



Encapsulation of Cancer Stem Cells (CSCs)

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Introduction

Cancer Stem Cells (CSCs) are proposed to be the root cause of relapse, drug resistance, and metastasis of cancer in the body, yet they are still widely misunderstood and hard to isolate. The hypothesis is that CSCs in isolation will produce clones on their own without being accompanied by another cell, while non-CSCs will die.

Impact: If CSCs can be encapsulated and differentiated, scientists can understand and target cancer related therapies to attack these cells which would immensely advance cancer therapeutics research.

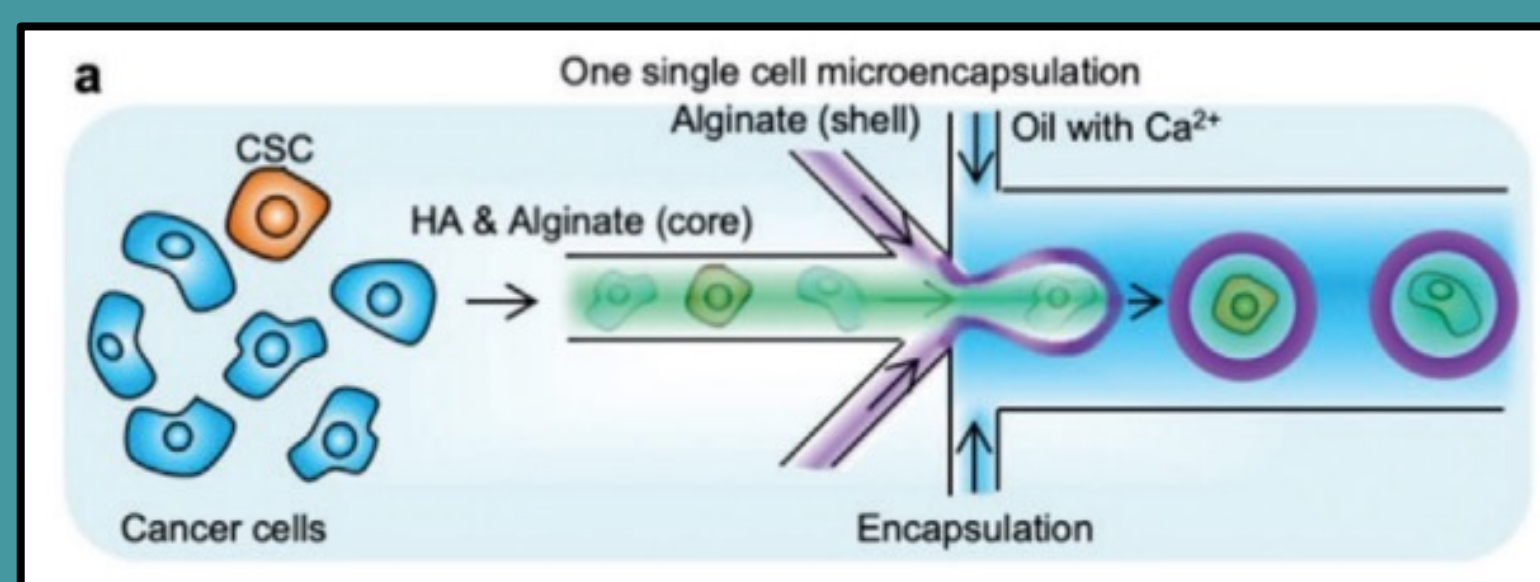
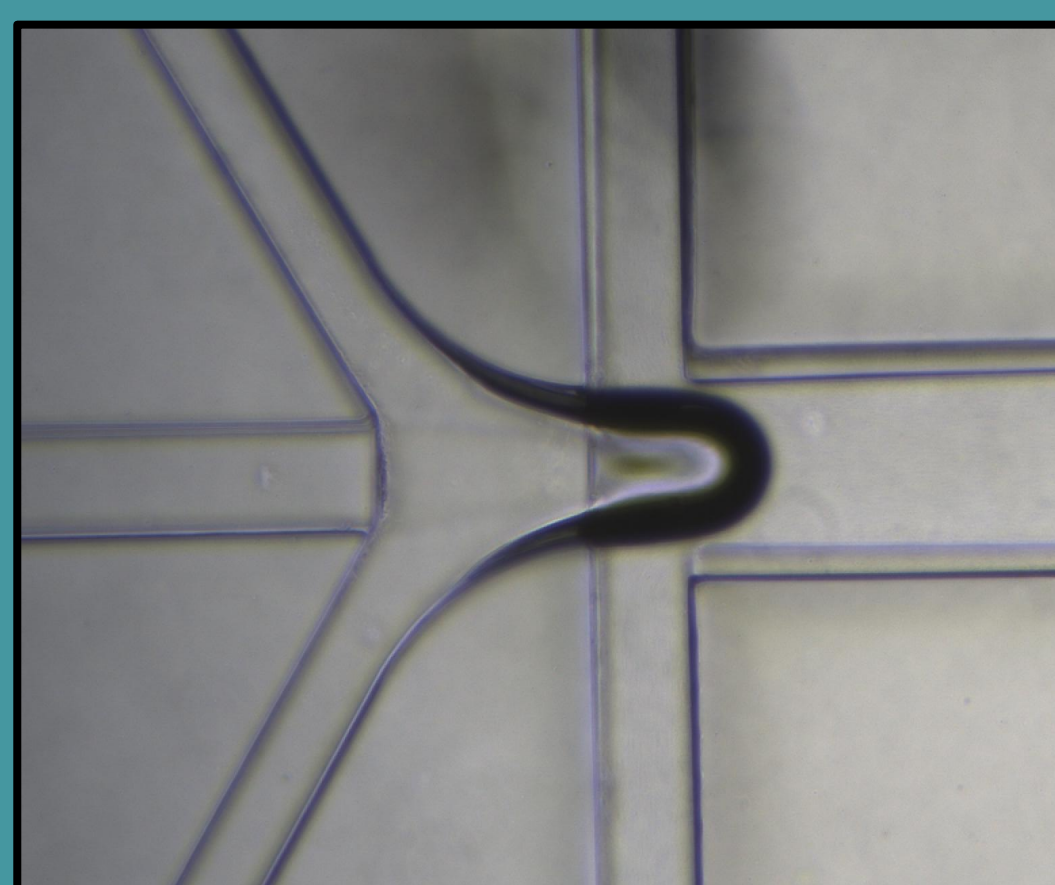


Image from "Bioinspired One Cell Culture Isolates Highly Tumorigenic and Metastatic Cancer Stem Cells Capable of Multilineage Differentiation". *Advanced science (Weinheim, Baden-Wuerttemberg, Germany)*, 7(11), 2000259. <https://doi.org/10.1002/advs.202000259>

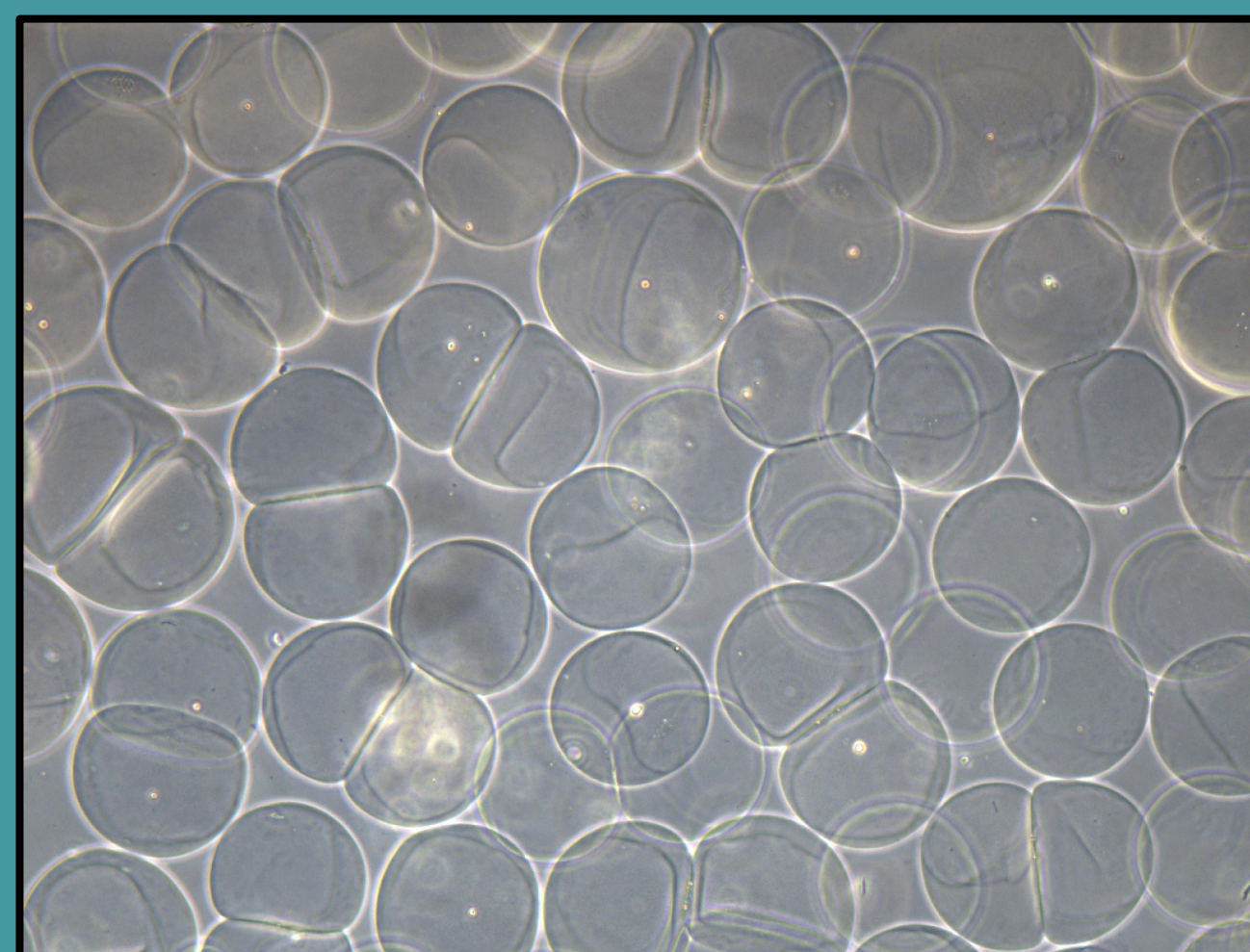


The PDMS device being used to run microfluidics experiment. The device itself has very small channels that allow the core solution, shell solution, and oil solution to simultaneously meet at its "T" junction in order to form the capsules

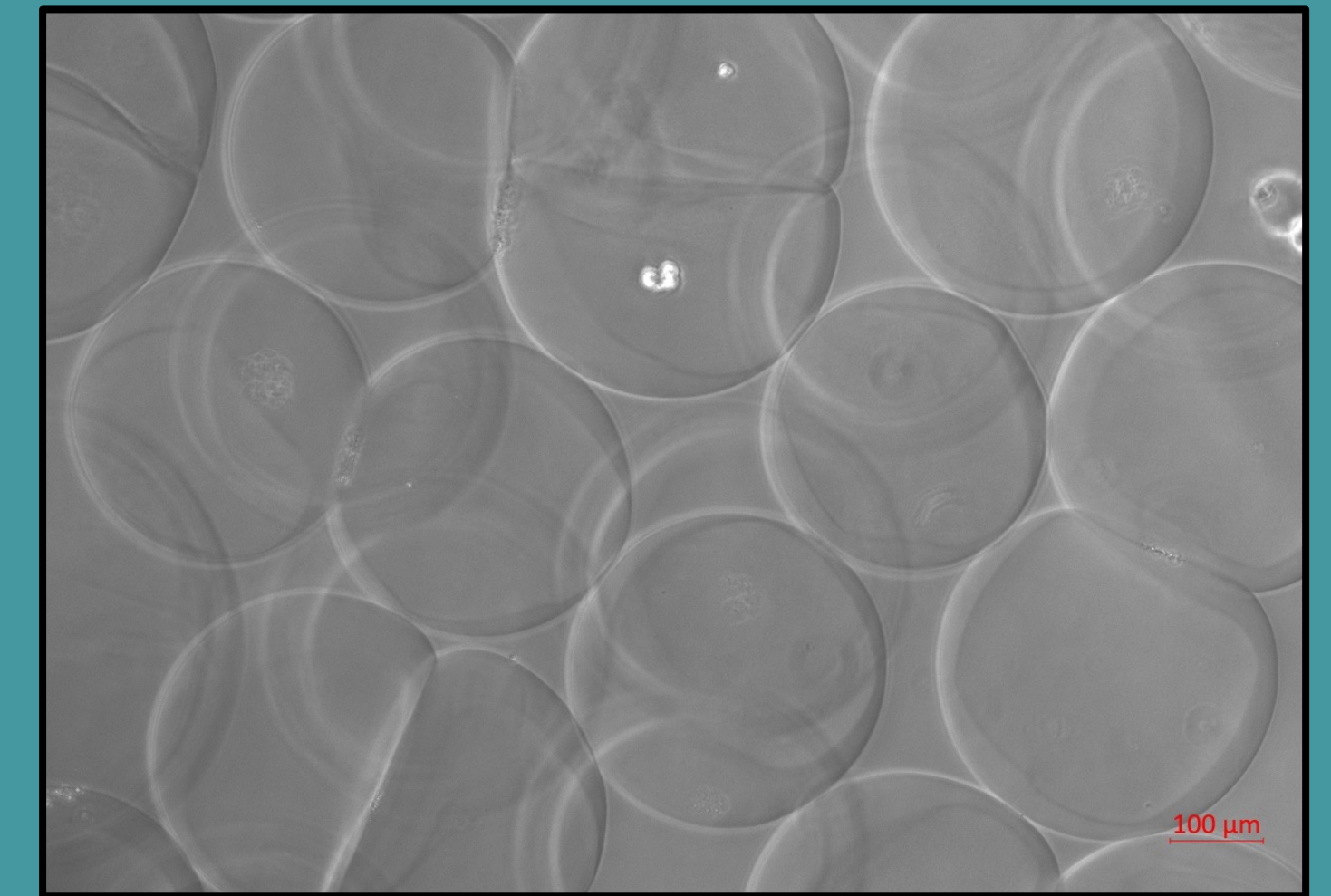
Activities:

- Making Polydimethylsiloxane (PDMS) devices for microfluidics experiments
- Running microfluidics experiments to encapsulate MDA-MB-231 and MCF-7, advanced breast cancer cells, in Hyaluronic Acid and Alginate
- Culturing, and growing capsules to allow the proposed stem cells to differentiate between the non-stem cells (grow or die)
- Separating and re-encapsulating the cells that produced clones (supposed CSCs)
- Performing cryosections on the capsules and testing the samples for specific markers

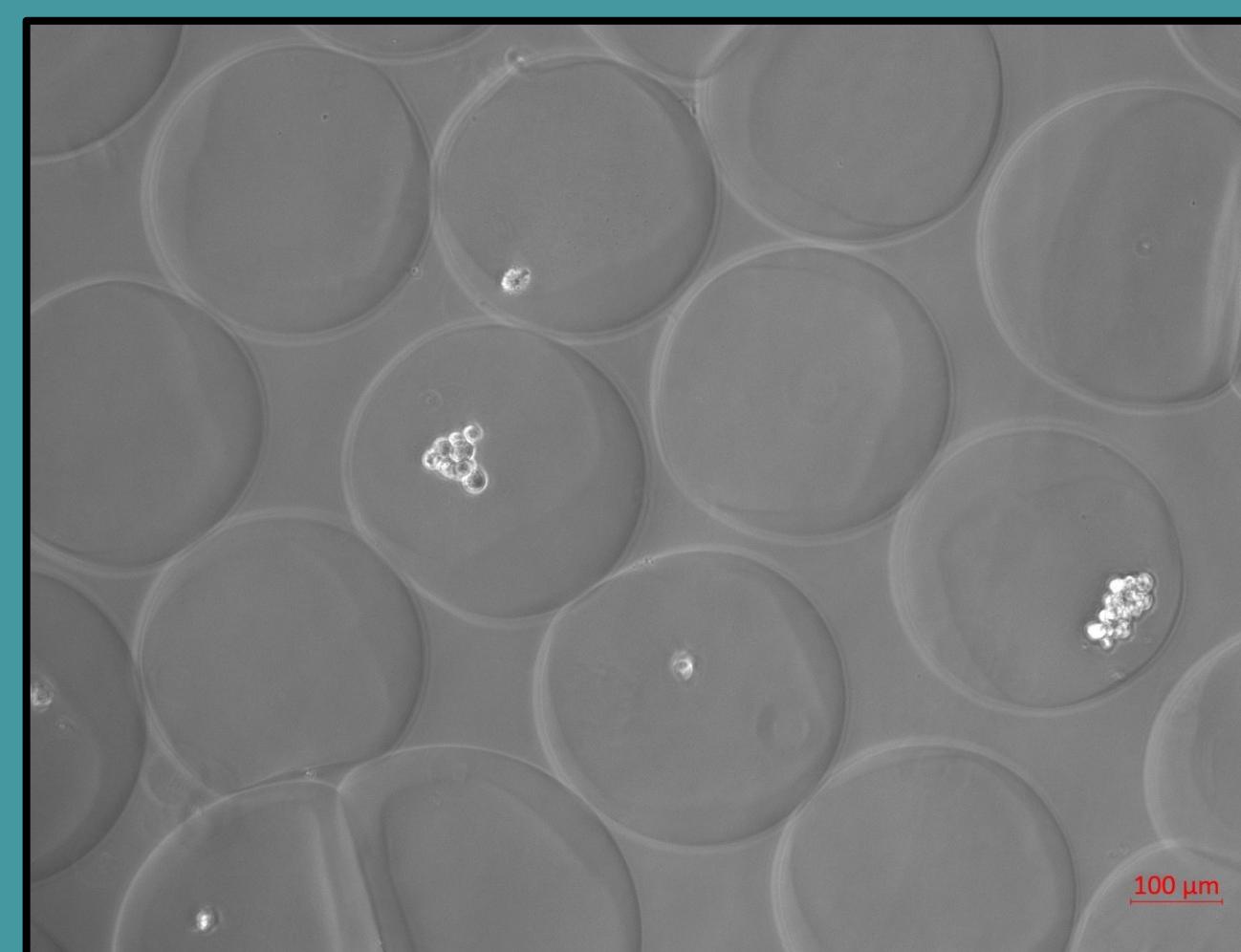
Day 1



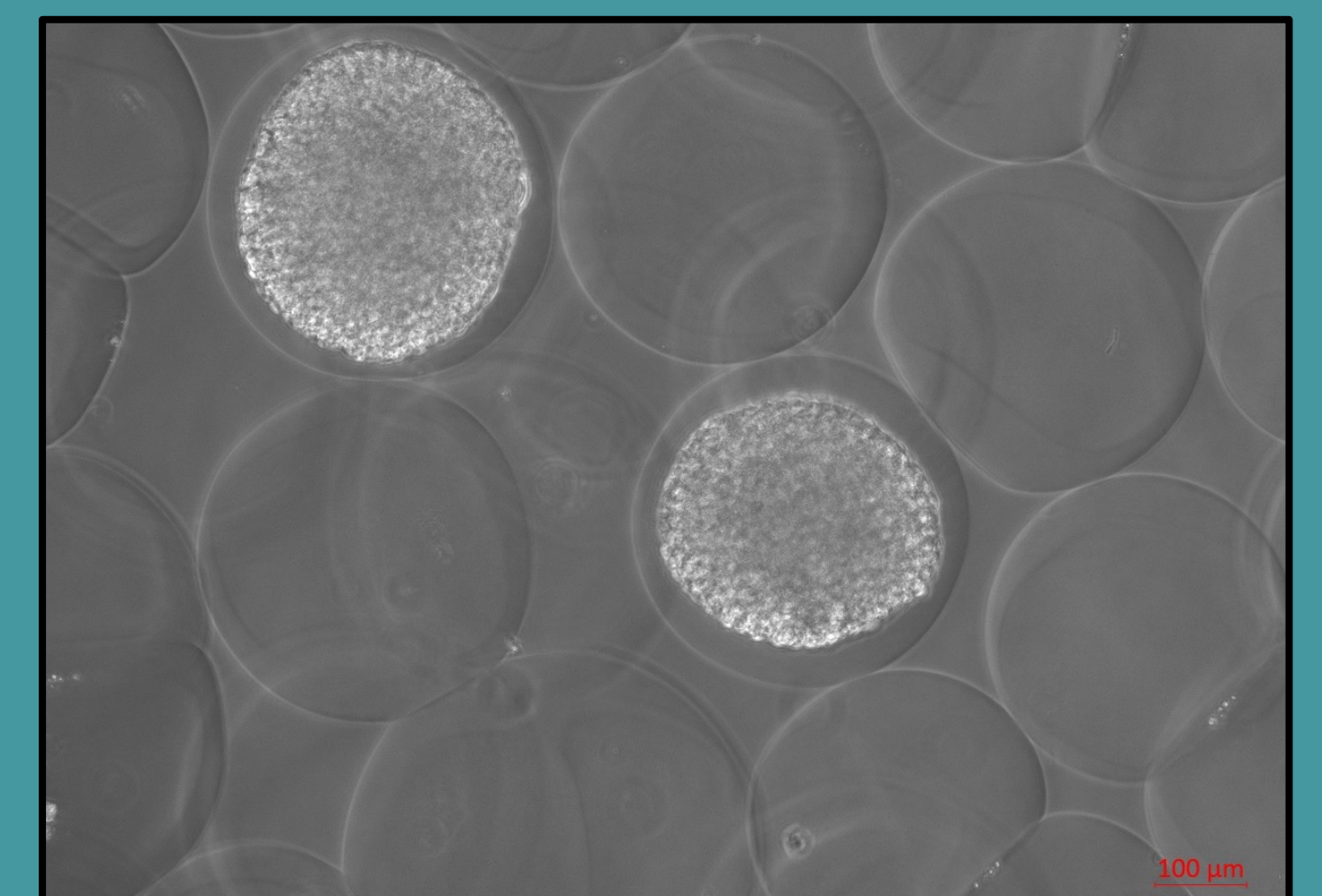
Day 5



Day 7



Day 12



A natural progression of successfully encapsulated cancer cells differentiating between CSCs and non-CSCs. The cells are cultured in CSC media and re-encapsulated after a two-week period due to rapid growth causing the clones to outgrow their capsules.

Results:

As shown in the images, certain cells in the capsules grew while others died. We can suspect the ones that grew are stem cells. The next step would be to manually separate these cells from the non-CSCs and re-encapsulate. Then we can cryosection the capsules and test them for different markers which would further confirm the stemness of the cells.

Future Work:

I plan on continuing this research in Dr. He's lab until graduation, and maybe further into PhD school. While I enjoy biotech and therapeutics research, I would still like to continue exploring the various fields in bioengineering and experience work in the medical device/instrumentation fields.

Site Information:

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