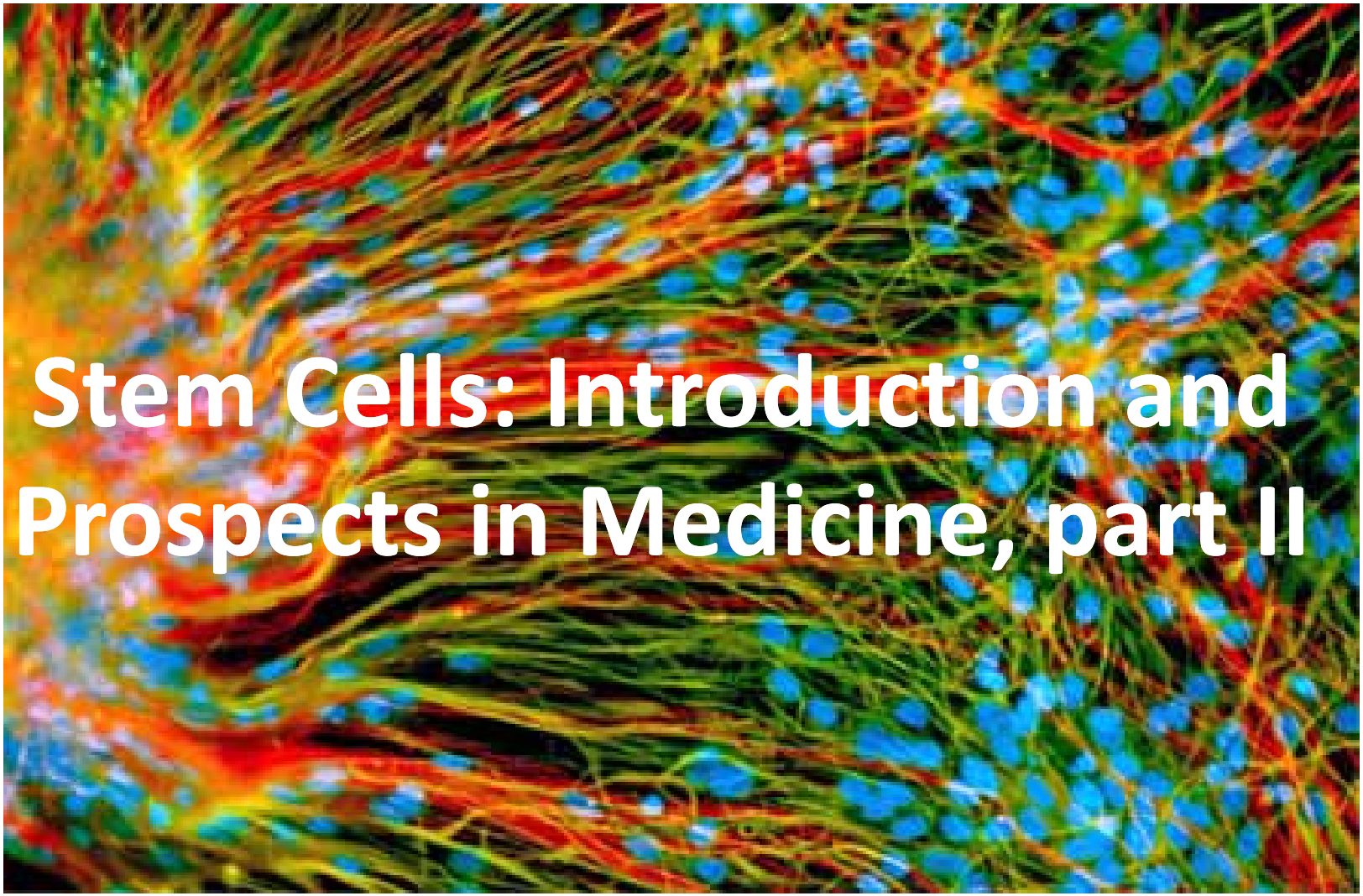


Bioscience in the 21st Century

Ware, 2009

www.gothamgazette.com/.../stemcell/stem_cell.jpg

Overview

- **Setting the stage for the discussion**:

  historical perspective and prospects in regenerative medicine (replacement of damaged or diseased cells and tissues with new cells and tissues)

- **Stem Cell Basics**:
  - What are stem cells?
  - Where do stem cells come from?
- **Adult Stem Cell Advances in the News!**
- **Stem Cell Research Challenges**

Discussion by Dr. Elaine Fuchs (*iBioSeminar*© : ascb.org)

Adult Stem Cell Research in the News!

Selected News about Adult Stem Cells

- "Scientists Find Way to Track Stem Cells in Brain"
  (*Science,* November 2007)

- "Stem Cells Restore Memory in Mice"
  (*Journal of Neuroscience,* October 2007)

- "Researchers Isolate Adult Stem Cells for First Time in Tendon"
  (*Nature Medicine,* September 2007)

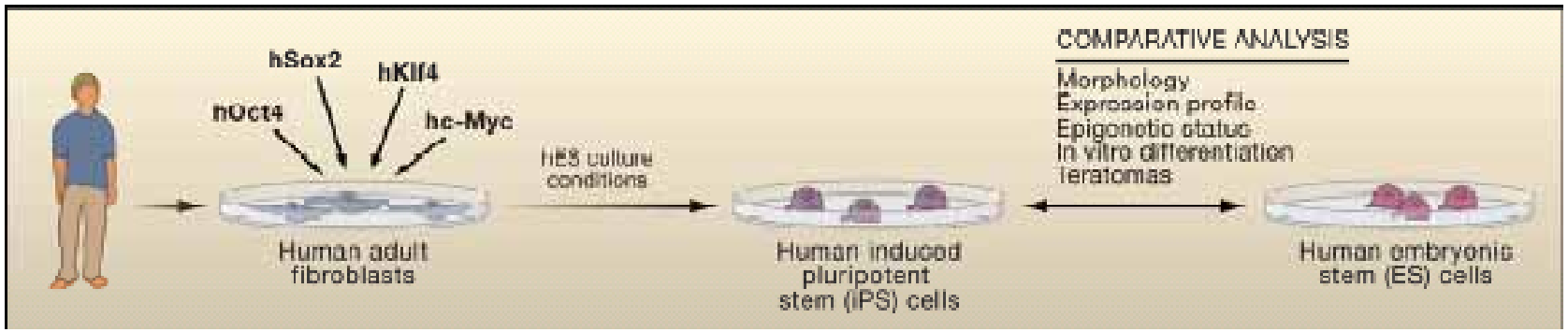
- " Stem Cells From Testes Produce Wide Range of Tissue Types"
  (*Nature,* September 2007)

- "Scientists Turn Human Skin Cells into Stem Cells"
  (*Science*; *Cell,* November 2007)

- "First Neurons Created from ALS Patient's Skin Cells"
  (*Science*, July 2008 [online])

- "Wisconsin team grows retina cells from skin-derived stem cells"
  (*PNAS*, August 2009 [online])

“Scientists Turn Human Skin Cells into Stem Cells”



Induction of Pluripotency: From Mouse to Human

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IMPACT :

- Understanding birth defects
- Possibility of generating patient-specific stem cell lines to study the mechanism of different diseases in the laboratory
- Creation of models for drug discovery and testing the toxic effects of drugs
- Tissue engineering (e.g., use of progenitor cells to make artificial bladders, retinas)
- Does this alter the debate about the use of human ES cells or not?

Parkinson's Disease (PD): Stem Cell Insights

Source cells	Differentiated Cell type	Host animal receiving brain transplant	Results
Monkey ESCs	Dopamine-producing neurons	Monkey model of PD	Diminished PD symptoms; low survival rate of transplanted cells
Human ESCs	Dopamine-producing neurons	Rat model of PD	Significantly improved muscle coordination; tumor formation in brains
Human neural progenitor cells from fetal tissue engineered to express a "survival factor"	N/A	Rat and monkey models of PD	Improved symptoms of PD; new dopamine-producing neurons generated; effects not long lasting
Adult human brain biopsy cells	Neural progenitor cells	Mouse	New neurons generated
Mouse or human neural ASCs	N/A	Mouse model of related disease, Sandhoff's disease	Increased life span; delayed loss of motor function; no tumors
Human ESCs	Neural progenitor cells	Mouse model of Sandhoff's disease	Increased life span; delayed loss of motor function; no tumors

adapted from K.A. Hogan, *Stem Cells and Cloning*.

Stem Cell Therapy Challenges

- Safety challenges – Use of ESCs or differentiated cells derived from ESCs for therapy? Considerations to avoid tumor formation. Immune system challenges to avoid rejection of foreign cells.

- Understanding the basic mechanisms that underlie stem cell biology

- Ethical considerations for ESC research

Ethical Issues surrounding the stem cell debate

Dr. Elaine Fuchs*: iBioSeminar (ASCB)* ascb.org
"Stem Cells: Biology and Promise for Regenerative Medicine"

1) Ethical Issues

2) Alternative methods for producing embryonic stem cells

Summary:

- **Stem cell therapies offer regenerative prospects for numerous human diseases**

- **Stem cells are capable of renewal and differentiation.**

- **Stem cells are derived from numerous sources and have different potency capacities.**

- **Adult stem cells (ASCs) have been detected in numerous tissues.**

- **Considerable ethical debate surrounds the use of embryonic stem cells. Adult stem cells may offer similar prospects for therapy as do as ESCs, yet a complete understanding of stem cell applications will require a basic understanding of differentiation and renewal mechanisms in ASCs and ESCs as well.**

Additional resources: http://stemcells.nih.gov/info/basics/

Ode to a Stem Cell, Part II©

by Vassie C. Ware, Ph.D.

There once was stem cell stuck in the ‘hood’
Dividing endlessly, but only wishing he could
Become something else, a skin cell, a hair cell, or some other type
But for weeks he sulked and uttered this gripe
“Why am I not needed?” to his friends he would say
Isn’t there a call for a specialist somewhere today?
Well, if you really want to leave to get a new start,
You must change your tune, for surely there is an art
To consider what signals you hear and choices you make.
Divide once more for the special journey you take.
Dare to be different, as you differentiate!

link