



# CLASSIFICATION OF CHORDATA

# Phylum Chordata

- ▶ The chordates are a group of particular interest to us as we belong to it, being members of the subphylum Vertebrata.
- ▶ The chordates include all of the vertebrates (fish, amphibians, reptiles, mammals and birds), but also two non-vertebrate subphyla: the Urochordata and the Cephalochordata.

# Characteristics of the Chordata

- ▶ Chordates are:
  - ▶ Bilaterally symmetrical
  - ▶ Triploblastic
  - ▶ Have a well developed coelom
  - ▶ Have a complete digestive system

# Five distinctive characteristics of the chordates

- ▶ Five distinctive characteristics separate the chordates from all other phyla:
  - ▶ Notochord
  - ▶ Single, dorsal, tubular nerve cord
  - ▶ Pharyngeal pouches or slits
  - ▶ Endostyle
  - ▶ Postanal tail
- ▶ Not all of these characteristics are apparent in adult organisms and may appear only in the embryonic or larval stages.

# NOTOCHORD

- ▶ Notochord is a flexible, rod like structure. It normally extends the length of the body and is an anchor point for muscles.
- ▶ The notochord bends without shortening and hence permits the animal to undulate.
- ▶ In invertebrates and jawless vertebrates (Agnatha), the notochord is present throughout life.
- ▶ However, in the jawed Vertebrates (Gnathostomata), notochord is replaced by the vertebral column.

# single, dorsal, tubular nerve cord

- ▶ In most **invertebrates** the nerve cord, if present, is **ventral to the gut**.
- ▶ In **chordates**, in contrast, the nerve cord is **dorsal to the gut** and notochord. The nerve cord passes through the neural arches of the vertebrae, which protect it.
- ▶ The nerve cord is enlarged in vertebrates into a brain, which is surrounded by a bony or cartilaginous cranium.

# PHARYNGEAL GILL SLITS IN PROTOCHORDATES

- ▶ In Protochordates (Urochordates and Cephalochordates), pharynx plays dual role i.e. acts as a food capturing device (filter feeding device) as also pharyngeal gill slits participate in respiratory gaseous exchange.
- ▶ Pharyngeal slits occur in aquatic chordates and lead from the pharyngeal cavity to the outside.
- ▶ Water containing food is drawn in through the mouth by cilia and exits via the pharyngeal slits where the particles are trapped in mucus

# Postanal tail

- ▶ The postanal tail, some musculature and the notochord enable larval tunicates and amphioxus to swim.
- ▶ The postanal tail evolved to allow organisms to swim and its efficiency has been enhanced by the addition of fins. **The postanal tail is present only in vestigial form in humans (the coccyx)** although tails as a whole are widespread among vertebrates.



# CLASSIFICATION OF CHORDATA

## PHYLUM CHORDATA

A. Subphylum Urochordata

B. Subphylum Cephalochordata

C. Subphylum Vertebrata  
Order Myxinoidea

1. Superclass Agnatha

1. Order Petromyxontia , 2.

2. Superclass Gnathostomata

1. Class Chondrichthyes

2. Class Osteichthyes

3. Class Amphibia

4. Class Reptilia

5. Class Aves

6. Class Mammalia

# SUBPHYLUM UROCHORDATA

- ▶ Notochord present only in larva and degenerates in adults.
- ▶ Pharynx consist of many gill slits
- ▶ Nervous system is reduced to ganglion in adult.
- ▶ **Retrogressive metamorphosis** occur in *Ascidea*.
- ▶ Adult ascidians lack a notochord and there is only a single ganglion in place of dorsal nerve cord.
- ▶ **Of the five characteristics of chordates adults possess only two: pharyngeal gill slits and an endostyle, both of which they use in filter feeding.**



*Ciona intestinalis*  
(a solitary sea squirt)

# Other Urochordate classes

- ▶ Besides the ascidians there are two other classes of the Urochordata: the Larvacea and Thaliacea.
- ▶ Both are small, transparent planktonic forms. Thaliaceans are cylindrical or spindle shaped whereas larvaceans are tadpolelike and resemble an ascidian larva.

# CHARACTERISTICS OF SUBPHYLUM CEPHALOCHORDATA

- ▶ These are typically marine animals.
- ▶ Scale less, fishlike marine animals, a few centimeter long.
- ▶ Often called “classical chordate” as they have ALL CHORDATE CHARACTERISTICS AS AN ADULT.
- ▶ Notochord present throughout life- extends into head head region.
- ▶ Pharyngeal gill slits and dorsal tubular nerve cords also persist.
- ▶ Tail has blocks of muscles called myotomes.
- ▶ There coelom is enterocoelic

# Amphioxus

Amphioxus is a filter feeder.

Water enters the mouth and then passes through the pharyngeal slits, where food is trapped in mucus. Cilia then move the food to the gut.

Amphioxus is interesting because it displays the basic Chordate characteristics in a simple and obvious form because of its transparency.

Amphioxus is considered to be the closest living relative of the Vertebrates because it shares several characteristics with Vertebrates that Urochordates do not possess.

# SUBPHYLUM VERTEBRATA- CHARACTERISTICS

- ▶ Notochord is replaced by Vertebral column. The defining feature of Vertebrates is the presence of a vertebral column consisting of a series of repeating units called vertebrae.
- ▶ Presence of an endoskeleton of bone and/or cartilage.
- ▶ Presence of a centralized nervous system with a brain and sensory organs located in a distinct head region.
- ▶ Presence of a cranium/skull protecting the brain.
- ▶ Presence of a muscular system attached to the endoskeleton to enable movement.

## **SUBPHYLUM VERTEBRATA- CHARACTERISTICS (continued)**

- ▶ **Presence of a closed circulatory system with a ventral heart having 2-4 chambers.**
- ▶ **Presence of skin that often produces scales, feathers, fur or hair.**
- ▶ **Presence of an excretory system consisting of paired kidneys.**
- ▶ **Presence of an endocrine system of glands located throughout the body.**
- ▶ **Presence of separate sexes that reproduce by sexual reproduction.**
- ▶ **Presence of neural crest cells.**



# SUPERCLASSES OF SUBPHYLUM VERTEBRATA

## **SUPERCLASS AGNATHA:**

- ▶ Vertebrate without jaws.
- ▶ Includes 2 orders:
  1. Order Petromyzontia
  2. Order Myxinoidea

## **SUPERCLASS GNATHOSTOMATA:**

- ▶ Mouth guarded by upper and lower jaw'
- ▶ Includes Classes:
  1. Class Chondrichthyes
  2. Class Osteichthyes
  3. Class Amphibia
  4. Class Reptilia
  5. Class Aves
  6. Class Mammalia