

Supplementary Materials Supplementary Figures

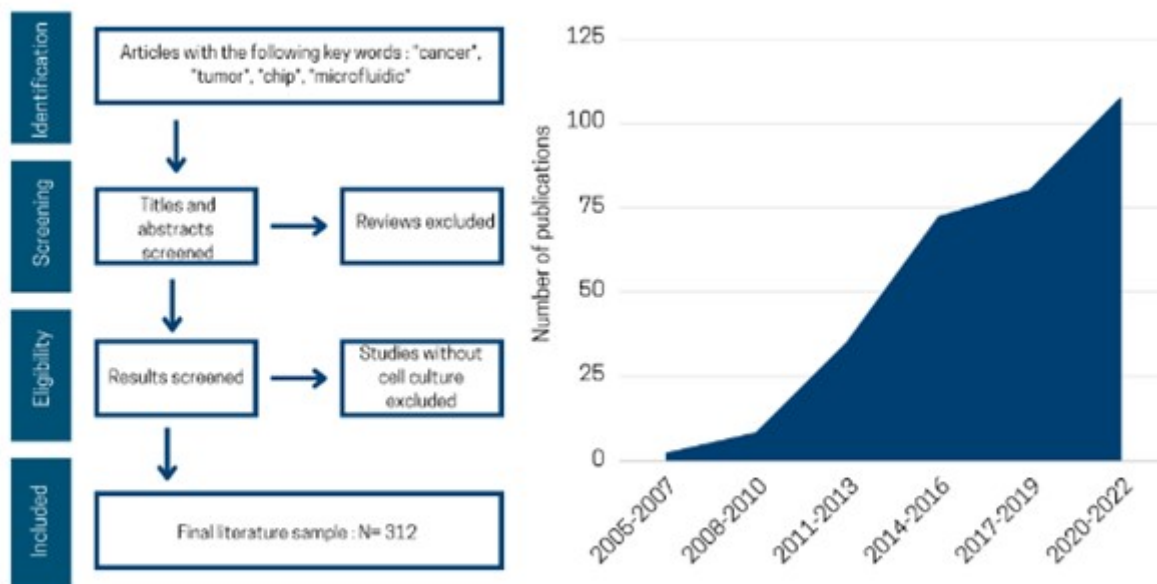


Figure S1: Systematic review flow chart and graph showing the number of publications during the last 10 years

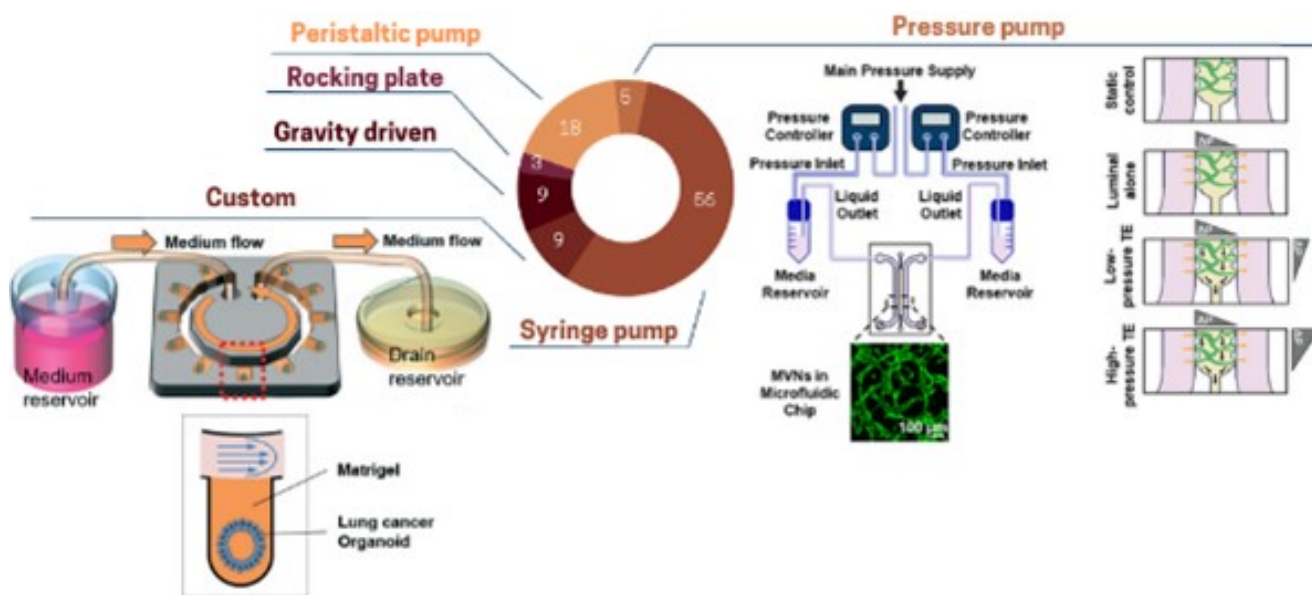


Figure S2: Pie chart illustrating the proportion of different flow control strategies used in ToC: syringe pump 56%, peristaltic pump 18%, gravity driven 9%, custom 9%, pressure pump 5%, rocking plate 3%. (Left panel) Custom: Siphon-driven passive micropump with a yarn flow resistance controller can be used to generate circulatory flow in a ToC. The application of flow allows to seed organoids in the device, to perfuse with cell culture medium/drug for 3 days (Jung et al., 2019). (Right panel) Pressure pump: Flow can be applied using pressure pumps in different directions of the chip: in the lateral channel and through the central channel (trans-endothelial flow)(Hajal et al., 2021)

Using a pressure pump, Hajal et al.(Hajal et al., 2021) were able to apply flow in two directions: luminal flow in the lateral media channels and trans-endothelial (TE) flow through the central gel channel. They showed that a significant delay in the extravasation of cancer cells was observed in the case of low-pressure TE flow compared to high-pressure TE flow. Precise

control of interstitial flow in different directions of the chip through pressure control thus opens up a new level of control in *in vitro* platforms. Despite not being frequently developed yet, the use of standalone ToC platforms with integrated perfusion systems holds great promises allowing shear stress control or drug injection and cell culture media sampling for off-chip analyses.

Hajal, C., Ibrahim, L., Serrano, J. C., Offeddu, G. S., & Kamm, R. D. (2021). The effects of luminal and trans-endothelial fluid flows on the extravasation and tissue invasion of tumor cells in a 3D *in vitro* microvascular platform. *Biomaterials*, 265. <https://doi.org/10.1016/j.biomaterials.2020.120470>

Jung, D. J., Shin, T. H., Kim, M., Sung, C. O., Jang, S. J., & Jeong, G. S. (2019). A one-stop microfluidic-based lung cancer organoid culture platform for testing drug sensitivity. *Lab on a Chip*, 19(17), 2854–2865. <https://doi.org/10.1039/c9lc00496c>

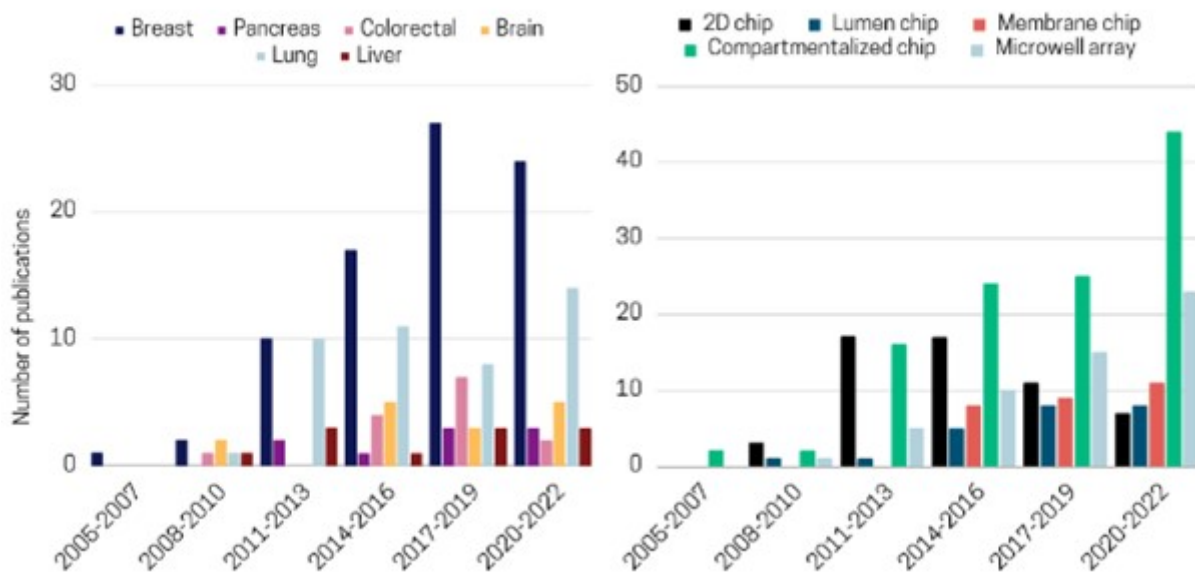


Figure S3: Evolution of ToC during the last 10 years