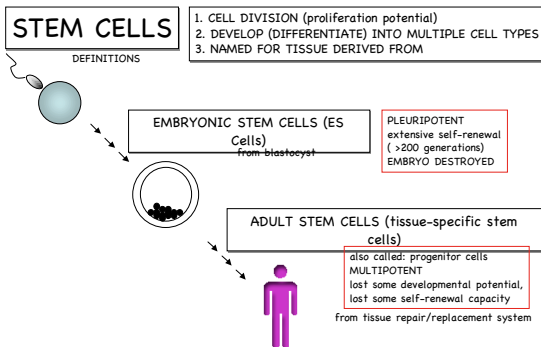
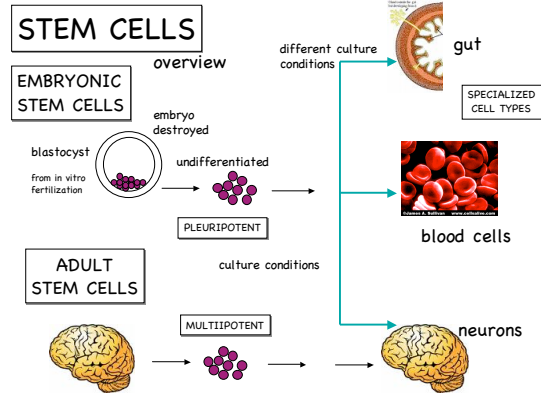


EMBRYONIC AND ADULT STEM CELLS 1 & 2

reading: p. 334; also chapter 20 for related information (on cloning)
 useful website: <http://stemcells.nih.gov/info/basics/basics1.asp>



Also: EMBRYONIC GERM CELLS (EG Cells; egg, sperm progenitors) and CORD BLOOD STEM CELLS (from umbilical cord)

DEVELOPMENT POTENTIAL

(STEM CELL POTENCY DEFINITIONS)

ALL OF THESE CELLS SHOW PROLIFERATION (self-renewal)

SATISFIES STRICTEST DEFINITION OF STEM CELLS

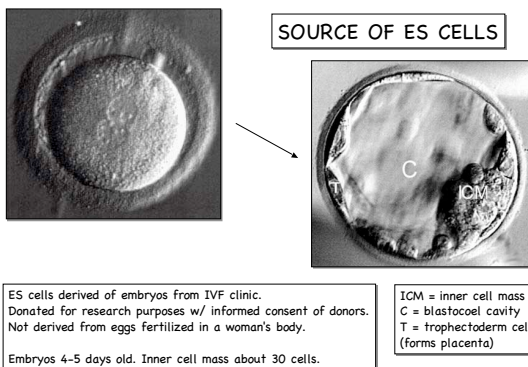
TOTIPOTENT - all tissues + placenta (morula = pre-blastocyst)

PLEURIPOTENT - all tissues (ecto-, meso-, endoderm) (blastocyst inner mass)

USUALLY CALLED "STEM CELLS" BUT DEBATED

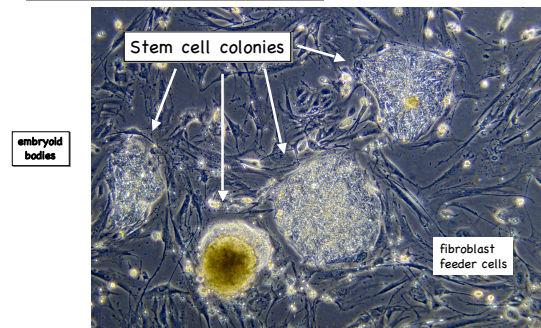
MULTIPOTENT - closely-related specialized cells (families of cells)(adult)

UNIPOTENT - produces only a single cell type (but shows self-renewal)

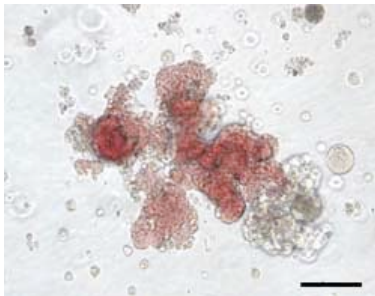


NIH stem cell website

UNDIFFERENTIATED HUMAN EMBRYONIC STEM CELLS



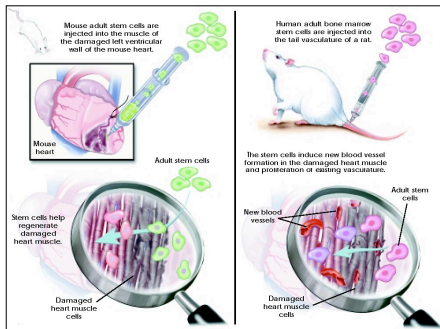
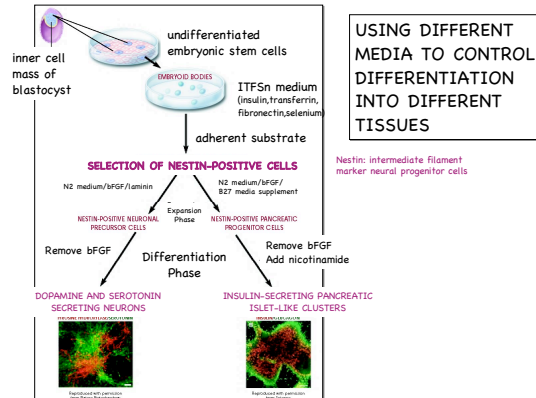
RED BLOOD CELL COLONY FROM HUMAN EMBRYONIC STEM CELLS



Development & Differentiation

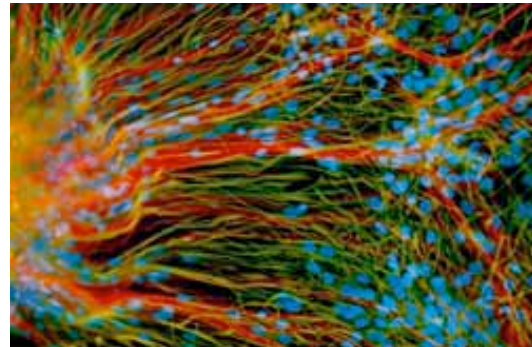
first specialized human cells to be coaxed down a specific developmental pathway

may one day augment human blood supplies for transfusion And transplantation

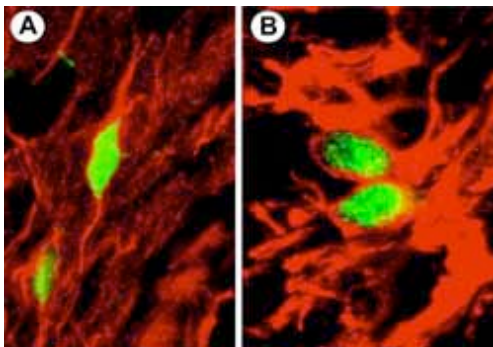


NIH website

FROM STEM CELLS: HUMAN NEURONS (red) GLIAL CELLS (green)



Transplant to Mouse Brain: neural precursors give rise to neurons (red in A) and astrocytes (red in B)



THREE ADULT CELL TYPES (PROLIFERATION)

1. DIFFERENTIATED CELLS (no longer capable of division)
 - a. cardiac muscle, neurons
 - b. produced during development
 - c. differentiate, retained throughout life.
2. CELLS IN G₀ STAGE OF CELL CYCLE
 - a. resume cell cycle when needed to replace cells
 - b. skin fibroblasts, smooth muscle, endothelial cells
 - c. epithelial cells of liver, pancreas, kidney, lung, prostate, breast (cf. cancers)
3. ADULT STEM CELLS
 - a. undifferentiated cells, short life, continually replaced
 - b. blood cells, epithelial cells of skin and digestive tract
 - c. divide to daughter cells: differentiate or remain stem cells

BLOOD CELL LINEAGES

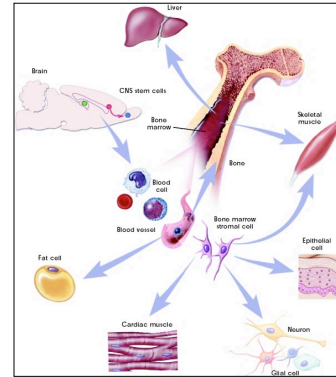
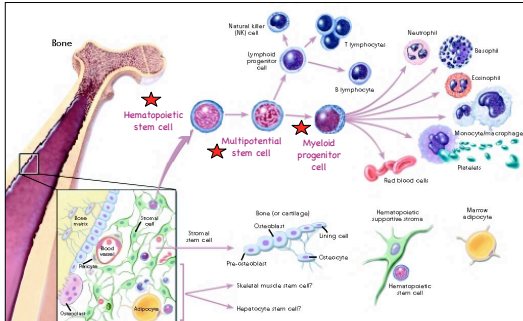
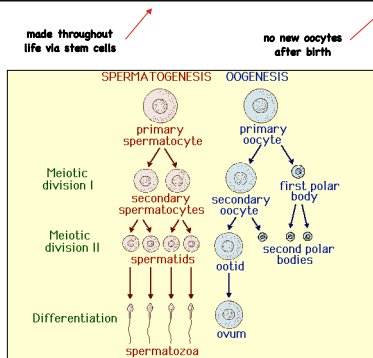
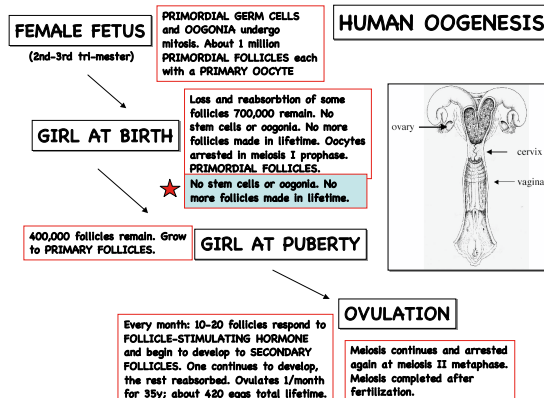
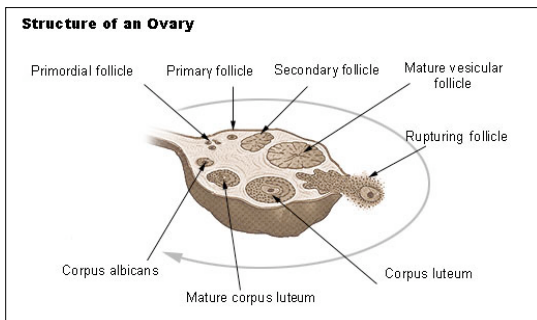
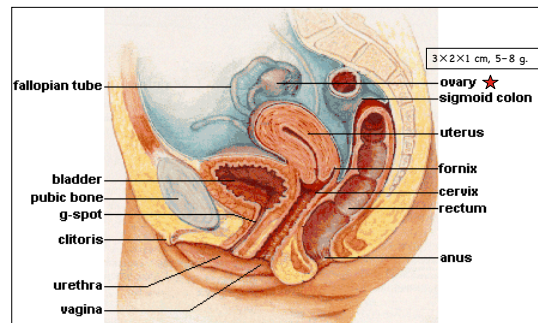


Figure 3. Plasticity of adult stem cells **NIH website**

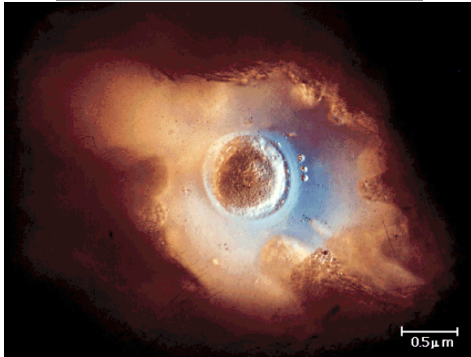
COMPARISON: SPERMATOGENESIS vs OOGENESIS



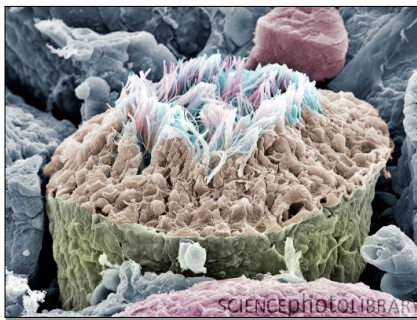
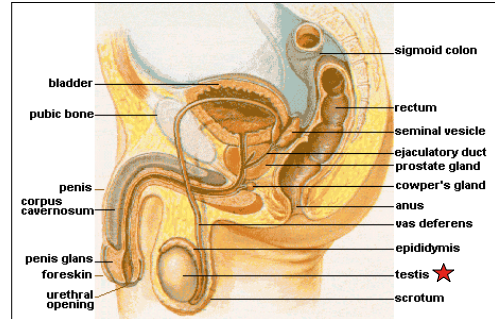
FEMALE REPRODUCTIVE SYSTEM



HUMAN EGG WITH POLAR BODIES



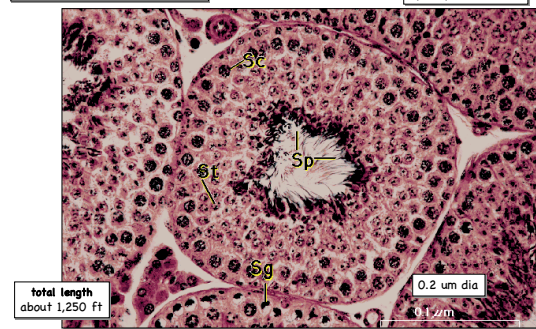
MALE REPRODUCTIVE SYSTEM



Sperm production site. Sectioned seminiferous tubule. This tubule contains a swirl of the tails of forming sperm cells (blue/pink) at its centre.

TESTIS (seminiferous tubule)

Sg - spermatogonia
Sc - spermatocytes
St - spermatids
Sp - spermatozoa

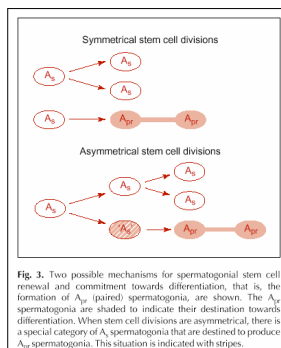


STEM CELL SELF-RENEWAL

EXAMPLE: HUMAN SPERMATOGONIA

A_s spermatogonia (stem cells) continued self-renewal

A_{pr} spermatogonia (paired) destined for differentiation



HUMAN MALE SPERMATOGENESIS

