

## GENERATION OF MULTI-LINEAGE PROGENITOR CELLS FROM HUMAN PLURIPOTENT CELLS

First step towards regulated generation of fully differentiated cells grown in humanised chemically defined media.

### Key Features:

- Simple and efficient method for generating progenitor cells committed to specific germ layers from which all adult cells are derived
- Easy and reliable method for expanding populations of pluripotent cells using specific growth factors
- Large-scale culture of primary cells or biopsy material

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## Background

Current methods to differentiate stem cells are limited by the quantity of growth factors required for large scale application and the use of media comprising animal products, which renders cells incompatible for clinical applications. These methods for generating pluripotent cells also require human embryonic cells to be grown in culture conditions during prolonged periods of time, which can result in loss of pluripotency and acquisition of genetic abnormalities. A simple method of differentiating human embryonic stem cells into multi-lineages and for expanding populations of pluripotent cells is therefore needed to satisfy both therapeutic and research applications.

## Technology

Professor Roger Pedersen and his team at the University of Cambridge's Laboratory for Regenerative Medicine have developed a novel means of generating neuroectoderm, endoderm and mesoderm progenitor cells from human embryonic stem cells using humanised chemically defined media with differentiation factors that modulate one or more of the Activin/Nodal, FGF, Wnt or BMP signalling pathways. This method is a

first step towards regulated generation of fully differentiated cells to produce a large variety of cell types. The method further provides a means for expanding populations of pluripotent cells.

The culture conditions required are devoid of animal products, eliminating factors that obscure analysis of developmental mechanisms and enabling clinical compatibility. Prolonged cell growth in culture in the presence of specific growth factors also prevents cells from losing their pluripotent status. This method therefore allows for large-scale culture of primary cells or biopsy material.

## Potential Uses

- Generates clinical grade progenitor cells for therapeutic applications:
  - To treat damaged or dysfunctional tissue
  - Potential for direct use in transplantation
  - Genetically manipulated progenitor cells may express a drug or growth factor
- Screening for compounds to treat damaged/dysfunctional tissue
- Unique *in vitro* model to study molecular mechanisms controlling cell fate of pluripotent cells during the early stage of mammalian development

## Commercialisation

We are seeking commercial partners for licensing, collaboration and development of this technology.

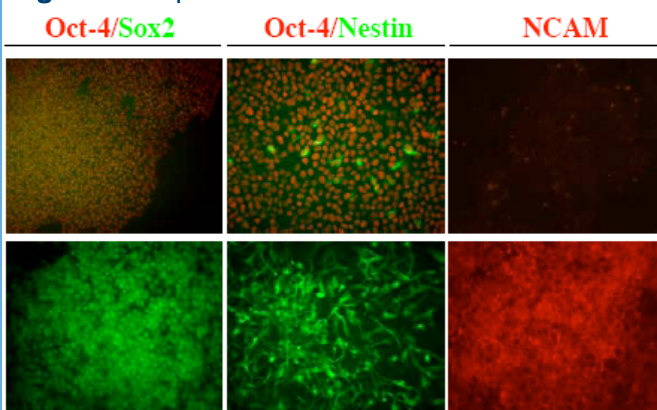
This technology is protected by national patent applications filed in Europe (EP2094833) and US (US100034785A1).

## References

Touboul T, *et al.* Generation of functional hepatocytes from human embryonic stem cells under chemically defined conditions which recapitulate liver development. (2010). *Hepatology*. 51(5):1754-1765.

Vallier L, *et al.* Early cell fate decisions of human embryonic stem cells and mouse epiblast stem cells are controlled by the same signalling pathways. (2009). *Plos One*. 4(6):e6082.

**Figure 1:** Expression of human ES cell markers



Expression of pluripotent (Oct-4), mesendoderm (Brachyury) and neuroectoderm (Sox2, Nestin, N-CAM) markers in human embryonic stem cells after modulation of the Activin/Nodal pathway