



Embryonic Stem Cells: From Research to Therapy

C. R. Kemp, D. Wawizak, E. Willems, M. Metioui, M. Hendrickx and Luc Leyns

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ABSTRACT This review focuses on the new discoveries regarding embryonic stem cells by summarizing the scientific advances, outlining the potential benefit for our society and finally raising a few ethical issues. The classic definition of a stem cell is a cell that can divide indefinitely and give rise to differentiated cells of various types. No stem cell is however totipotent, the closest to it are embryonic stem cells and embryonic germ cells which are pluripotent, giving rise to many very different cells types from gut to brain ones. Other stem cells, generally adult cells, are said to be multipotent, giving rise to several related cell types, for example the various blood cells. Only one type of stem cells is however being used routinely in the hospitals during bone marrow transplantation. The recent discovery of human embryonic stem cells that are able to give rise *in vitro* to a large variety of functional cells types, has raised hopes of finding therapeutic solutions for many diseases and health problems, from heart attacks to Parkinson disease, but has not yet yielded therapeutic applications. Since the ES cells are the most pluripotent stem cell type existing, they could be viewed as the ultimate panacea. Several difficulties have already been identified and more will undoubtedly arise but they will most likely be ironed out thanks to the intensive research going on. A few ethical questions also need to be addressed concerning the therapeutical uses of ES and EG cells by transplantation and the use of supernumerary embryos resulting from *in vitro* fertilization and embryos recovered from terminated pregnancies. Finally, the most difficult question is centered around the generation of embryos for the specific purpose of deriving ES cells. We would like to emphasize the fact that embryonic stem cells and germ stem cells have an enormous life-saving potential which no other application has demonstrated to date. We expect that this groundbreaking ES cell technology will be blooming in the coming decade and will deliver numerous therapeutic solutions to health problems.

Authors' Address: C.R. Kemp, D. Wawizak, E. Willems, M. Metioui, M. Hendrickx and Luc Leyns, Vrije Universiteit Brussel, Laboratory of Cell Genetics, 2, Pleinlaan 1050 Brussels, BELGIUM
E-mail: luc.leyns@vub.ac.be