

Design and development of a portable organ-on-a-chip incubator (*New - Winter 2019*)

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Organ-on-a-chip (OOC) systems are microfabricated devices that combine living cells, biomaterials, and other biological elements together with microscale feature geometries and microfluidics to mimic the structure, function, and physiology of real tissues and organs. OOCs are quickly emerging as a powerful technology with significant advantages over traditional experimental models. A major challenge, however, is maintaining cell viability with OOCs, particularly when OOCs are transported between labs. Thus, there is a need to design and develop a low-cost and portable incubation system with active control of temperature, humidity, and CO₂ concentration. The goal of this project is to design a hand-held, battery-operated version of a laboratory-scale incubator, with the ability to maintain living cells in culture for up to a day without loss of cell viability or function. The student will be involved with developing the concepts related to thermodynamic and environmental control within this portable incubator, with potential to expand the project to include on-board imaging capabilities.

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Research Area: Microfluidics; biofluid mechanics; microscale cell-based systems; cellular microenvironments; microfabrication; cell biology; cell imaging and microscopy; biomedical engineering; and cancer.