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New Stem Cell Centre Gives Hope For Stroke Damage

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Researchers within the University of Adelaide's new Centre for Stem Cell Research are aiming by the end of this year to show repair in stroke-damaged brains using stem cells taken from adult teeth.

The world-leading research using dental pulp stem cells from extracted human teeth and stroke-affected rat brain tissue were outlined as part of the launch on 16 September, 2008 of the Centre for Stem Cell Research.

The focus of the new Centre will be on turning novel basic research into potential life-saving treatments and cures for serious conditions and diseases.

The Centre will draw together almost 100 research scientists and 80 research students from 18 research groups based at the University of Adelaide, the Women's and Children's Hospital, the Institute of Medical and Veterinary Sciences (IMVS), Hanson Institute and the Queen Elizabeth Hospital.

University of Adelaide Vice-Chancellor and President Professor James McWha said the new Centre would help put South Australian researchers at the forefront of stem cell research in Australia.

"The members of the Centre undertake internationally recognised and awarded research on areas such as the isolation of adult and cord blood stem cells, clinical applications including potential cures for stroke damage and cardiac repair, and novel approaches to diseases such as cystic fibrosis and leukaemia," said Professor McWha.

Centre Director and University of Adelaide Principal Research Fellow, Associate Professor Mark Nottle, said: "The focus of the Centre is on translating basic research into clinical and commercial outcomes through collaboration between members and with external partners."

The stroke research project is a collaboration between Dr Simon Koblar, University of Adelaide, and Associate Professor Stan Gronthos, IMVS and Hanson Institute. Last week they started injecting adult dental pulp stem cells into stroke-damaged rat brains and should have preliminary results on therapeutic outcomes by the end of the year.

"Stroke is the leading cause of disability in Australia with 270,000 Australians left with the residue of strokes every year," said Dr Koblar.

"Even if all we can do is get someone's hand function to improve that would be a magnificent advance."

Article adapted by Medical News Today from original press release.

Dental pulp stem cells are highly promising as precursors of replacement neurons (brain cells) because they are easily accessible, can be taken from the patient needing treatment, and they have similar properties to cranial neural crest cells that normally make brain cells and other cranial tissues.

The launch of the Centre for Stem Cell Research took place at 3pm at the National Wine Centre on Tuesday 16 September.

The Centre's main aims are to:

- undertake and foster world-class stem cell research;
- establish and maintain collaborative links in stem cell research within Australia and internationally;
- provide higher degree and research training opportunities;
- to build public awareness of stem cell research in South Australia.

The Centre will provide Early Career Research Fellowships to attract and retain the brightest young minds to Adelaide, and to continue to build the already substantial critical mass of stem cell researchers within Adelaide. Initial funding from the Fellowships has come from the University and Bellberry Limited, a not-for-profit company that manages the only private human research ethics committees in Australia.

Source: Dr. Simon Koblar
University of Adelaide

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II.

06/17/2008 - Adult Human Dental Pulp Stem Cells Differentiate Towards Functionally Active Neurons Under Appropriate Environmental Cues

Stem Cells: First published online May 22, 2008

Agnes Arthur , Grigori Rychkov , Songtao Shi , Simon Andrea Koblar , Stan Gronthos

Human adult dental pulp stem cells (DPSC) reside within the perivascular niche of dental pulp and are thought to originate from migrating cranial neural crest (CNC) cells. During embryonic development, CNC cells differentiate into a wide variety of cell types including neurons of the peripheral nervous system. Previously, we have demonstrated that DPSC derived from adult human third molar teeth differentiate into cell types reminiscent of CNC embryonic ontology. We hypothesized that DPSC exposed to the appropriate environmental cues would differentiate into functionally active neurons. The data demonstrated that ex vivo expanded human adult DPSC responded to neuronal inductive conditions both in vitro and in vivo. Human adult DPSC, but not human foreskin fibroblasts (HFF) acquired a neuronal morphology, and expressed neuronal specific markers at both the gene and protein levels. Culture expanded DPSC also exhibited the capacity to produce a sodium current consistent with functional neuronal cells when exposed to neuronal inductive media. Furthermore, the response of human DPSC and HFF to endogenous neuronal environmental cues was determined in vivo using an avian xeno-transplantation assay. DPSC expressed neuronal markers and acquired a neuronal morphology following transplantation into the mesencephalon of embryonic day two chicken embryo, while HFF maintained a thin spindle fibroblastic morphology. We propose that adult human DPSC provide a readily accessible source of exogenous stem/precursor cells which have the potential for use in cell therapeutic paradigms to treat neurological disease.

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Adult tissues contain highly proliferative, clonogenic cells that meet criteria of multipotent stem cells and are potential sources for autologous reparative and reconstructive medicine. We demonstrated that human dental pulp contains self renewing human dental pulp stem cells (hDPSCs) capable of differentiating into mesenchymal-derived odontoblasts, osteoblasts, adipocytes, chondrocytes and striated muscle, and interestingly, also into non-mesenchymal melanocytes. Furthermore, we showed that hDPSC cultures include cells with the label-retaining and sphere-forming abilities, traits attributed to multipotent stem cells, and provide evidence that these might be multipotent neural crest stem cells.