KEYNOTE ADDRESS

P1 Stem Cells in the 21st Century

Ariff Bongso
Department of Obstetrics & Gynaecology, National University of Singapore
Kent Ridge, Singapore

Rapid advances in the field of assisted conception have recently led to the derivation and propagation of human embryonic stem cells (hESCs) from 5-day-old embryos left over from In Vitro Fertilization (IVF) programmes. These cells are very versatile and can be coaxed into almost all the tissues types of the human body and therefore offer promise in the treatment of a variety of incurable diseases by transplantation and gene therapy, provide an ideal screening tool for potential drugs in the pharmaceutical industry and for the first time, allow the study of early human development and what goes wrong in infant cancers. Several hESC lines have been registered with the NIH, USA for research, of which only some are eligible for shipping based on their stability and characterisation. Our group has produced six of these eligible cell lines. All NIH hESC lines have been derived and propagated on mouse feeder cells thus limiting their clinical application for fear of transmission of adventitious agents from mouse to human cells. We derived and have propagated the first hESC line in a completely animal-free *in vitro* system thus making hESC lines safe for use in later clinical applications. Several groups have also been successful in directing these hESCs into desirable cells and tissues such as pancreatic islets, neurons, heart cells and blood cells for future treatment of diabetes, neuronal, cardiovascular and blood borne diseases by cell-based transplantation therapy. Other important studies such as the unraveling of the genetic secrets driving these cells into various tissues are also being undertaken and such results will be useful in the development of proteins and growth factors that could help to produce stable tissues from hESCs. Since the origin of hESCs is from donor embryos, there is concern that hESC-derived tissues may be rejected and as such, attempts to customise tissues for patients is being attempted via therapeutic cloning. Progress is also being made on the isolation and differentiation of adult mesenchymal, bone marrow and umbilical cord stem cells for future cell based therapies. The background to all these studies will be presented and discussed.