

Supplementary information: Portable and Integrated Organ-on-a-chip Microfluidic Flow Control System Using Off-the-shelf Components

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Name	Brand	Model Key	Link of Manual/Website	Page	Unit Price	Total Price	Way of Obtaining
Vacuum Pump	SURGEFLO	-	https://nl.aliexpress.com/item/33006096807.html?spm=a2q0s.9042311.0.0.4e144c4d1qjenH	-	1.39	1.39	Purchase from Aliexpress
Shut-off Valve	SMC	VX214AGA	https://docs.rs-online.com/ad6b/0900766b813f122e.pdf	12-13	45.52	45.52	Supported by PME Department
Vacuum Gauge	Festo	VAM-63-V1/0-R1/4-EN	https://www.festo.com/us/en/a/download-document/datasheet/537811/	-	26.36	26.36	Supported by PME Department
Manual Valve	Festo	HE-2-QS-6	https://docs.rs-online.com/94e1/0900766b816a12cc.pdf	-	18.34	18.34	Supported by PME Department
Switch Valve	IDEX	MHP7970-500-4	https://www.idex-hs.com/store/pub/media/productattachments/files/downloads/File-1469551785.pdf	-	2075.11	2075.11	Purchase form Inacom
Three-way Valve	SMC	VDW-250-1-G-2-01F-A-Q	https://www.smworld.com/discon/en/oldpdf/vdw-old-e.pdf	402-406	22.21	22.21	Purchase form RS online
Flow Controller	Bronkhorst	ML120V21-BAD-CC-K-S-DA-A0V	https://www.bronkhorst.com/getmedia/84f1ce1f-9a10-4007-b89d-873031f9ad9f/917097-Manual-mini-CORI-FLOW-ML120.pdf	-	1516.95	3033.9	Supported by Bronkhorst
Pressure Controller	Bronkhorst	IQP-600C-1K5A-AAD-00-V-A	https://www.bronkhorst.com/getmedia/aef32966-8264-45d8-8478-b40df22290ab/917045-Manual-IQ-FLOW.pdf	-	233.3	233.3	Supported by Bronkhorst
						5456.13	

Fig. S1 List of flow control components used in the platform

Name	Quantity	Parameter	Way of Obtaining
Reservoir	8	10ml	Supported by PME Department
Leak tight cap	1	-	Supported by PME Department
PTFE tubing	-	1/16" X 1/32"	Supported by PME Department
PU tubing	-	4mm X 2.5mm	Supported by PME Department
PU tubing	-	6mm X 4mm	Supported by PME Department
Plastic thread fitting and Ferrule	10	1/4"-28 to 1/16" OD	Supported by PME Department
Plastic fitting	1	1/4"-28 to 2.5mm ID	Supported by PME Department
Metal thread fitting and Ferrule	7	1/4"-28 to 1/16" OD	Purchase from Inacom
Barbed adapter	7	1/4"-28 to 1/16" OD	Supported by PME Department
Syringe needle	4	0.25mm	Supported by PME Department
Screw	34	M3 X 12	Supported by PME Department
Screw	4	M3 X 16	Supported by PME Department
Screw	2	M4 X 12	Supported by PME Department
Screw	4	M5 X 12	Supported by PME Department
Screw	2	UNC 4-40	Purchase from RS online
Nut	38	M3	Supported by PME Department

Fig. S2 List of flow control connections used in the platform

Name	Brand	Quantity	Link of Manual/Website	Parameter	Unit Price	Total Price	Way of Obtaining
Arduino Mega 2560	Arduino	1	https://docs.rs-online.com/9ab3/0900766b80e8ba22.pdf	-	46.94	46.94	Purchase from RS online
Battery 1	HENSENS	1	https://www.123accu.nl/Soundcast-20S-1P-accu-24V-2000-mAh-123accu-huismark-127294.html?mkwid=sGugb8Bvg_dc%7Cpcrid%7C171663098801%7Cpkw%7C%7Cpm%7C%7Cslid%7C%7Cprid%7C%7Caso00611_4894128104582&pgid=40095430284&ptaid=pla-297471473451&ecid=EA1aIQobChMI9LD_IYKx6QIVrt3Ch_QRTQapEAQYBSABEgKxpPD_BwE	24VDC	47.5	47.5	Purchase from 123accu
Battery 2	TIANQIU	1	https://tianqiu.en.made-in-china.com/product/KytmsGnHaYkb/China-6f22-9V-Tianqiu-Super-Heavy-Duty-Carbon-Dry-Battery.html	9VDC	1.1	1.1	Purchase from Aliexpress
Cooling fan	ebm-papst	1	https://docs.rs-online.com/d403/0900766b816d6d50.pdf	5V,0.4W	24.9	24.9	Purchase from RS online
Resistor	-	1	-	220Ω	-	-	Supported by PME Department
Resistor	-	2	-	4.7kΩ	-	-	Supported by PME Department
Resistor	-	3	-	8.5kΩ	-	-	Supported by PME Department
Transistor	STMicroelectronics	3	https://docs.rs-online.com/d061/0900766b8135f82f.pdf	80V,3A	2.69	2.69	Purchase from RS online
Voltage regulator	STMicroelectronics	1	https://docs.rs-online.com/9aaa/0900766b814b2420.pdf	12V,1.5A	0.417	0.417	Purchase from RS online
Voltage regulator	STMicroelectronics	1	https://docs.rs-online.com/61d4/0900766b813d3857.pdf	5V,1.5A	0.559	0.559	Purchase from RS online
Capacitor	EPCOS	3	https://nl.rs-online.com/web/p/polyster-film-capacitors/0334221/	100nF	0.15	0.45	Purchase from RS online
General purpose PCB	ADAFRUIT INDUSTRIES	1	https://docs.rs-online.com/82cc/0900766b8153435e.pdf	-	8.05	8.05	Purchase from RS online
Internet cable	Omron	1	https://docs.rs-online.com/504e/0900766b815165a2.pdf	-	11.4	11.4	Purchase from RS online
RJ45 connector	MH Connectors	1	https://docs.rs-online.com/9abe/0900766b813030b5.pdf	-	1.26	1.26	Purchase from RS online
9 pin D sub connector Male	TE Connectivity	2	https://docs.rs-online.com/6181/0900766b804c485c.pdf	-	4.302	4.302	Purchase from RS online
9 pin D sub connector Female	RS PRO	4	https://docs.rs-online.com/20e6/0900766b815860ec.pdf	-	0.929	0.929	Purchase from RS online
SPST Switch	Arcoelectric	2	https://docs.rs-online.com/af05/0900766b808a97c8.pdf	-	2.2	2.2	Purchase from RS online
Relay	TONGLING	1	https://www.generationrobots.com/media/IQC-3FF-v1.pdf	5VDC	0.61	0.61	Purchase from Aliexpress
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Fig. S3 List of electronic connections used in the platform

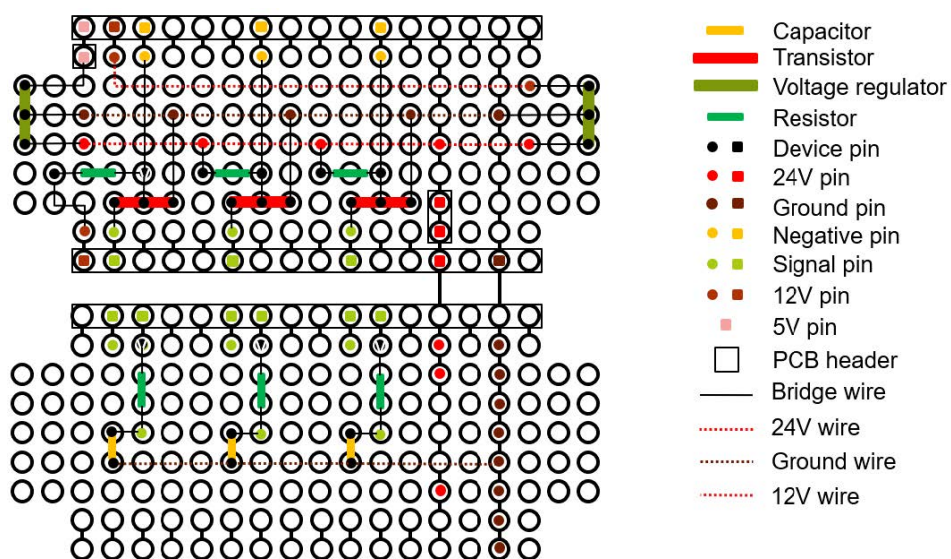


Fig. S4 Layout of general purpose PCB. The dash lines represent wires in the back side while other devices are placed at the front side.

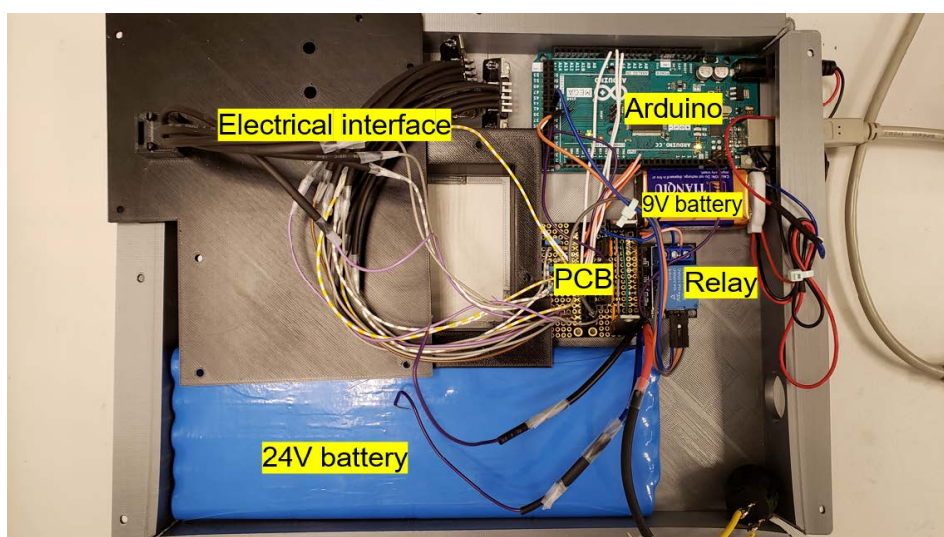


Fig. S5 Photo of electronics placed in the base of platform.

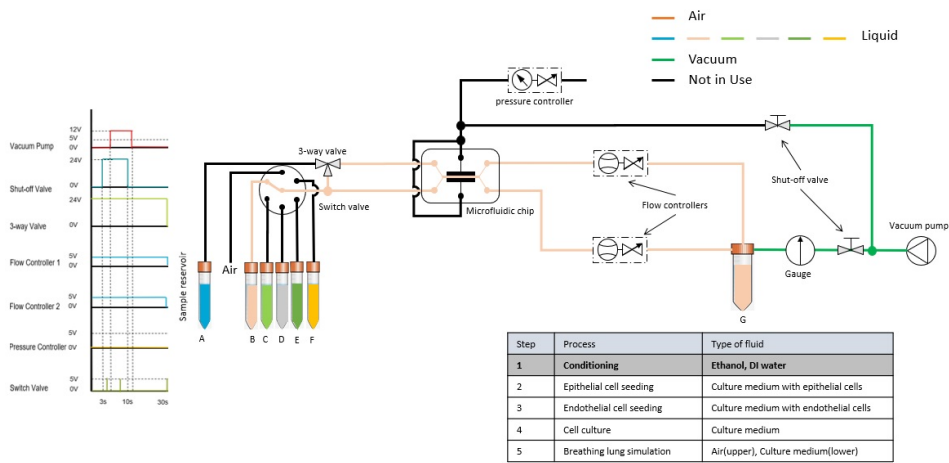


Fig. S6 Protocol of Lung-On-Chip experiments - conditioning process. The flow rate controlled by the Flow controller 1 and 2 are set to the largest.

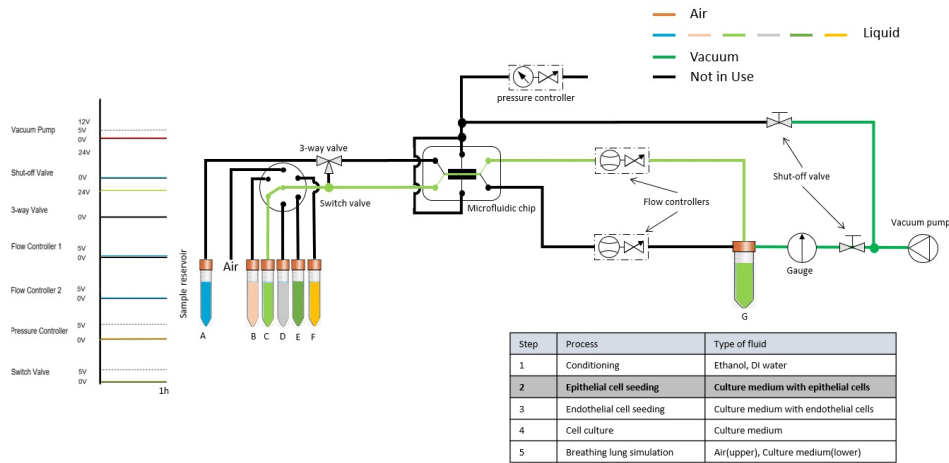


Fig. S7 Protocol of Lung-On-Chip experiments - epithelial cell seeding process. The flow rate controlled by the Flow controller 2 is low but not equal to zero.

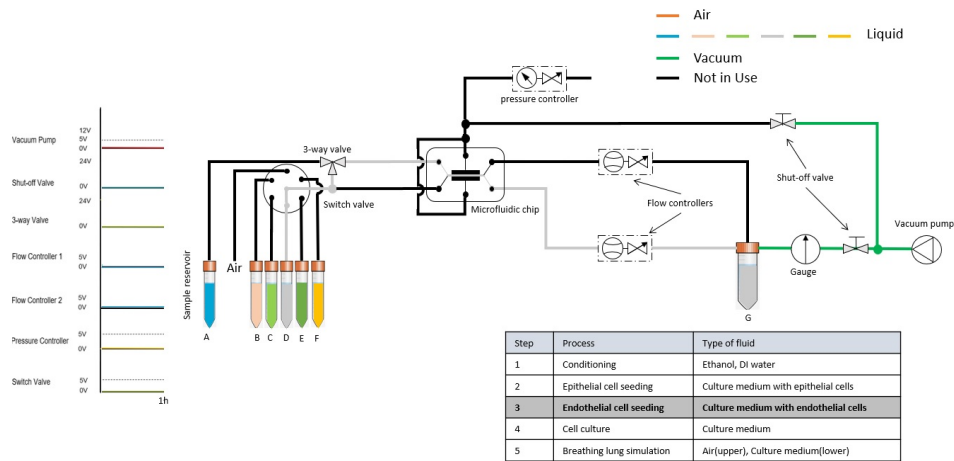


Fig. S8 Protocol of Lung-On-Chip experiments - endothelial cell seeding process. The flow rate controlled by the Flow controller 1 is low but not equal to zero.

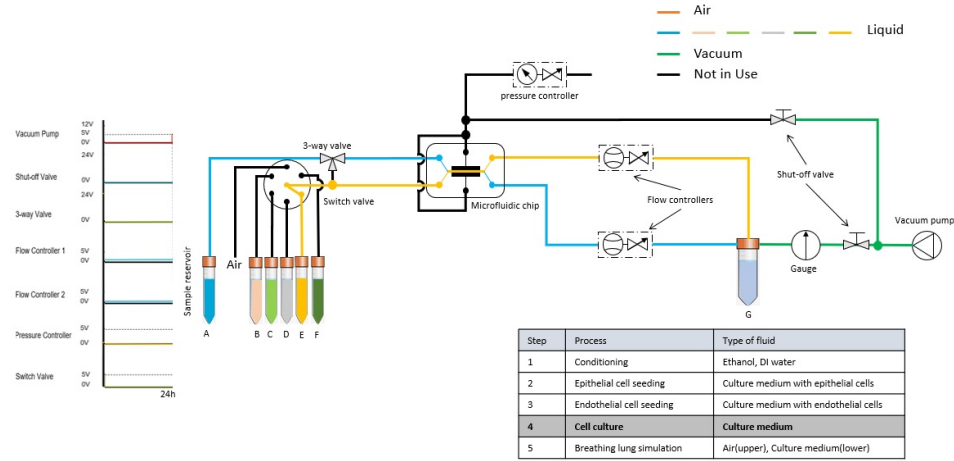


Fig. S9 Protocol of Lung-On-Chip experiments - cell culture process. The flow rate controlled by the Flow controller 1 and 2 are suitable for cell culture.

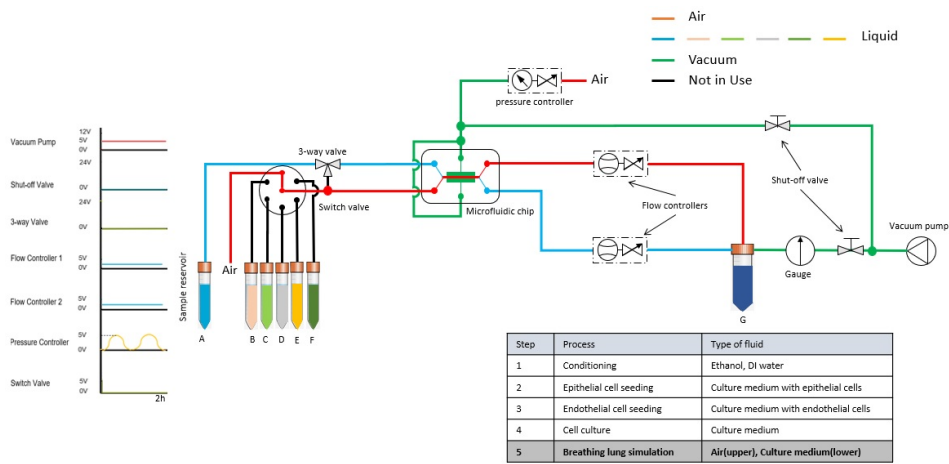


Fig. S10 Protocol of Lung-On-Chip experiments - breathing lung simulation. The flow rate controlled by the Flow controller 1 and 2 are selected based on the user’s application.