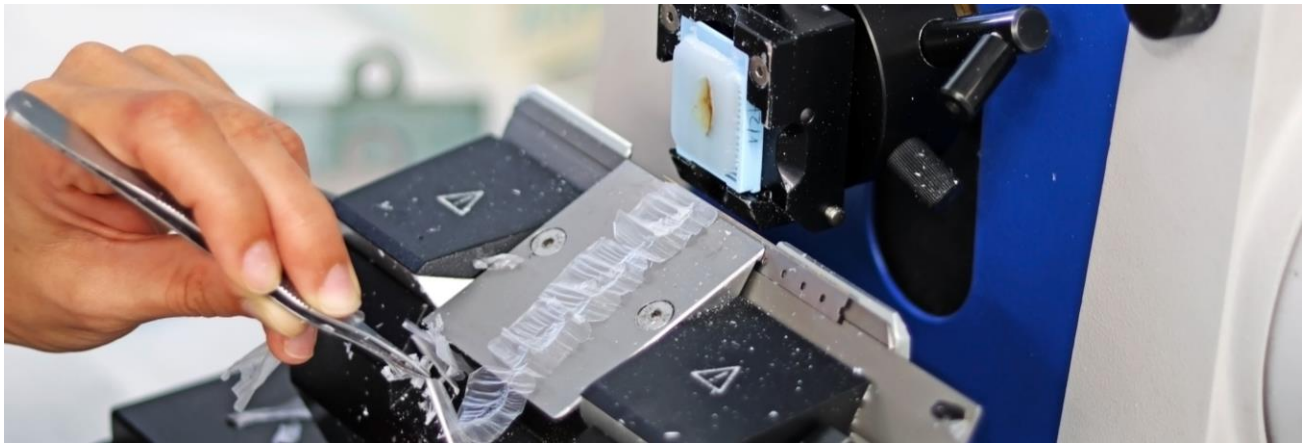
Licensing Opportunity

Aligning microtissues/organoids/spheroids in microtome blocks for rapid histological processing and analysis



Application

Acoustofluidic focusing aligns microtissues such as organoids, spheroids and tumoroids in a single plane of a microtome block. Consequently, the samples are easy to locate inside the block. Microsectioning a thin slice of the plane yields a maximum of samples, thus, rendering microscope analyses and down-stream processing more efficient.

Features & Benefits

- concentrates samples within in a plane of the microtome block
- aligns samples of various sizes (tested for spheroids 100 µm – 500 µm)
- 80% of the samples have their center of mass within +/- 100 µm of the plane

Publication

- D. Deshmukh et al.,"Acoustofluidic patterning for improved microtissue histology", Preprint (2025) http://dx.doi.org/10.1101/2025.02.09.637288
- Patent pending, PCT/EP2024/060082

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Technology Readiness Level

1 2 3 4 **5** 6 7 8 9

Background

Microtissues are important in disease modeling, drug testing and clinical studies with patient derived cells. The limited availability of sample material requires optimized workflows with a minimum of sample loss. Histology is the primary method for analyzing microtissues. Samples are prepared by embedding microtissues inside a processing gel, which then undergoes paraffin embedding. Thin slices are cut from the paraffin block for imaging. With a random distribution of the microtissues inside the block, lots of slices have to be cut to locate the samples with a risk of losing part of the samples.

Invention

Pre-patterning of microtome blocks facilitates the concentration and localization of microtissues. The preparation starts with patterning microtissues within a hydrogel inside an acoustofluidic device. A standing acoustic wave drives the samples (i.e. their centers of mass) to a predefined plane in the channel. Gelling the hydrogel freezes the sample distribution. The solidified bar from the acoustic channel is placed into more liquid hydrogel to form a block precursor, which is then gelled and the water exchanged by resin or wax. Note that multiple such pre-patterned bars can be added in co-planar layers to further increase sample concentration within the microtome block. Adding dye to the bars or the surrounding hydrogel volume helps to identify the region of interest for the microtome operator.

The acoustofluidic method was successfully tested on liver and osteosarcoma microtissues, which vary in tissue size and shape, thus, demonstrating the robustness and versatility of the approach.