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Stem cells: The hope and the hype

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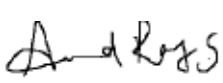
Everyone irrespective of their background seems to be talking about stem cells these days. Stem cells have garnered much attention because they can turn into all different types of cells and that too on demand. While the implications for the use of stem cells in medicine are profound, there are still a lot of practical barriers that need to be streamlined for realizing the full potential of stem cells as therapeutic tools.

The current issue of Transcomm is dedicated to making sure the reader realizes the true potential of stem cells i.e what they can actually do and what they cannot. Our goal here at Transcell is to educate the general public about the significance of storing their loved ones' stem cells which could come handy in the future when the donor or the related family develops a life threatening disease for which stem cells are the only treatment options. Often times, the term stem cells is used out of context and like any other novel treatment modality, the promise of curing any disease using stem cells should be taken with a pinch of salt. We will look into the history of stem cells, where and when it all started before we touch upon various case studies and novel treatment methods that have been made possible thanks to the advent of stem cells.

The Russian histologist Alexander Maksimov is credited with coining the term "stem cell" in 1908. Back then, the mere idea of self- renewing cells existing inside the body offered a ray of hope for many patients and researchers alike. Only after the Second World War were scientists able to trace the lineage of a particular cell using radioactive markers which helped noted scientists like Altman, McCulloch and Till to observe and document the presence of self-renewing cells in animal models. Since then, much of the research on so-called self- renewing cells/stem cells has been carried out mainly in mouse and primate models. The fascinating properties of stem cells, such as the ability to self-renew unlimitedly together with asymmetric division and plasticity have heralded the dawn of a new era of regenerative medicine. New treatment modalities using stem cells (stem cell therapy) while offering a very cost effective therapeutic approach also help tackle some rather debilitating diseases where in conventional treatments have failed to deliver. For example cell-replacement therapies using stem cells have been gaining importance in the field of Diabetes, wherein insulin-producing cells could be generated from stem cells which could then be grafted into the pancreas of the patient. Similarly, research on adult mouse brains has shown that certain brain disorders characterized by the loss of neurons (Parkinson's etc) could be corrected by grafting stem cells into developing brains which would then differentiate into neurons and restore the normal functioning of the brain. The two examples mentioned above are just a tip of the iceberg. The list of uses of stem cells in regenerative/reparative medicine could be exhaustive. After reading this particular edition of Transcomm, we hope that the reader would agree with us that the hype surrounding stem cells is in fact true and that the hopes of treating various fatal, non-fatal and emerging diseases is possible using stem cells.



India tops in development of stem cell treatment, also it can be a pathbreaking therapy for diabetes, Autism

Researchers and experts believe India has been rapidly making strides in the field of stem cell therapy followed by countries like China and Japan. The lack of awareness that stem cells could be used for treating various incurable diseases has been hampering its growth as an alternative treatment modality. Diabetes and Autism, two of the major issues plaguing India could be tackled with the usage of stem cells. Using a patient's own stem cells (autologous transplant), new Beta cells could be generated in the pancreas. This type of transplantation is also free of any complications that might arise due to graft rejection. Umbilical cord tissue derived stem cells are considered to be ideal for treating Autism. Currently clinical trials are underway to treat Autism using umbilical cord tissue stem cells. The advantage of using umbilical cord tissue derived stem cells is that the collection of stem cells is not as laborious as collecting adult stem cells and moreover, the stem cells collected right after birth are more potent than their adult counterparts.

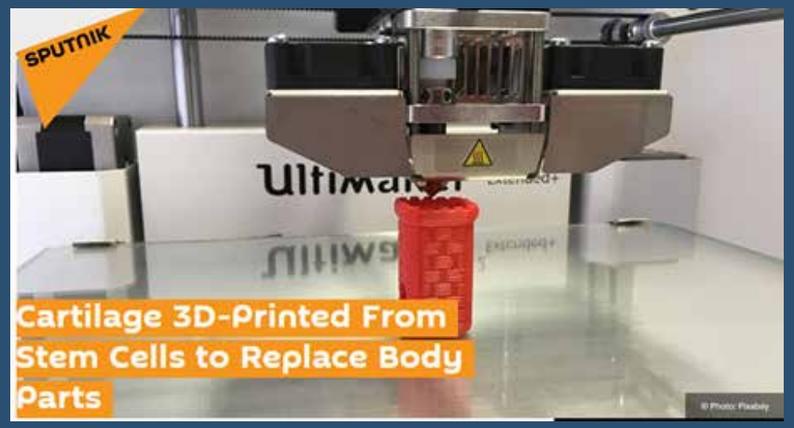
Skin stem cells used to generate new brain cells

Study to advance understanding of the role of microglia in Alzheimer's disease

Date: April 25, 2017
Source: University of California - Irvine
Summary: Using human skin cells, neurobiologists have created a method to generate one of the principle cell types of the brain called microglia, which play a key role in preserving the function of neural networks and responding to injury and disease

Using skin cells derived from a patient, neurobiologists at the University of California, Irvine have managed to generate one of the major types of brain cells called Microglia. Microglia play a pivotal role in preserving the function of neural networks while also playing an important role in injury and disease. The group led by EdselAbud, Wayne Poon and Mathew Blurton Jones of UCI have used a series of differentiation factors that helped the stem cells derived from skin to transdifferentiate into Microglial cells. Recent studies on Microglia have implicated their role in Alzheimer's. The current research would help unravel the connection between Microglia and Alzheimer's and would also lead to better drug development.

New stem cell invented that can grow into any tissue in the body, study finds



Researchers from China and the Salk institute have successfully created a new kind of stem cell, which is more versatile than the ones that are available now. The new cell named Extended Pluripotent Stem cell (EPS) can give rise to every cell in the body, researchers claim. The EPS cell not only can give rise to every cell in an embryo and adult organism, but also can make the placenta and other extra-embryonic tissues needed for the embryo to survive and grow. This ability enables the new type of stem cell to produce complete embryos and offspring, the scientists said. This research would enable researchers create transgenic animal models for analyzing various diseases with ease. Moreover, chimeras could also be developed with human cells for cultivating organs in the lab which could eventually be transplanted back into patients with organ failure.

A research team at Sahlgrenska Academy in Sweden has managed to create cartilage tissue from stem cells using a 3D printer. The fact that stem cells survived the printing is seen as a major success in itself and could potentially serve as an important step in the quest to 3D-print body parts.The research team used cartilage cells taken from humans in connection with knee surgery. Subsequently, the cells were reversed in their development under lab conditions to become so-called pluripotent stem cells, which are cells that have the potential to develop into any kind of cells. Later, they were enclosed in a structure of nanocellulose using a 3D printer. After printing, the cells were treated with growth factors to form cartilage.On top of being a major technological achievement, the study represents a major step forward for the artificial creation of human tissue using stem cells and 3D bioprinting. In the not-too-distant future, 3D printers could be used for repairing cartilage damage or as a treatment for osteoarthritis, which causes the degeneration of joints.

Japanese man is first to receive 'reprogrammed' stem cells from another person

World-first transplant, used to treat macular degeneration, represents a major step forward in movement to create banks of ready-made stem cells.

David Cyranoski 28 March 2017

On 28 March 2017, a Japanese man in his 60s became the first person to receive cells derived from induced pluripotent stem (iPS) cells donated by another person. The surgery is expected to set the path for more applications of iPS-cell technology, which offers the versatility of embryonic stem cells without their ethical taint. Banks of iPS cells from diverse donors could make stem-cell transplants more convenient to perform, while slashing costs. IPS cells are created by removing mature cells from an individual (for example, from their skin) and reprogramming these cells back to an embryonic state. They can then be coaxed into a type of cell useful for treating a disease.In the latest procedure, performed on a man from the Hyogo prefecture of Japan, skin cells from an anonymous donor were reprogrammed into iPS cells and then turned into a type of retinal cell, which was in turn transplanted onto the retina of the patient, who has age-related macular degeneration. Physicians hope that the cells will stop the progression of the disease, which can lead to blindness.

SPRAY-ON SKIN: 'MIRACLE' STEM CELL TREATMENT HEALS BURNS WITHOUT SCARRING

Pennsylvania state trooper Matt Uram was talking with his wife at a July Fourth party in 2009 when a misjudged spray of gasoline burst through a nearby bonfire and set him alight. Flames covered the entire right side of his body, and after he fell to the ground to smother them, his wife beat his head with her bare hands to put out his burning hair.From the hospital, Uram was transferred to the Mercy Burn Center in Pittsburgh, where doctors removed all of the burned skin and dressed his wounds. It was on the border between a second- and third-degree burn, and he was told to prepare for months of pain and permanent disfigurement. Not long after this assessment, however, a doctor asked Uram if he would be willing to take part in an experimental trial of a new device.The treatment, developed by German researcher Dr. JörgGerlach, was the world's first to use a patient's stem cells to directly heal the skin. If successful, the device would mend Uram's wounds using his body's ability to regenerate fully functioning skin. Uram agreed to the procedure without hesitation.Five days after the accident, surgeons removed a small section of undamaged skin from Uram's right thigh—about the size of a postage stamp—and used it to create a liquid suspension of his stem cells that was sprayed in a fine mist onto the damaged skin. Three days later, when it was time to remove the bandages and re-dress the wounds, his doctor was amazed by what he saw. The burns were almost completely healed, and any risk of infection or scarring was gone.

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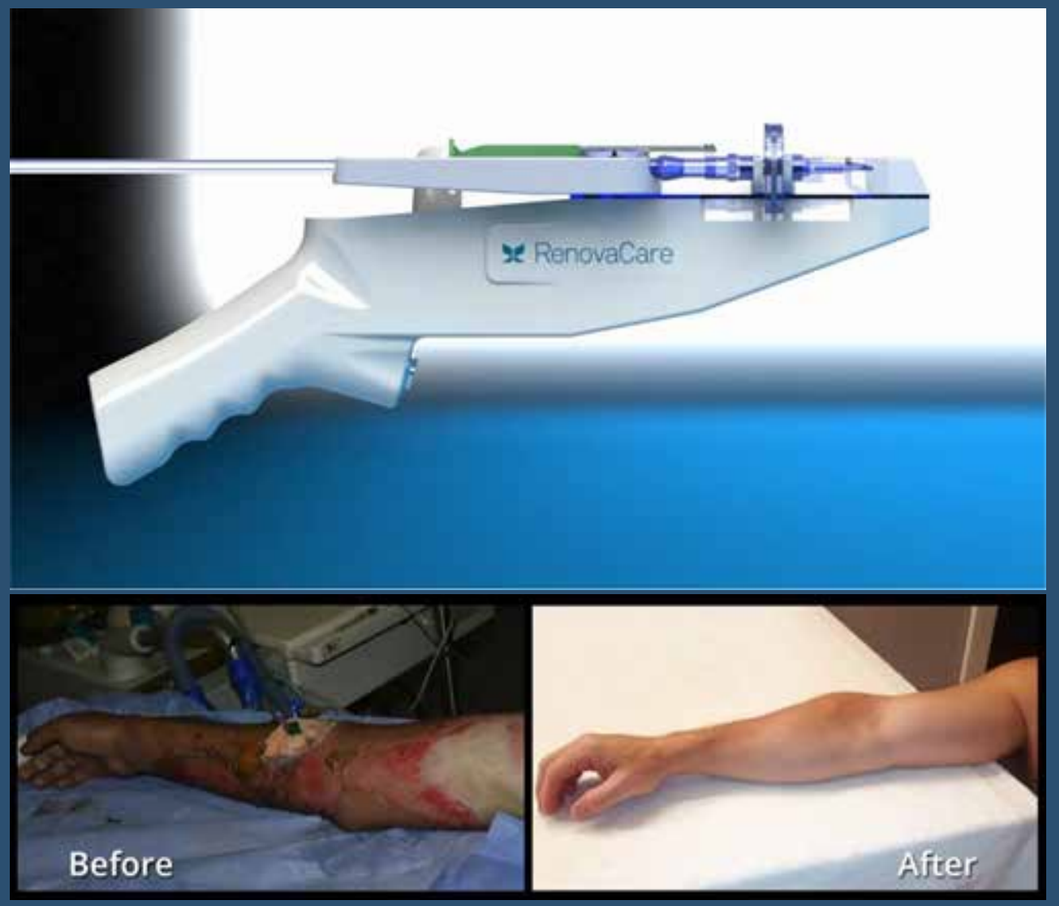

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