



## **BIOFORCE-SENS**

Development of a strength sensor the molecule screening on in vitro cardiac tissue

## **Project Summary**

The real effect of chemicals, nanoparticles and numerous molecules on human health is nowadays a worry for a growing number of people and companies. To respond to this need a very large number of new tests should be performed. However for ethical and technical reasons animal experiments are more and more limited. An alternative to such experiments requiring only few or even no animal life is based on *in vitro* testing. Most of the current testing techniques are based on dispersed or on monolayer cell cultures. A new and promising *in vitro* technique is based on test models using cultured tridimensional (3D) tissue. Its interest is due to the higher similarity between organized cells in 3D tissue with in vivo tissue. The developed test platform plus sensor microsystem in this project provide a new and promising way to study and screen 3D contractile tissue (e.g. of cardiomyocytes). It has been designed primarily for *in vitro* testing of cardiac tissue in the measuring range up to 2'000 [ $\mu$ N] with a resolution of about 3 [ $\mu$ N]. Access to spatial distribution of strength in the tissue is made possible (e.g. for fine studies on spreading phenomenon).

This new platform and new strength sensor microsystem have been conjointly designed using high performances optical, electronic and mechanical elements. Contractile strength is measured using a novel optomechanical microsystem integrated in the culture chamber designed as a low-cost consumable to be simply placed in the test platform. This chamber is controlled in temperature through a closed loop system integrated in this instrument. Specifically designed software controls the whole system, the data acquisition and processing. Full metrological characterization has been successfully performed. Biocompatibility of the materials used has been successfully tested and first experiments with cardiac tissue have started. Biological validation of this platform and sensor microsystem was not a part of this project and will be carried out and reported in a separate work.

An improved understanding of the mechanical phenomenon behind contractile biological tissue and its sensitivity to chemicals, nanoparticles and various molecules is expected out of this development.

## **Valorisation**

First steps to protect the intellectual property (IP) have been performed regarding the innovative design and fabrication method for the sensor microsystem. Next steps will be taken once the work for biological validation is accomplished.

Proposals for biological validation and optimization of the platform plus sensor microsystem have been submitted to a FP7 EU project and a Swiss National Science Foundation in collaboration with our partner from the Medical Center at UNIGE.

Publication works of this project results are still suspended for a time due to IP issues to be solved.

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This project has been carried out at hepia HES-SO//Geneva in collaboration with Capsant Neurotechnologies Ltd and UNIGE







