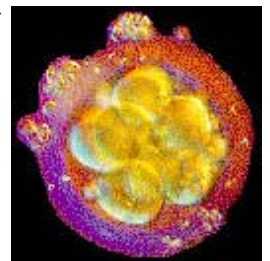


VERTEBRATE DEVELOPMENT PATTERNS

Embryology - study of development of the embryo

5 major stages

- 1. gametogenesis** - gamete production - (**meiosis**)
spermatogenesis - in semiferous tubule
spermatocytes --meiosis 1 & 2 --> sperm cells
oogenesis - in ovary
every 28d FSH (pituitary) stimulates dormant follicle
oocytes -meiosis-> produce 2nd oocyte & polar body
LH (pituitary) triggers ovulation
- 2. Fertilization** - union of sperm & egg cell --> 2n zygote
parts of a sperm - acrosome, head, mito, & flagella
must penetrate... 1) egg's jelly coat, 2) vitellin
layer .. (glycoproteins), & 3) membrane
acrosome reaction...
monospermy = plasma membrane/ vitellin layer -
impermeable? hardens forming fertilization membrane
- 3. Cleavage** - rapid succession of cell divisions.....
without growth - no increase in size, only cell #
forms hollow ball of cells called blastula, w internal fluid
filled cavity is the **blastocoel**
animal pole - portion of embryo primary tissues
vegetal pole - portion of embryo with "yolk"



4. Gastrulation - period of cell migrations around blastopore, which converts embryo from hollow ball of cells into a 3 layered stage called gastrula embryo forms 3 primary germ cell layers :

ectoderm - outer epidermal layers of organs, skin

endoderm - digestive tract tissue

mesoderm - fills in space inbetween : muscle
gastrulation obliterates the blastocoel - forms new cavity called **archenteron** - forms digestive cavity

5. Organogenesis Organ Formation

ex: **neurulation** in frog - formation of nervous system

neural plate (ectoderm) - flat tissue surface that migrates to form tube = neural tube = brain & spinal cord

notochord (mesoderm) cartilage-like = backbone

organs form --> flat plates into tubes --> 3D shape

Key differences : plant & animal development...

animals -

cell migrations &

embryonic induction - where one group of cells

influences development of an adjacent group of cells

ex : lens induction in eye

plants -

plane of cell divisions (cytokinesis)

influences width vs. height

Genetic Basis of Development....

is **Differential Gene Activity**...

cells become structurally, functionally, & biochemically different by expressing different genes at different times during development

Totipotency...

demonstration that all cells of organisms have a full genetic complement

i.e., differentiation does not proceed by loss of genes

Genomic Equivalency: experiments -

1. F.C. Steward (1950) w **carrot** grows full plant via 1 cell
2. Briggs & King (1952) & J.B.Gurdon (1974) show same in **frogs**
3. John Wilmut (1997) clones **Dolly** (mammals) - fig 21.7*

Stem Cells...

unspecialized cells (in form & shape) that can reproduce indefinitely under appropriate conditions -->

differentiate into one or more cell types.

fertilized egg cells are **totipotent** (= all) embryonic stem cells vs. adult stem cells (**pluripotent**) = many, but not all)- fig 21.9

Transcriptional Regulation...

results in expression of Tissue Specific Proteins - fig 19.7*

ex: muscle cell determinism - fig 21.10*