PRESS RELEASE

Press Meet held at Madras Medical College on 11th November 2013

Stem cells as a potential future treatment of Hirschsprung's Disease

The study was conducted by

Department Of Paediatric Surgery
Institute Of Child Health & Hospital For Children
Madras Medical College

&

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Introduction of department and incidence of Hirschsprung's disease

Department of paediatric surgery ICH & HC Chennai is the main tertiary care centre for whole of Tamilnadu and neighbouring states Andhra Pradesh, Kerala, Pondicherry etc.

There are four paediatric surgical units in ICH & HC with about 180 beds. Paediatric surgery O.P. Department attends to about 120 cases per day. We perform about 5600 major surgical procedures and 17,800 minor surgical procedures per year, in addition to about 500 newborn surgeries.

We treat about 80-120 cases of **Hirschsprung's disease** per year.

This study is based on this disorder.

Stem cells as a potential future treatment of Hirschsprung's Disease

Neural precursor cells from the Intestine, *in vitro* expanded in a novel polymer for Hirschsprung's disease

What is Hirschsprung's disease?

Hirschsprung's disease (HD) is a disorder of the abdomen in **which a part or whole of the large intestine lacks the nerves** which are needed for movement of the stool through the intestine. During normal development of the fetus, cells from a region called neural crest in the embryo migrate to the large intestine to form a network of nerves called Auerbach's plexus and Meissner's plexus which are needed for the motility of the intestine. In Hirschprung's disease, this migration is not complete and hence the affected part of the colon lacks these nerves that regulate the activity of the large intestine and hence the large intestine **cannot relax and pass stool, creating an obstruction**. **This disease affects about one in 5,000 children.**

Current Treatment Options:

Pull through Surgery is the mainstay treatment option in which the intestinal tract is reconstructed by pulling the normal portion of the colon which has the network nerves down to the anus so that the activity of the large intestine is preserved. However, this is a major surgical procedure involving single or multiple stages. A potential solution is the cell based therapies.

Cell based therapies for Hirschsprung's disease:

There are several studies which have isolated the neural precursors in the form of Neurosphere like bodies (NLBs) from the embryonic and post-natal human gut tissues and there are animal experiments which have shown that transplantation of such isolated neural precursor cells have resulted in these cells colonizing the affected gut portion and giving rise to neurons and ganglia which have the capability to restore the function of the colon.

What's new that we have accomplished?

We have isolated and cultured **enteric neural precursor cells from routine gut biopsy samples** of patients undergoing surgeries for Hirschsprung's disease or other disorders of the gastrointestinal system in a **novel Thermo-reversible Gelation Polymer (TGP)** scaffold and compared it to conventional culture techniques. We found that TGP yielded **more number of neural progenitor or precursor cells** as inferred from the intense staining while characterization compared to the conventional culture technique. Also this polymer is unique because it is purely synthetic and does not have risk of biological contamination with viruses and foreign proteins associated with conventional scaffold materials used for culture.

What does this study add to the field of Hirschsprung's disease treatment?

- It is **possible to isolate Human intestinal neural precursor cells** from postnatal gut biopsy samples of patients with Hirschsprung's disease as well as other gastrointestinal disorders.
- These neural precursor cells **can be expanded** in the laboratory using the novel polymer TGP.
- As TGP has been used for transplantation earlier in humans and animals, enteric **neural precursor cells cultured in TGP can be transplanted along with the TGP scaffold for optimal regeneration** of the neurons in the affected portion of the colon in Hirschsprung's disease

The related article has been published in the Journal ***Intractable & Rare Diseases Research*** and the link for the article is http://www.irdrjournal.com/getabstract.php?id=708

Message from the Dean, Madras Medical College / DME Dr. V. Kanagasabai during the Press Meet

"The doctors at ICH have harvested human gut stem cells and have effectively cultured them to become Neuronal tissue in the lab of NCRM, which has a potential for future treatment of Hirchsprung's disease. We have to buy high end equipment for the same for which 4 – 5 Crore rupees will be utilized thereby making the Institute of child health, a nodal centre for offering free treatment to the needy children of the state. In ICH alone about 150 patients need this treatment every year."