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Short Commentary Open Access

Regenerative Medicine: The Final Frontier

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Short Commentary

Regenerative medicine is a branch of translational research in tissue engineering and molecular biology which deals with the "process of replacing, engineering or regenerating human cells, tissues or organs to restore and establish normal function.

This field holds the promise of engineering damaged tissues and organs via stimulating the body's own repair mechanisms to functionally heal previously irreparable tissues or organs. Regenerative medicine also includes the possibility of growing tissues and organs in the laboratory and safely implanting them when the body cannot heal itself. If a regenerated organ's cells are derived from the patient's own tissue or cells, this may potentially solve the problem relating to the shortage of organs available for donation, as well as the problem of organ transplant rejection [1].

Additionally, regenerative medicine is an emerging interdisciplinary field of research; clinical applications focus on the repair, replacement or regeneration of cells, tissues or organs to restore impaired function resulting from congenital defects, disease, trauma or other causes. It uses a combination of several approaches that puts it beyond traditional transplantation and replacement therapies.

These approaches may include, but are not limited to, the use of stem cells, soluble molecules, genetic and tissue engineering and advanced cell therapy [2].

The ten main applications include:

- Novel methods of insulin replacement and pancreatic islet cell regeneration for diabetes.
- Autologous cells for the regeneration of heart muscle after myocardial infarction and cardiomyopathies.
- Immune system enhancement by engineered immune cells and novel vaccination strategies for infectious diseases.
- Tissue- engineered skin substitutes, autologous stem or progenitor cells, intelligent dressing, and other technologies for skin loss due to burns, wounds, and diabetic ulcers.
- Biocompatible blood substitutes for transfusion requirements.
- Umbilical cord blood banking for future cell replacement therapies and other applications.
- Tissue- engineered cartilage, modified chondrocytes technologies for traumatic and degenerative joint disease.
- Gene therapy and stem cell transplants for inherited blood disorders.
- Nerve regeneration technologies using growth factors, stem cells, and synthetic nerve guides for spinal cord and peripheral nerve injures.
- Hepatocyte transplants for chronic liver diseases or liver failure [2].

In a globalized world, patients and researchers travel across national boundaries in pursuit of favorable environments that enable new solutions. The biomedical research and entrepreneurial community should maintain an active role in communicating the progress being made in human stem cell research to the rest of the society, while highlighting opportunities and risks with equal objectivity. Research transparency, integrity and safety must continue to stand at the heart of any future development in this field [3].

Additional challenges facing nations without a national strategy i.e. lack of clear identification and prioritization of areas of unmet medical needs inability to access data that could provide useful healthcare benchmarks, time, cost, and complexity of clinical trials, complexity and uncertainty of the reimbursement system and lack of investment capita [4,5]. Therefore it is important to design a strategy to implement these programs.

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