

Pulsatile Pump for Decoupled Pressure & Flow



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Medical technology and devices



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Problem

Vascular bioreactors that replicate complex human physiological conditions are critical for research and development in cardiovascular regenerative medicine. Existing vascular bioreactors attempt to incorporate pulsatile flow using positive displacement pumps. However, these struggle to accurately simulate physiological waveforms due to the inherent link between pressure and flow outputs.

Solution

This invention relies on the principle of pressure-driven flow. It utilises two gas-filled chambers, connected to both ends of the vascular construct, which work in tandem to control pressure at each end. This enables independent control of the axial pressure gradient (proportional to flow rate) and absolute pressure.

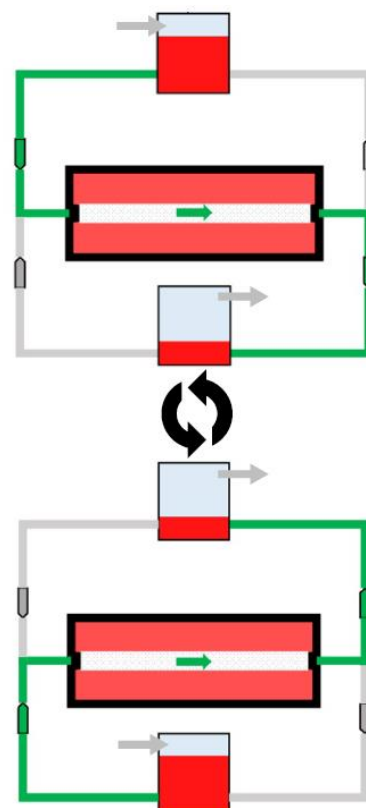
The decoupling of flow and pressure in this way presents more accurate simulation of biological conditions. Experimental results indicate that cells cultivated using this pumping system demonstrate a closer resemblance to cells in physiological conditions than to those grown with traditional pumping systems.

Intellectual Property Status

This invention is protected by international patent application PCT/AU2023/050061.

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Schematic of the pumping process

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