

Foreword

The 6th China–France International Symposium “Stem Cells and Regenerative Medicine” and first meeting of the France–China International CNRS Network (GDRI) CeSMER (Nancy, 10–13 July 2016)

J.F. Stoltz, J. Magdalou* and D. Bensoussan

Guest Editors

Most human tissues do not regenerate spontaneously. This is why the development of biotherapies with stem cells represents promising alternatives. The principle is simple: cells collected from a patient or a donor are either introduced with or without modifying their properties (by gene transfection for example) into a scaffold primarily made of three-dimensional porous polymers, or cultured in a bioreactor in which physicochemical parameters and mechanical stress are controlled. Once the tissue is fully mature or the number of cells adequate, engraftment may be performed. *In vitro* preparation of biotissues such as bone, tendon, cartilage, skin, blood vessels, cardiac muscle inspires great hopes for the next decades, with perspectives of new therapies to restore tissue functions or for disabling disorders such as myopathies and degenerative neurological diseases. It is estimated that annual expenses linked to these emerging activities will amount to 100 billion US\$ during the next 10 years.

The concept of *regenerative medicine* is a new emerging multidisciplinary field involving surgery medicine, biology, chemistry, mechanic and engineering. It can be defined as “*the way to improve the health and quality of life by restoring, maintaining or enhancing tissue and organ functions*”. . . . A large number of experimental differentiation methods has been developed for each tissue or type of therapy. Moreover, mechanical stress influences the differentiation of cells that are used. Such changes are now considered as critical not only for understanding pathological mechanisms (inflammation, atherosclerosis, etc.) but also for tissue reconstruction. For example, the quantities and quality of bone obtained depend on the intensity, magnitude, and frequency of mechanical stress. This fact seems natural since it is well known that prolonged immobilization, implying absence of mechanical stress, weakens bone and muscles and decreases their respective mass.

*Corresponding author: Jacques Magdalou, UMR 7365, Ingénierie Moléculaire et Physiopathologie Articulaire, CNRS-Université de Lorraine, Biopôle de l'Université de Lorraine, Campus Biologie Santé, 9 Avenue de la Forêt de Haye, BP 20199, 54505 Vandoeuvre Lès Nancy cedex, France. E-mail: jacques.magdalou@univ-lorraine.fr.

Among possible medium-term therapeutic applications are cardiac insufficiency, treatment of atherosclerosis, diabetes, erectile dysfunction in diabetes patients or post prostatectomy, bone repair and osteoporosis, cartilage defect, burns, liver or bladder regeneration, and neurodegenerative disorders. The biological potential of stem cells is not well known yet. Cells needed for regenerative medicine could be obtained from various sources including bone marrow, umbilical cord, placenta and amniotic fluid.

Many problems remain to be solved:

Scientific and technical knowledge for the development of innovative strategies to facilitate cell differentiation, increase the yield of cells and ensure standardized products is lacking.

We have to overcome the risks of teratogenic effects or immune reactions, enable grafting via direct cell or biotissue transplantation and avoid legal issues involved in national regulations.

It can be noted that today the focus has switched from organ growth to cell therapy where cells are often implanted directly to restore damaged or diseased tissues. Progenitor cells currently represent an expanding area of research, stimulated by their potential applications in cell therapy and tissue repair.

Thus, the issue of *in vitro* tissue or cell culture is multifaceted as it involves genetics for the choice of initial cells (progenitor cells, differentiated cells or genetically modified cells), biochemistry for the choice of the polymeric scaffold and of the medium and for oxygen control, and mechanics for the magnitude and frequency of mechanical stress and for transport of diverse components. Moreover must be added practical consideration on the size and shape of materials produced that must allow the physiological milieu to circulate everywhere during the growth period. Finally once good quality tissue or cells have been obtained; one must be able to use them to replace the damaged tissue while ensuring adequate compatibility.

The present proceeding do not claim to cover all aspects of regenerative medicine or cell therapy, however the communications presented underline the interest of several clinical researches in this field.

After the “4th China–France Medicine Symposium” in Wuhan (18–19 June 2011) and the 5th symposium in Kunming (12–14 December 2014), the aim of this symposium (Nancy 10–13 July 2016) is to create a network of researchers from China, France and other European countries in regenerative medicine and biotherapy, providing a global overview of the present knowledge, promoting the exchange of information on recent developments in these fields, and seeking a possible international cooperation between these groups. The next 7th symposium will be organized in Shangrao (PR China) in October 2017.

Guest Editors

J.F. Stoltz

J. Magdalou

D. Bensoussan