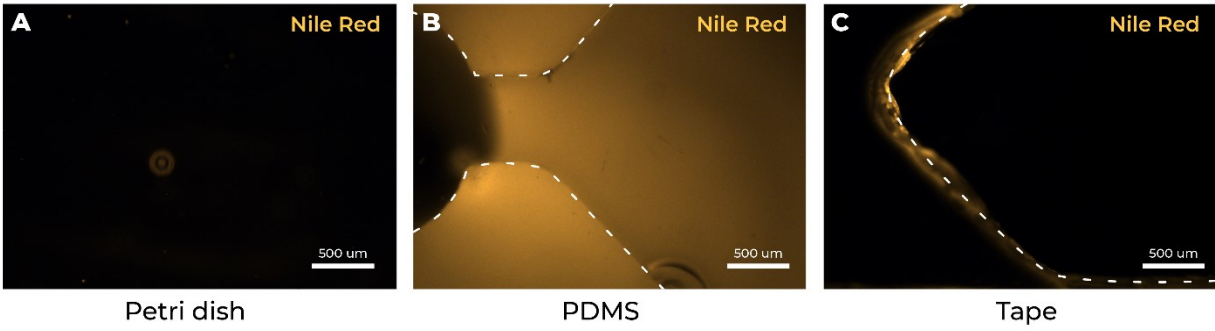
Supplementary Figure 7. A) Dimensions of TapeTech assembly ribbon designed for interfacing with a 3D-printed fluidic chip (Formlabs). **B)** Dimensions of the 3D-printed fluidic chip.



Supplementary Figure 8. Exploded-view of the TapeTech fitting that adheres to the TapeTech ribbon. A 5 mm PMMA sheet was laser cut, and the holes were threaded using a 1/4-28 straight flute tap. Commercially available 1/16" hose barb to 1/4-28 threaded adaptors were screwed into the PMMA sheet to create a watertight seal. The tape was precisely cut to size using xurography and adhered to the fitting assembly, integrating with the TapeTech ribbon to their respective channel.



Supplementary Figure 9. Representative live/dead assay fluorescence image of normal human lung fibroblasts cultured for 3 days in a 6-well plate, with a 30 mm by 10 mm tape submerged in the cell culture medium to assess potential toxicity



Supplementary Figure 10. Nile red, a low-molecular-weight hydrophobic fluorophore, was used to assess the material absorption. Nile red solution was perfused into devices and petri dishes made from different materials and incubated for 3 days. After 3 days, the devices and petri dishes were washed three times with PBS. A) Micrograph of the fluorescence signal in the petri dish after washing. B) Micrograph of the fluorescence signal in the PDMS device after washing. C) Micrograph of the fluorescence signal in the tape-based fluidic device after washing.

Supplementary Table 1. Primer sequences for qPCR

Gene name	Forward (5' -> 3')	Reverse (5' -> 3')
CXCR4	CATCAGTCTGGACCGCTACC	CCAGACGCCAACATAGACCA
MMP2	TACAGGATCATTGGCTACACACC	GGTCACATCGCTCCAGACT
KLF4	AGATGGGGTCTGTGACTGGA	CCTCCCCCAACTCACGGATA
eNOS	GAACCTGTGTGACCCTCACC	TGGCTAGCTGGTAACTGTGC
HES1	CCAAGTGTGCTGGGGAAGTA	CACCTCGGTATTAACGCCCT
MMP1	AAAATTACACGCCAGATTTGCC	GGTGTGACATTACTCCAGAGTTG
VCAM1	CTCCTGAGCTTCTCGTGCTC	TGACCCCTTCATGTTGGCTT
ICAM1	ACCATGGAGCCAATTTCTCG	GCGCCGAAAGCTGTAGATG
CTGF	CGAGGAGTGGGTGTGTGA	TTCCAGTCGGTAAGCCGC
CCL2	CAGCCAGATGCAATCAATGCC	TGGAATCCTGAACCCACTTCT
GAPDH	ACAACCTTGGTATCGTGGAAGG	GCCATCACGCCACAGTTTC

Supplementary Table 2. The cost of fabricating the TapeTech ribbon for the 6-channel ibidi chip was calculated based on the material expenses. The unit cost of double-sided tape and PET films is \$45.48/m² and \$10.59/m², respectively.

Item	Area [m ²]	Cost [\$]	Notes
Total Tape employed [m²]	0.010016	\$0.46	https://www.amazon.com/3M-9495LE-Double-Coated-Polyester/dp/B007Y7DC20/ref=sr_1_4?gclid=Cj0KCQjwz96WBhC8ARIsAATR252YcAEDnrSimdEe8B_Tv9Jcq34pj2Xd_nvvd0N8gFzxXdXnp1ZWDUUaAto7EALw_wcB&hvadid=268164105083&hvdev=c&hvlocphy=9002000&hvnetw=g&hvqmt=e&hvrand=14180290249352038269&hvtargid=kw_d-295838783959&hydacr=6982_9806415&keywords=3m+9495le&qid=1658333916&sr=8-4
Total PET film employed [m²]	0.016216	\$0.17	https://catalog.cshyde.com/item/films/mylar-polyester-pet-film/48-4f-oc
Total Cost		\$0.63	Fabrication of TapeTech ribbon Fig. 2C