

STEM CELLS AND THEIR DERIVATIVES – CURRENT PERSPECTIVES IN TISSUE ENGINEERING AND REGENERATION

EWA ZUBA-SURMA*

DEPARTMENT OF CELL BIOLOGY, FACULTY OF BIOCHEMISTRY, BIOPHYSICS AND BIOTECHNOLOGY, JAGIELLONIAN UNIVERSITY, KRAKOW, POLAND

*E-MAIL: EWA.ZUBA-SURMA@UJ.EDU.PL

[ENGINEERING OF BIOMATERIALS 148 (2018) 39]

Abstract

Several current approaches in tissue and organ regeneration focus on applications of recent achievements of cell-based therapies and biomaterial sciences. Such combined approaches relying on both components such as stem cells (SCs) with high regenerative potential and new biocompatible scaffolds opens new opportunities in tissue engineering and injured organ treatment.

Several types of SCs with multi- and pluripotent characteristics such as mesenchymal stem cells (MSCs) of various origin and induced pluripotent SCs (iPSCs) have been indicated as potential source of cells for therapy. When combined with optimized biocompatible carriers and scaffolds, such SC fractions become leading targets for cell-based regenerative applications in several tissue injuries.

Although such SC populations have been employed in experimental therapies of several organs injuries as well as in clinical studies, there is still discussion which subpopulation/s would be the most efficient and safe for therapies in humans. The selection of the optimal cell population for tissue regeneration would include predominantly safety aspects as well as major mechanisms of action critical for a specific tissue repair that are provided by specific SC population. Such mechanisms of SC activity includes extracellular vesicles (EVs) release. Such stem cell derivatives may modulate endogenous cell functions in place of transplantation by transferring several bioactive SC-derived molecules including proteins and transcripts.

Thus, the newest trends in tissue regeneration would focus not only on combined applications of biocompatible materials with selected and optimized SC fractions, but also with their bioactive derivatives such as EVs. However, successful applications of SCs and their derivatives in regenerative medicine requires safety, ethical acceptance and therapeutic efficacy, which still need further investigations and optimization.

Acknowledgments

This study was funded by The National Centre for Research and Development (NCBR) in the program STRATEGMED III (project no. STRATEGMED3/303570/7/NCBR/2017)