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Hand-powered microfluidics: A membrane pump with a patient-to-chip syringe interface BRENDAN MACDONALD, MAX GONG, University of Toronto, TRUNG NGUYEN, National Hospital for Tropical Diseases, Hanoi, Vietnam, DAVID SINTON, University of Toronto — In this talk, an on-chip hand-powered membrane pump with a robust patient-to-chip syringe interface is presented. This approach enables safe sample collection, sample containment, integrated sharps disposal, high sample volume capacity, and controlled downstream flow with no electrical power requirements. Sample is manually injected into the device via a syringe and needle. The membrane pump inflates upon injection and subsequently deflates, delivering fluid to downstream components in a controlled manner. The device is fabricated from poly(methyl methacrylate) (PMMA) and silicone, using CO_2 laser micromachining. Pump performance is experimentally demonstrated and the behavior is subsequently modeled with reference to a resistor-capacitor electrical circuit analogy. Downstream output of the membrane pump is regulated, and scaled, by connecting multiple pumps in parallel. The device provides precisely controlled pumping rates and high volume throughput without any electrical power requirements.

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