Topic 13 - Development

Different Paths: From Zygote to Person
Fetal Alcohol Syndrome

1 in 750 births
Mild to severe effects: Developmental disorder
Greatest damages
First trimester

Signs:
small eye opening
thin upper lip
smooth philtrum

http://www.aafp.org/afp/20050715/279_f2.jpg
Fetal Alcohol Syndrome

Physical development
- Stunted growth (10th percentile)
- Microcephaly (small head)
- Brain abnormality (size, structure)

Mental disorders
- Retardation (leading cause in the Western World)
- ADHD
- Memory issues
- Lack of impulse control

*Interaction of genes and environment*

http://www.judiciaryreport.com/images/fas-brain.jpg
Human Development Pathway

Zygote: sperm + egg
Blastula: 1 week, hollow ball of cells
Gastrula: 2 weeks, cell layers form
Pattern formation (limbs, systems, etc.)

How?

Cell differentiation through differential gene expression:

- some genes turn off so cells can specialize
  - ex: liver cells: genes for muscle protein shut off
  - muscle cells: genes for liver function shut off
Embryo Flexibilities

Splitting: identical twins
Developmental arrest: stopping and starting development

Chimera: fusion of two zygotes into one
Humans: offspring could be “unrelated” to their mother

Blood from zygote A
Organs from zygote B
Eggs are from zygote B

Children would appear unrelated based on blood test!
Developmental Arrest

Frozen embryos
  Storage of embryos in In Vitro Fertilization (IVF)
Maternal arrest: Kangaroos can depress development of zygote
Similarities among vertebrates

Early embryonic development similar for all vertebrates

Process is the same: zygote to blastula to gastrula

Suggests common descent

Master control genes

How do cells know what to turn into?
Master genes – homeobox genes (1983)
Cause a cascade of development
Trascription regulators
Found through-out different organisms
Mutations can cause disruptions in development
Clones

Asexual reproduction: produces clones
  advantage: don’t need to find a mate
  disadvantage: low variation
Uncommon among “higher animals”

Sexual reproduction: produces offspring
  different than parents
  advantage: variation
  disadvantage: find mate, fight for mate
Cloning

Reproductive cloning: creation of identical offspring from parent cell
Dolly the sheep

current: Livestock, pets

Therapeutic cloning: creation of identical cells for treatment of disease
Spinal cord injury, Diabetius
Stem Cells

Occur in the blastula (inner cell mass)

Cells that have the potential to develop into any cell type (Pluripotent stem cells)

Embryonic stem cells
derived from a embryo
destruction of the embryo

Adult stem cells
from an adult cell (backward development)
much more difficult to revert
Next time: Sex & Union

Read: none