Supplementary Information (SI) for Lab on a Chip.

Dissociable Perfusion Chip (DPC): Perfusable microfluidic chip for single-cell screening of anti-cancer drugs in live glioblastoma explants

Supplemental Information

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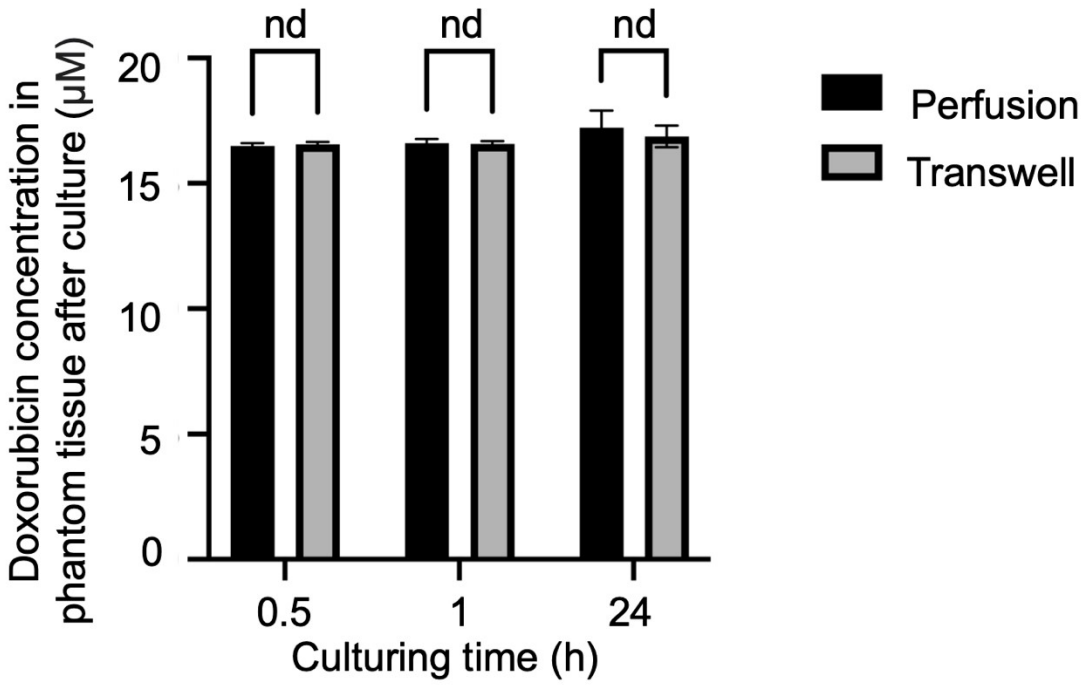
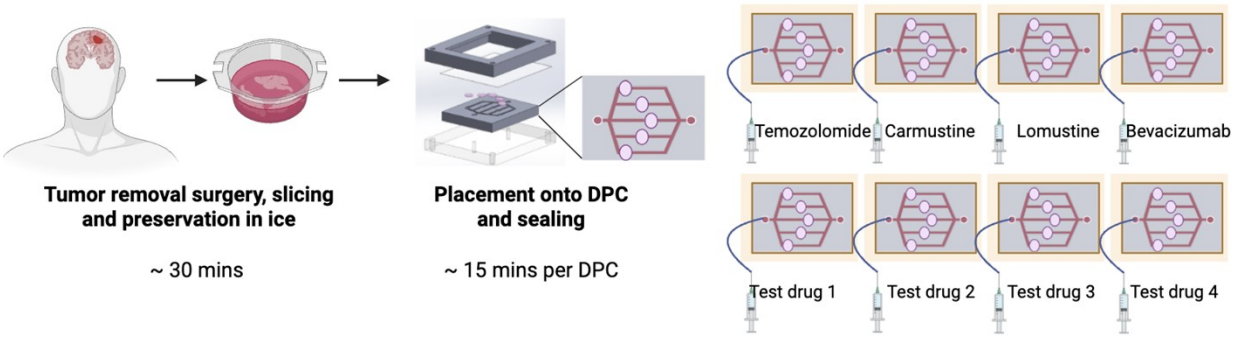
Supplemental Figure 1. Concentration of model drug molecule doxorubicin within 0.6% agarose gel tumor phantom slices after perfusion with doxorubicin on three independent chips compared to culture on transwell membranes for up to 24 h. All data are mean ± standard deviation, with n =11-15 measurements per condition. Condition differences at each time point were tested via two-way repeated-measures ANOVA with FDR correction and were not significant, represented as “nd”.



Supplemental Figure 2. Schematic diagram showing future possible higher-throughput drug screening. In this scenario, tissues are removed from excised tumors during surgery, sliced and placed on ice (~30 mins), followed by placing 5 slices into the DPC and sealing and perfusing (~15 mins). Altogether, it would take ~2 h to load 8 DPCs if performed sequentially, or ~15 min in parallel with multiple people or automated sealing. Created with BioRender.com.

Supplemental Figure 2.



Supplementary Table 1. Comparison of our work with similar previously published work.

Presence of key components of perfused microfluidic systems for anticancer drug screening in current literature and our system.

Technology	**Article**	**Tissue can be removed for downstream analysis**	**Cell-specific drug sensitivity**	**Automated**	**Human samples used**	**Multiple samples can be tested in parallel**
Multi-well PMMA microfluidic device for drug response on intact tumor slices	(10)	+	-	+	+ 250 µm thick slice	+
Static culture of human GBM tumor slices coupled with scRNA seq for cell-specific drug response	(1)	+	+	-	+ 500 µm thick slice	+
Bioprinted personalized chips with patient GBM and endothelial cells in brain decellularized ECM bioink	(3)	N/A	-	-	+ GBM slice	-
Perfusable microfluidic platform for screening of anti-cancer drugs in live tissue explants	Our work	+	+	+	+ 500 µm thick slice	+

Supplementary Table 2. Detailed comparison of our work with similar previously published work. Presence of key components of perfused microfluidic systems for anticancer drug screening in current literature and our system.

Technology	Article	Tissue can be removed for downstream analysis	Cell-specific drug sensitivity	Automated	Human samples used	Multiple samples can be tested in parallel
Multi-well PMMA microfluidic device for drug response on intact tumor slices	(10)	Easy to remove tissue from porous membrane	Alluded to heterogeneity by using various cell death dyes - could track mechanism of death (apoptosis vs. general death)	Drug is added manually but syringe pump pulls solution throughout chip	250 μm thick patient-biopsy sample	40 channels - many drug lanes in different areas of same slice
Static culture of human GBM tumor slices coupled with scRNA seq for cell-specific drug response	(1)	Easy to remove tissue from porous membrane	scRNA-seq to capture all cell types in GBM. Used slices from distal locations along the tumor. Assessed drugs targeting specific subpopulations	Manual input required for media changes	500 μm thick human GBM tissue slices (diameters not uniform)	True, but each tissue slice requires one transwell and one well
Bioprinted personalized chips with patient GBM and endothelial cells in brain decellularized ECM bioink	(3)	Not relevant	Cell types present not analyzed	Manual input required for media changes	Patient GBM cells	One device per patient
Perfusable microfluidic platform for screening of anti-cancer drugs in live tissue explants	Our work	Easy to remove tissue from PDMS, no adhesive agents are used	scRNA-seq used to capture all important cell types. Used slices from distal locations along the tumor. Assessed drugs targeting specific subpopulations	Once syringe pump is set up, media/drug delivery is automated	500 μm thick, 3 mm diameter human GBM tissue slices	5 tumor slices can be cultured per chip

Bibliography

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