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# Effect of Acoustic Standing Waves on Cellular Viability and Metabolic Activity

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**Abstract**

Acoustic standing wave devices offer excellent potential applications in biological sciences for drug delivery, cell manipulation and tissue engineering. However, concerns have been raised about possible destructive effects on cells due to the applied acoustic field, in addition to other produced secondary factors. Here, we report a systematic study employing a 1D resonant acoustic trapping device to evaluate the cell viability and cell metabolism for a healthy cell line (Human Dermal Fibroblasts, HDF) and a cervical cancer cell line (HeLa), as a function of time and voltages applied (4–10 Vpp) under temperature-controlled conditions. We demonstrate that high cell viability can be achieved reliably when the device is operated at its minimum trapping voltage and tuned carefully to maximise the acoustic standing wave field at the cavity resonance. We found that cell viability and reductive metabolism for both cell lines are kept close to control levels at room temperature and at 34 °C after 15 minutes of acoustic exposure, while shorter acoustic exposures and small changes on temperature and voltages, had detrimental effects on cells. Our study highlights the importance of developing robust acoustic protocols where the operating mode of the acoustic device is well defined, characterized and its temperature carefully controlled, for the application of acoustic standing waves when using live cells and for potential clinical applications.

**Keywords:**

Acoustic field, standing waves, cell viability, cavity resonance, HeLa, Human Dermal Fibroblasts, cell manipulation

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