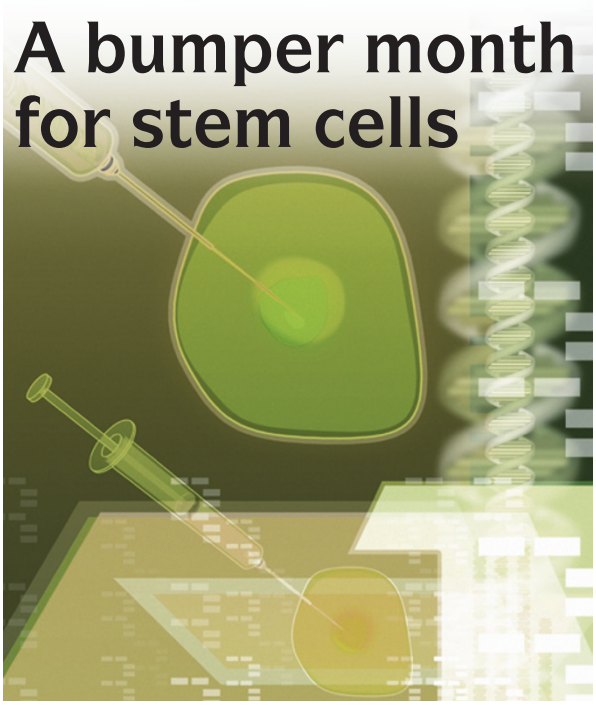
STEM CELLS

A bumper month for stem cells



Each advance in stem cell research brings us closer to realizing the much-discussed potential of these cells for basic research and repair strategies. Several exciting new papers address some of the technical and ethical challenges that are facing the field.

The ability to obtain patient-specific pluripotent cells would have advantages for research into inherited diseases and could alleviate immune rejection in transplantation strategies. Somatic cell nuclear transfer (SCNT), in which the nucleus of an adult somatic cell is transferred to an oocyte to generate embryonic stem (ES) cells, could provide one means to achieve this. Mitalipov and colleagues have now reported the first successful attempt at SCNT in primates, producing two ES cell lines from fibroblasts from an adult rhesus macaque.

For those wishing to avoid the use of donated oocytes or human embryos, from which many human stem cells are derived, the advent of methods to directly reprogramme adult somatic cells into a pluripotent state would be welcomed. Two papers by the groups of Thomson and Yamanaka describe the reprogramming of adult human fibroblasts to a pluripotent state by the addition of just four genes by retroviral transfer. Furthermore, a follow-up report by Yamanaka has now shown that the reprogramming can also be achieved by introducing only three genes, avoiding the need to introduce the tumour-promoting *c-Myc* gene. Although the technique remains some way from translation to the clinic, this is an important first step towards such goals and can provide an important source of patient-specific cells for research.

Regardless of the method by which they are obtained, it would be advantageous to be able to genetically manipulate stem cells. Now, Keller and colleagues have identified the human counterpart of the *Rosa26* locus, a site commonly targeted for gene insertion in mice, paving the way for efficient manipulation of gene expression in human ES cells.

An understanding of how to differentiate pluripotent cells into specific cell types will be essential for their therapeutic use, and will give important information about developmental regulatory mechanisms. Studer and colleagues have now described the isolation and differentiation of a population of neural crest stem cells (NCSCs) from human ES cells. When transplanted into chick embryos or adult mice, the cells survived, migrated and differentiated into various neural crest cell derivatives, including peripheral neurons and Schwann cells. This technique can provide a source of NCSCs for both research and therapeutic purposes and also sheds light on the temporal order of the development of different neural-crest-derived cells.

The progress in our understanding of how to generate and manipulate pluripotent cells is important for neuroscience research at all levels, including basic research, drug development and clinical applications. A key area of future research for neuroscience will be to understand how to channel and restrict the differentiation of stem cells to specific lineages, a feat that will be crucial for the future use of such cells in cell-replacement strategies.

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ORIGINAL RESEARCH PAPERS

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