

Development of method for identifying and isolating viable, non-labelled cells by telomere length

Summary

Dielectrophoresis is a method which creates polarization of cells as a response to electric field gradient. In the framework of this project, the method will be optimized in such a way that permits its applicability in selecting adipose tissue-derived, viable, non-labelled mesenchymal stem cells from a heterogeneous stem cell population according to their telomere length on a microflow biochip which is a novelty. Selection of viable, non-labelled stem cell populations with long telomeres can be beneficial for therapeutic purposes, as replicatively aged cells with low potency and increased risk for oncogenesis would be removed. Stem cell subpopulations sorted by telomere length can be utilized also for the development of organ 3D models (“Skin-on-a-chip”, “Organ-on-a-chip”) in order to study aging processes and age-related diseases such as cardiovascular diseases, diabetes, and cancer. A properly optimized dielectrophoresis method can be applied in conventional and precision (personalized) medicine, pharmaceutical industry as a tool for drug development, as well as cosmetology to test different cosmetic substances.

Objective

To optimize dielectrophoresis method for selection of viable, non-labelled stem cells according to their telomere length from a heterogeneous stem cell population on a microflow biochip.

Planned actions, expected results

1. Determination of parameters for dielectrophoresis (DEP): development of equipment, elaboration of a method to measure DEP parameters, validation of the method (using control methods) for stem cell selection according to telomere length with an efficiency of subpopulation selection from a heterogeneous population of >95%.
2. Prototyping of a DEP biochip – the development of equipment (prototype of DEP biochip) for sorting of viable, non-labelled cells according to telomere length with a sorting speed of 1 million stem cells per 5 minutes.

Duration of implementation: 36 months

Budget EUR 133 805.88