

Deuterostomia

radial cleavage (embryonic stage)

triploblastic (3 germ layers: endoderm, mesoderm, ectoderm)

bilateral larvae – adults are **Pentaradial** (lose bilateral symmetry)

Madreporite - opening for water vascular system

clade: Amniota

(1) Amniotic egg (w/ 4 extraembryonic membranes)

Chorion- protect, help from placenta (in mammals), gas exchange

Allantois - disposal sac, help from umbilical cord, gas exchange

Yolk sac - nutrition (in reptiles), form blood vessels (in mammals)

Amnion- membrane closest to the embryo, forms fluid-filled sac, shock absorber

(2) Impermeable skin

(3) Rib cage - ventilate lungs

Clade: Lepidosaurs

earliest reptiles

1. scales w/ keratin

2. shelled amniotic eggs laid on land

3. internal fertilization (inside female)

4. many ectothermic; birds are endothermic

2 pair appendages

snakes & lizards

Archosaurs

large opening (snout)

crocodiles, pterosaurs, dinosaurs

Crocodylia - crocodile = narrow snout; alligator = broad, wide snout

Pterosaurs - wings of collagen

Dinosaurs - 2 lineages by hip structure:

- Ornithischian - "bird-hipped" ; herbivores; did not evolve into birds

- Saurischian - "lizard-hipped"; retained ancestral hip; long-necked ; theropods; evolved into birds

Chordata

bilateral symmetry

coeloms and segmented bodies

Derived Characteristics of Chordates:

- dorsal, hollow nerve cord

- notochord from mesoderm; support

- pharyngeal slits - all chordate embryos; grooves become slits that open into pharynx

- post anal tail - movement; reduced in embryology

Gnathostomata

jaws , fins (maneuvering), gills (gas exchange)

enlarged brains, enhanced senses

genetic duplication (hox genes)

lateral system (aquatic) - sensitive to vibration

Jaws- major adaptation ; modified skeletal rods

Ancestral Amniote

Diapsids Synapsids

Skull = 2 hole Skull = 1 hole either
either side side (Temporal Fenestra)

mammals

Bird Origin

archosaurs

evolved from theropods

Archaeopteryx- oldest bird

digit loss/fusion = wing-joint flight

loss of teeth

wing claw lost

hollow bone= reduce weight

long tail w/ vertebrae

reduction in growth rate in juveniles

Vertabrata

3 lineages of Gnathostomata

Chondrichthyes cartilage skeleton

calcium mineralization

suspension feeders;
shark-teeth

Cloaca - reproductive tract

Shark & Rays

Osteichthyes bony endoskeleton and
(Actinopterygii) scales

tetrapods

swim bladder

gills

lateral line system

Tetrapods 4 limbs
(Sarcopterygii)

ears

head on necks that move
independently from body

pelvic bones

absence of gills

has clade: Amniota

Amphibians water and terrestrial
environments (damp
habitats)

moist skin

eggs w/o shell

external fertilization

Actinopterygii & Sarcopterygii:
- operculum (gill cover)

complex nervous systems & behaviors

backbone or **Rudimentary Vertebrae** -
endoskeleton

2 or more sets Hox genes (genetic complexity)

Pharyngeal Cleft/Groove

Neural crest cells disperse thru embryo
(teeth, skull, neurons)

Cyclostomata - circular mouth, no jaws



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