

Prof Nicolas Place
Institute of Sport Sciences FBM
(ISSUL) Quartier UNIL-Centre
Bâtiment Synathlon
Office : 3120
nicolas.place@unil.ch
021 692 38 06



Design of a force measurement device for 3D skeletal muscle cell culture

What is the problem?

Bioengineered organs are increasingly employed in research to better replicate the *in vivo* functionalities of the target organ. To facilitate this type of cell culture, specialized support devices tailored to the specific tissue of interest are essential.

What is the need?

We have developed a support system to culture bioengineered muscle bundles *in vitro* and quantify their force using a video-based method that measures post displacement. While effective, this method presents significant limitations, including low throughput, lengthy video processing times, and an inability to perform measurements directly within an incubator. To address these issues, we require a displacement detection system that is compatible with the cell culture environment and integrated into the existing culture support. This system should enable real-time, high-throughput measurements while maintaining sterility and functionality in an incubator setting.

What is the benefit (if problem is solved)?

The organ-on-a-chip system would enable the *in vitro* growth of a bioengineered skeletal muscle, followed by the recording of the force generated during its contractions in response to electrical stimulations in culture conditions. This setup offers an excellent model for skeletal muscle, facilitating cutting-edge research in the realms of skeletal muscle contractility and metabolism.

Wrap up

Propose a design for a support device allowing bioengineering of skeletal muscle bundle, compatible with electrostimulation and combined with a force measurement system.