The Role of Adult Stem Cells in Personalized and Regenerative Medicine

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Objective

To illustrate the potential benefits of adult stem cells in the emerging fields of personalized and regenerative medicine

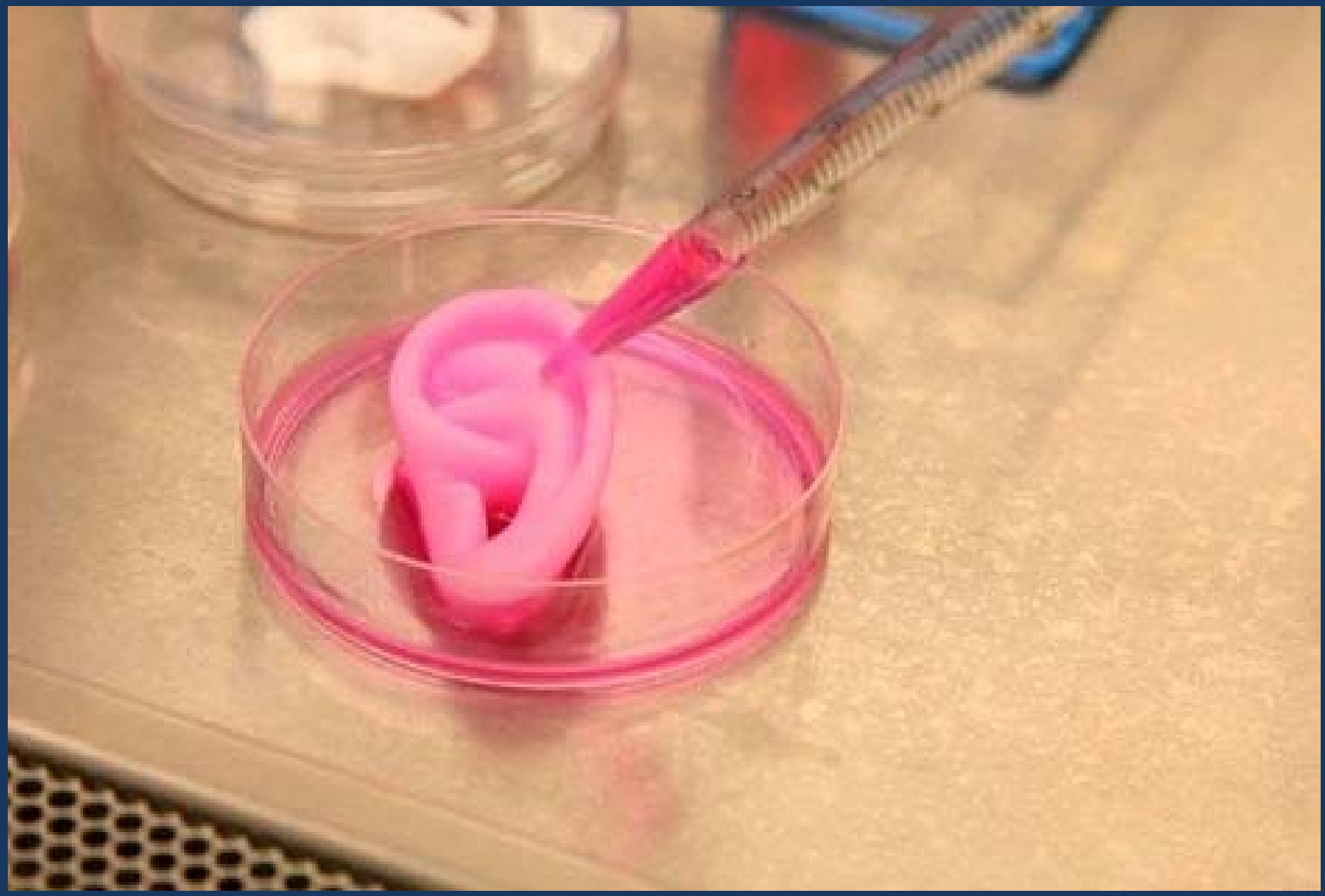
News Flash: November 1, 1999

Football great Walter Payton dies at age 46 due to liver failure.

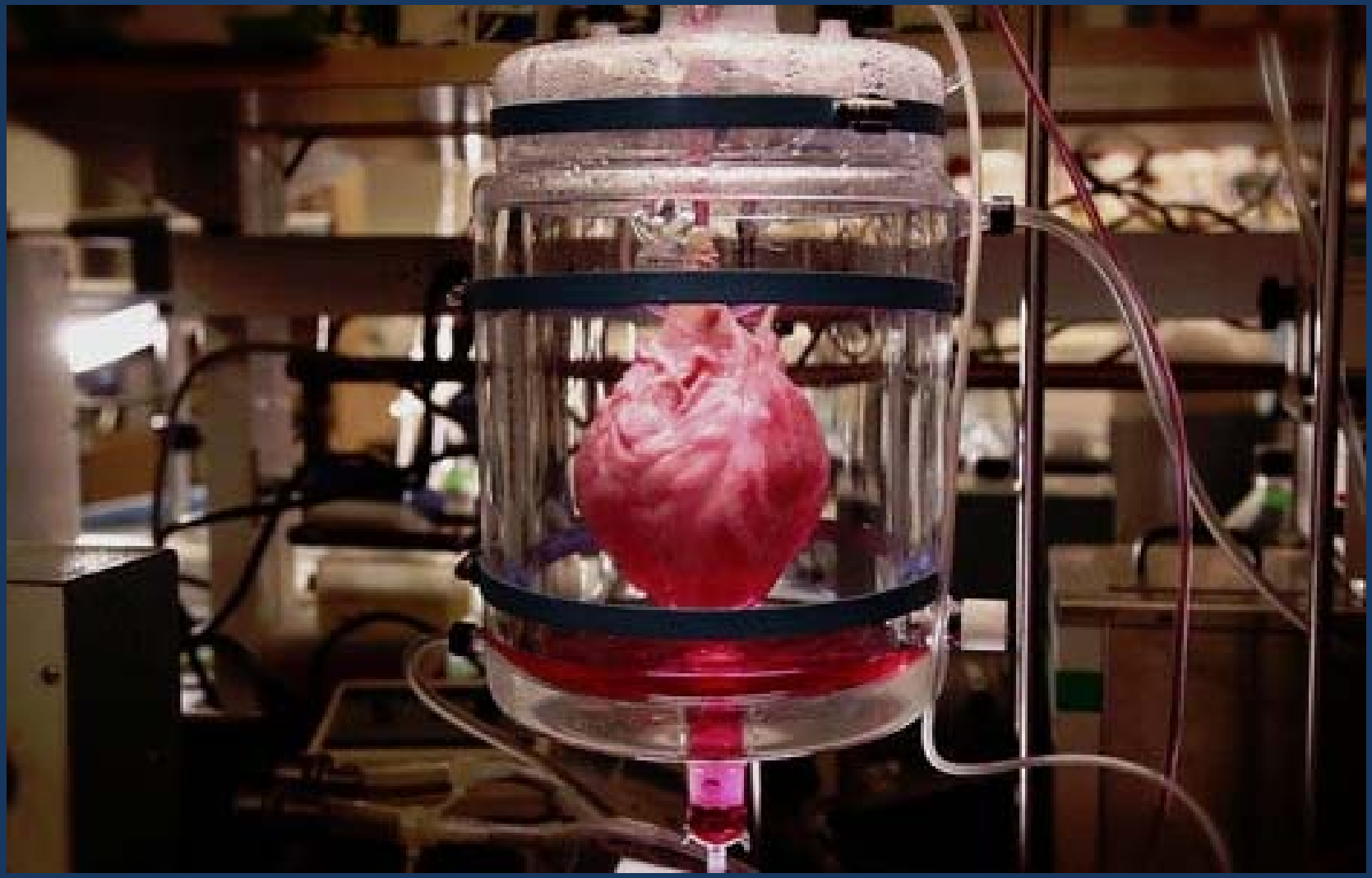
Unable to find a match for a liver transplant, Payton joined the 18 people a day who die waiting for a donor organ.

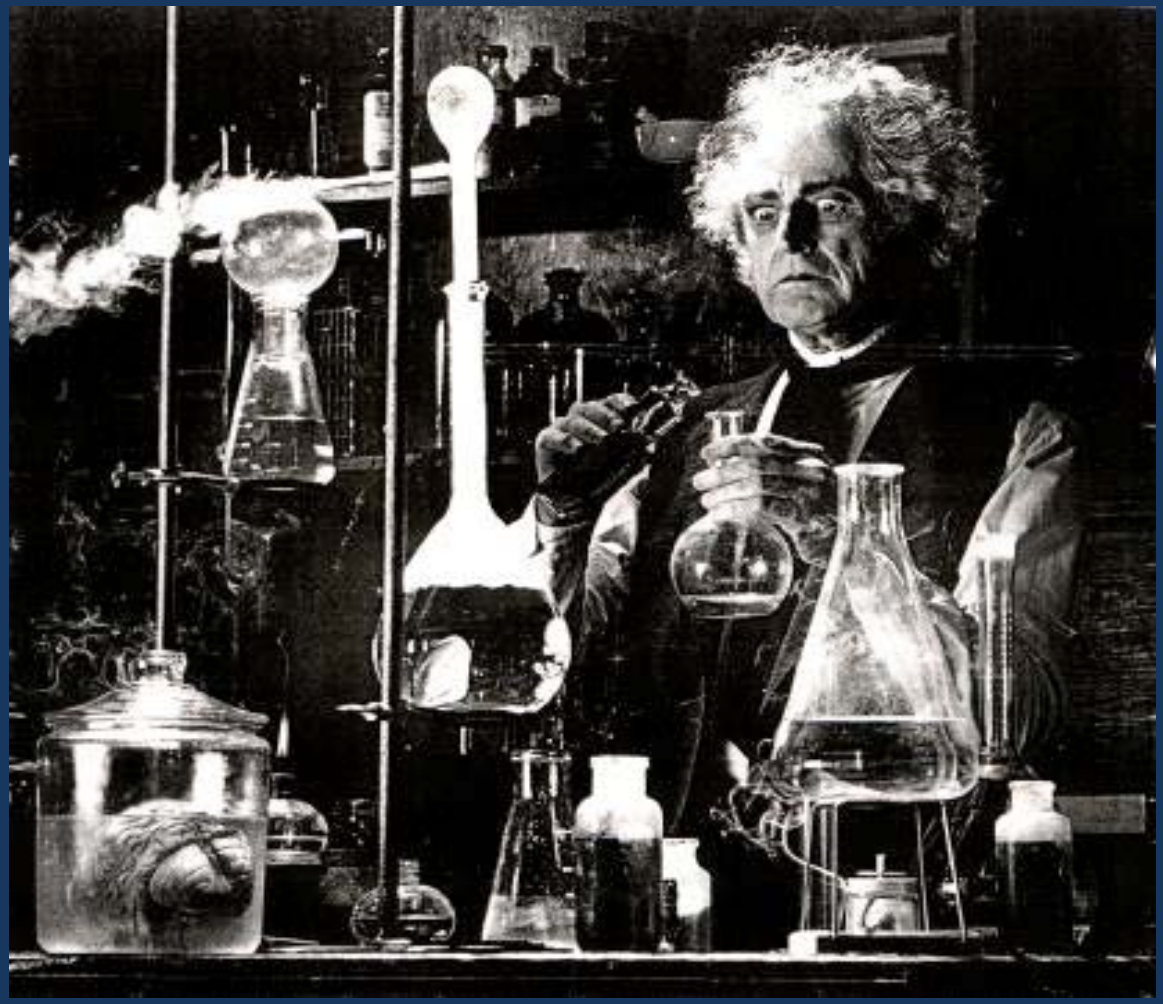
What if …?

The Future



The Future is now…





Past and Present
Standard Pharmacologic Approach

The pharmaceutical industry has typically developed medications based on general clinical observations and more recently, known disease mechanisms.

Examples

- **Antibiotics-** were based on the observation that bacteria produce substances that inhibit other species.
- **Blood Pressure Treatments-** have typically been designed to act on certain pathways proven to affect blood pressure, such as kidney salt and water absorption, blood vessel contractility, and cardiac output.
- **Diabetes Treatments** - are aimed at improving insulin release from the pancreas and sensitivity of the muscle and fat tissues to insulin action.

Definitions

- Personalized Medicine
- Regenerative Medicine
- Adult Stem Cells

Personalized Medicine*

A medical model emphasizing the customization of healthcare delivery with all decisions and practices being tailored to individual patients.

Systematic use of genetic or other information about an individual patient to select or optimize that patient's preventative, diagnostic and therapeutic care*

Example: Individualized or personalized genetic testing to customize cancer treatments to further its effectiveness.

*Pricewaterhouse Coopers' Health Research Institute,(2009). [The new science of personalized medicine] http://www.pwc.com/personalizedmedicine, p3.

Regenerative Medicine*

The process of creating functional tissues to repair or replace tissue or organ function lost due to damage or congenital defects.

- Holds the promise of regenerating damaged tissues and organs in the body by stimulating previously irreparable organs to heal themselves.
- Has the potential to solve the donor organ shortage
- Solves organ transplant rejection!

*Regenerative Medicine. NIH Fact sheet 092106.doc" (PDF). September 2006. http://www.nih.gov/about/researchresultsforthepublic/Regen.pdf. Retrieved 2011-01-16

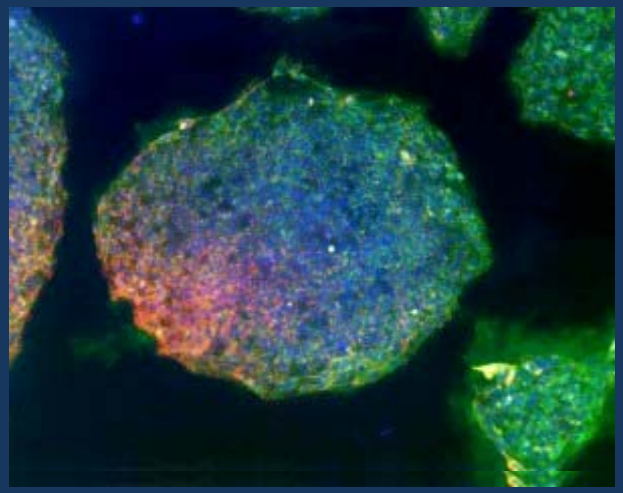
Stem Cells

Stem cells are reparative cells found throughout the body that can give rise to specialized cells that regenerate and restore the organs and tissues in which they reside. Under certain conditions, they have the ability to reproduce themselves or proliferate for long periods.

Stem cells are found throughout the body.

The most commonly known origins are:

- Embryo
- Fetus, Newborns to Adults



Adult Stem Cells

Are relatively rare, undifferentiated cells found in many organs and differentiated tissues.

Stem Cell Characteristics:

- Self renewal
- Differentiation

Differentiates along the three germ layers:

Ectoderm, Endoderm, and Mesoderm

Adult Stem Cells

Ectoderm

skin
nervous system, eyes, ears, adrenal and pituitary glands

Endoderm

epithelial elements of larynx, trachea, lung, GI tract, liver, pancreas, thyroid, parathyroid glands, urinary bladder, vagina, urethra, thymus

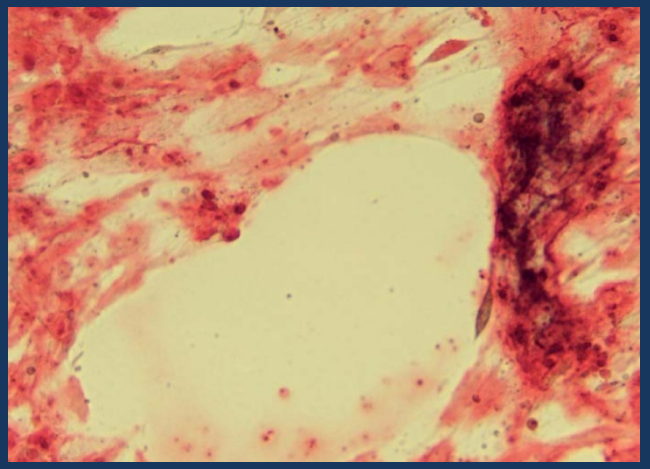
Mesoderm

bone/cartilage
muscle/tendon/ ligament/fat
heart/blood vessels
Kidneys/urogenital
bone marrow/lymphatic

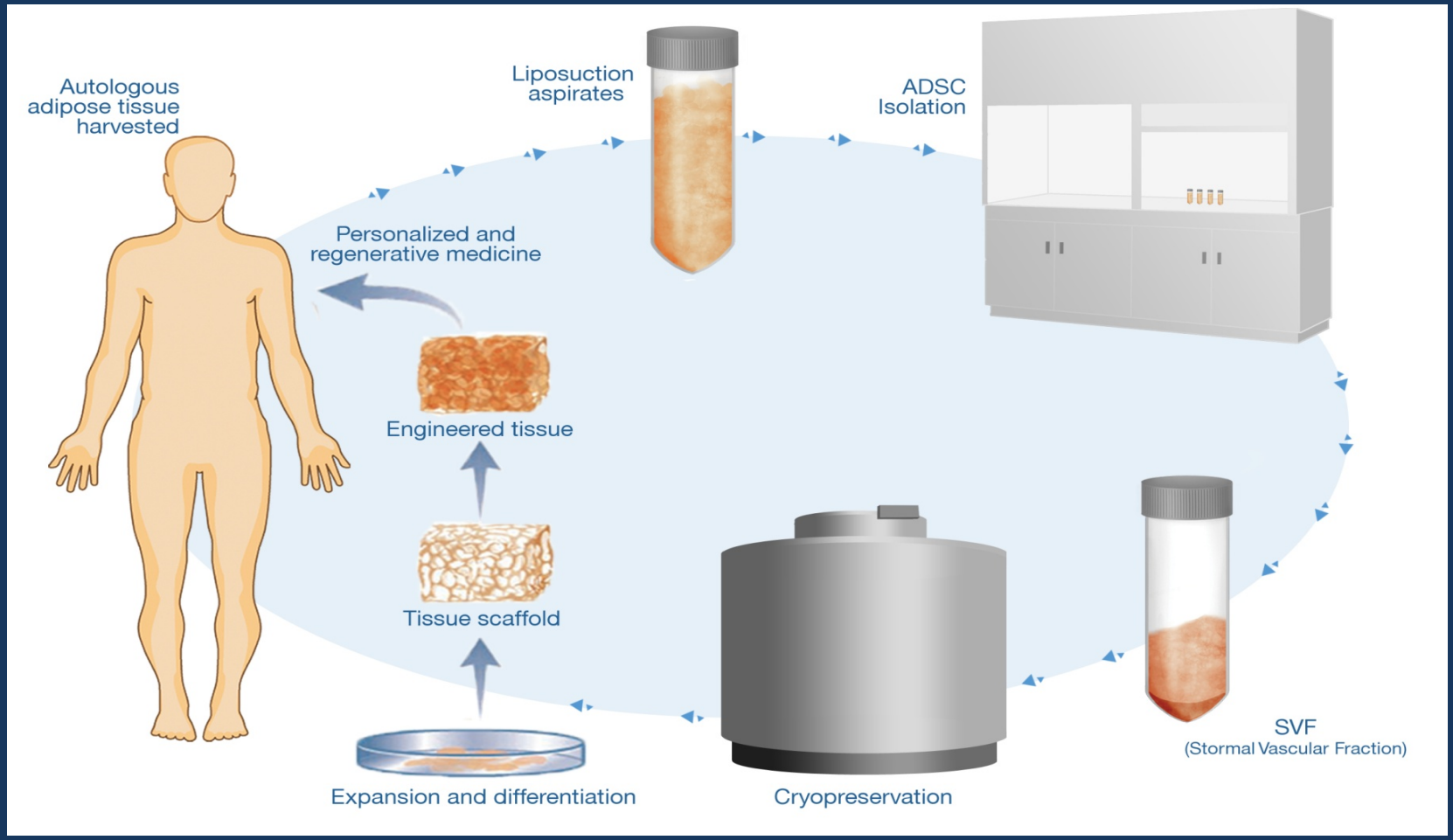
Mesenchymal Stem Cells

Mesenchymal Stem Cells are derived from:

- Bone marrow
- Adipose tissue (fat)



Adult Stem Cells
in
Personalized and Regenerative Medicine



Current Adult Stem Cell Treatments

- Leukemia, lymphomas and other cancers
- Bone marrow failure and other blood disorders
- Autoimmune diseases
- Inherited disorders: metabolic diseases
  immune system disorders

Potential Future Adult Stem Cell Treatments

- Diabetes
- Wound Care
- Heart Disease
- Arthritis
- Plastic & Reconstructive Surgery
- Cosmetic Applications
- Sports Injuries
- Crohn's Fistula
- Multiple Sclerosis
- Organ and Tissue Regeneration
- ?

Stem Cells: An Accelerating Science

Pub Med

Search ‘stem cell’ - 253,957 results*

NIH Clinical Trials

Search ‘stem cell’ – 3,443 trials**

What’s new?

Approximately 82 new articles daily

Approximately 2 new clinical trials daily

* http://www.ncbi.nlm.nih.gov/sites/pubmed Accessed 11/22/2010

** http://www.clinicaltrials.gov/ct2/results?term=STEM+CELL Accessed 3/13/2011

Stem Cells and Healthcare Today

Megatrend 12: "Medical tourism" - The allure of good care at much lower prices will cause increasing numbers of people to go abroad for cheaper treatment. The Deloitte Center for Health Solutions predicts that the number of Americans traveling abroad for treatment will soar to more than 1.6 million in 2012." *

Asia, Europe and many other parts of the world promote stem cell therapies, cures and treatments. U.S. trails Asia and Europe leaving patients with no choice but to seek alternative treatment outside of the country.

The United States is expected to lose 1.2 million patients in 2011 to ***medical tourism***. At a cost of more than $15,000 per treatment (average), we stand to lose approximately $18,000,000,000 in medical treatments overseas in 2011 and $24,000,000,000 in 2012.

Harvard Business Review: Megatrends in Global Health,
http://hbr.org/web/extras/insight-center/health-care/globaltrends/1-slide# Accessed 1/16/11

Lifetime Burden of Organ Transplant Costs

Transplant	30 Days Pre-transplant	Procurement	Hospital Transplant Admission	Physician During Transplant	180 Days Post-transplant Admission	Immuno-suppressants	Total
Heart Only	$34,200	$94,300	$486,400	$50,800	$99,700	$22,300	$787,700
Single Lung Only	$7,500	$53,600	$256,600	$27,900	$84,300	$20,500	$450,400
Liver Only	$21,200	$73,600	$286,100	$44,100	$77,800	$20,600	$523,400
Kidney Only	$16,700	$67,500	$92,700	$17,500	$47,400	$17,200	$259,000
Pancreas Only	$16,500	$68,400	$93,400	$16,300	$58,700	$22,200	$275,200
Intestine Only	$48,400	$77,200	$743,800	$100,600	$124,300	$27,500	$1,121,800

Milliman Research Report: 2008 U.S. organ and tissue transplant cost estimates and discussion, April 2008

The Paradigm Shift – Personalized and Regenerative Medicine

"There is an urgent need to increase the value of healthcare, but we can't get there by fixing the healthcare of yesterday. We need to replace our current focus on treating disease with a better approach that is personalized, preventive, predictive and participatory, the basic tenets of personalized medicine."

Gerald McDougall, Principal, Personalized Medicine and Health Sciences, PricewaterhouseCoopers
- The Science of Personalized Medicine: Translating the Promise into Practice, December 8, 2009

"Regenerative medicine has the opportunity to begin producing complex skin, cartilage and bone substitutes in as little as 5 years. Tissue and organ patches designed to help regenerate damaged tissues and organs such as the heart and kidneys are within reach in 10 years….. Additionally, efforts to advance regenerative medicine offers the opportunity to create a tremendous new global industry led by the U.S…"

U.S. Department of Health and Human Services
- 2020: A New Vision, - A Future for Regenerative Medicine, May 2006

Embracing Regenerative Medicine

Banking today: harnessing our healthy tomorrow

Stops cellular aging.

- As we age, so do our stem cells
- Proliferation and differentiation
- Telomerase

Autologous (self) banking provides a perfect match

- For minorities and those of mixed race (approximately 102.5 million in U.S.), there is less than a 10% chance of finding matched adult stem cells from a public cell bank.

Banking provides 'bio-insurance'

- Physical Injury, emergency care

“The Regenesist”

Our Future: Stem Cell Apothecary "Regenesist"

ACCESS

- Your Regenesist has access to your cryopreserved stem cells

PRESCRIPTION

- Therapeutic assay is prescribed by your physician

RECOVERY

- Your cryopreserved specimen is requested from the Biobank

PROCESSING

- Your Regenecy processes your cryopreserved stem cells in the laboratory bioreactor to produce a personalized cure, FOR YOU

The Future is in Our Hands

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www.americancryostem.com