Tissue engineering doesn't have to cost a fortune- An ultra-low-cost autoclavable tissue engineering platform for perfusion and syringe-based cell culture

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While tissue engineering offers the promise of revolutionary innovation, the cost of bioreactors necessary for large construct tissue culture is often prohibitive. Using our methods, several perfusion-capable tissue-culture devices were built for under 25 USD per device. These devices allowed large 3D tissue culture devices-up to 50 mm×50 mm - to be maintained in a sealed sterile environment after assembly, avoiding the problems associated with unsealed petri dishes. Our devices consisted of individual autoclavable containers with multiple access ports. Media changes were performed via peristaltic pump perfusion or with syringe-based cell culture techniques through luer-lock stopcocks. Tissue constructs were live-imaged with light-microscopy through the window section of the device and fluorescent-protein-expressing cells were imaged with inverted fluorescence microscopy. The low cost of component parts allows rapid customization for individual experiments, including the addition of separate inlets to adjust media level in compartments of the device. Notably, these devices were maintained on perfusion culture with a pump external to the incubator for 14 days and developed no contamination. While original models of our devices used silicone and parafilm to hold the tubing in place in the lid, newer iterations seek to utilize custom-designed pieces of PDMS that will hold the tubing in place and obviate the use of adhesives for device construction. We hope to make the device even easier to assemble, with quick-locking pieces to streamline assembly.

Biography

Ryan Bender is currently pursuing his MD at SUNY Downstate Medical Center in Brooklyn, NY and is also working on his research at the Laboratory of Bioregenerative Medicine and Surgery at Weill Cornell Medicine in New York. He has completed his Graduation cum laude from Cornell University with a degree in Biological Engineering and a minor in Biomedical Engineering.

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