MEETING REPORT

Stem cell research and therapy*

To place India in an advantageous position in the fast-developing global stem cell market, there has to be strategy in place. The Indian Council of Medical Research (ICMR) and the Department of Biotechnology (DBT) have plans for a national stem cell initiative prioritizing research funding, focusing on clinical applications and promoting 'stem cell city clusters' in India. The National Task Force on Stem Cell Research established at New Delhi in April 2005 will be taking these plans forward. To look at the current regulatory scene in our country as well as the potential of stem cells in the future, KLES Kidney Foundation, KLES Hospital and MRC, Belgaum organized a national seminar on stem cell research and therapy. There were 97 participants from different institutions of India.

R. B. Nerli (Director, KLES Kidney Foundation) spoke on the present scenario regarding stem cell science in India. P. B. Seshagiri (Indian Institute of Science, Bangalore), in his inaugural address spoke on 'Stem cell research: Perspectives and prospects'. Embryonic stem (ES)-cells are derived from the inner cell mass of blastocysts. Though the first mammalian (mouse) ES-cells were derived about 21 years ago, the relatively recent generation of primate (including human) ES-cells has generated enormous excitement. This is because the ES-cells have the extraordinary potential to act as a model system for studying early human development, including cell differentiation. More importantly, they have immense potential for cell-based (transplantation) therapy, following lineage-specific differentiation, for various human diseases such as diabetes mellitus, myocardial infarction, Parkinson's disease, etc. In recent years, there have been attempts to use somatic stem cells (from the bone marrow, umbilical cord) for cell therapy for the above diseases. Evidence has been forthcoming for achieving differentiation of human ES-cells to functional neuronal cells or β-islet cells and for the successful experimental cell-transplantation in model organisms, which has been quite promising. Despite these advances, there is need for a thorough understanding of the biology of inducing directed-differentiation of ES-cells to various cell types *in vitro* and *in vivo*. In this context, environmental and growth factors regulating differentiation of ES-cells are aggressively being studied. Moreover, the methodology to obtain uniform population of differentiated cells, their selection (sorting) and enrichment from within a heterogeneous differentiated-cell population is being evolved. Future prospects for stem cell technology and for its potential use in cell transplantation medicine are quite promising.

Aparna Kanna (Reliance Life Sciences Pvt Ltd, Mumbai) in her keynote address spoke on 'Human embryonic stem cells and their applications'. In Reliance Life Sciences, the embryonic stem cell programme is involved in developing cell therapies to address neural, cardiac and metabolic disorders. The recent derivation and in-depth characterization of a new human embryonic stem cell line, ReliCell®hES1, which displayed *in vitro* differentiation potential and found to be capable of giving rise to dopaminergic neurons, cardiomyocytes, pancreatic islets and hepatocyte-like cells belonging to ectoderm, mesoderm and endoderm lineages respectively.

Ramanand Nadig (Manipal Hospital, Bangalore) spoke on 'Relevance of stem cell research and clinical implications'. He reported his experience with stem cell therapy in myocardial infraction, spinal cord injury, leg ischaemia, etc. and hypothesized the mechanisms. K. Udaykumar (Manipal Hospital) spoke on 'Human mesenchymal stem cells: Basic biology and clinical application'. Mesenchymal stem cells (MSCs) are a well-characterized population of adult stem cells. These cells are found in the bone marrow, and can form a variety of cells in the laboratory, including fat cells, cartilage, bone, tendon and ligaments, muscles cells, skin cells and even nerve cells. MSCs represent a small fraction (0.001–0.01%) of the total population of nucleated cells in the marrow. However, they can be isolated and expanded with high efficiency, and induced to differentiate to multiple lineages under defined culture conditions. These cells can be maintained and propagated in culture for long periods, without loosing their capacity to form different kinds of cells. These cells have generated a great deal of interest because of their potential use in regenerative medicine and tissue engineering. Both pre-clinical and clinical studies offer examples that illustrate the therapeutic value of MSCs.

In his valedictory address, P. B. Seshagiri stressed on the need to start a Regenerative Medicine Department at the KLES Hospital for the benefit of people in the northern part of Karnataka.

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