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Topic

COMPARISION : CHORDATES v/s NON- CHORDATES

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A. Differences between Chordates & Non- Chordates

NON-CHORDATES	CHORDATES
1. Body with bilateral or radial symmetry.	1. Body bilaterally symmetrical.
2. The paired appendages vary in number and may even respond to the number of body segments.	2. The appendages are two pairs.
3. Tail absent.	3. A post-anal tail is usually present.
4. Branchial clefts absent.	4. The branchial clefts are always present, being restricted to larval stages only in some.
5. The vascular system is open and consists of a heart, arteries and sinuses, the last ones are continuation of primary body cavity.	5. The vascular system is a closed one and consists of a heart, arteries and veins.
6. The heart is less muscular, dorsal and always above the alimentary canal.	6. The heart is highly vascular, ventral and lies below the alimentary canal.
7. No portal veins.	7. Portal veins present in the majority.
8. The respiratory pigment haemocyanin is a prosthetic group of copper or haemoglobin in some cases. Both are dissolved in plasma.	8. The respiratory pigment haemoglobin is an iron compound and present in the erythrocytes.
9. Notochord absent.	9. A solid, un-segmented, flexible axial rod, the notochord is universally present and extends along the whole body length.
10. The main nerve cord is a solid, double one, running mid-ventrally immediately dorsal to the ventral body wall.	10. The spinal cord is a hollow, mid-dorsal tube, placed immediately below the body wall and above the notochord.

B. Chordate Features Shared by the Non-Chordates

Besides the four unique features of the chordates, there are many characteristics which are also present in many higher invertebrate chordates. The significance of the structural similarities is very difficult to interpret from the phylogenetic point of view.

However, it may be suggested that the chordates as a group evolved from some higher groups of non-chordates and, hence, the structural resemblances are due to remote common ancestry.

Bilateral Symmetry:

Both the chordates and most of the non-chordates like annelids, arthropods, etc. exhibit distinct bilateral symmetry.

Axiate Organization:

All the chordates have a distinct polar axis. The anterior end is marked by the presence of head and the posterior end is characterised in most cases by the tail. The axis extending from the head to the tail end is regarded as the antero-posterior axis.

The antero-posterior axis of the chordates corresponds to that of most of the higher non-chordates. The axiate organization is not strictly homologous, because many fundamental differences exist between the two groups.

Triploblastic Condition:

All animals above the rank of cindarian coelenterates have a third germ layer besides ectoderm and endoderm. This third layer is known as mesoderm.

Although the embryonic formation of the mesoderm is different in non-chordates, its formation is similar in chordates, echinoderms, brachiopods, chaetognaths and in some other enterocoelous forms. The triploblastic condition has added more weight to the phylogenetic relationship of the chordates with the non-chordates.

Metamerism:

Segmental organisation is characteristic of most of the non-chordates and the chordates. In annelids and arthropods, segmentation is well-marked both internally as well as externally but in chordates the external segmentation is not seen. The segmental arrangement of the body wall musculature is prominent in chordates.

Coelom:

The eucoelom or true coelom is the secondary body cavity of triploblastic animals, situated between the gut and body wall. The space of body cavity is lined by coelomic epithelium and contains coelomic body fluid.

The mode of origin of coelom is different among the different groups of invertebrates and chordates. In annelids, arthropods and molluscs the coelom formation is of schizocoelic type, because the coelom develops by the splitting of the embryonic mesoderm layer.

In echinoderms, hemichordates and in other chordates the coelom formation is of enterocoelic type, or the coelom is called enterocoel, because the coelom develops from the embryonic archenteron or enteron. Here mesoderm arises in the embryo as paired lateral pouches growing out from the endoderm.

These pouches gradually lose continuity with the endoderm and grow downwards and inwards until they meet and fuse. The inner splanchnic part remains against the wall of developing gut and outer somatic part of the mesoderm becomes applied against the developing body wall.

Embryonic Development:

Protostome and deuterostome are the two groups of animals which differ in the embryonic origin of the mouth. Among protostomes, the mouth is formed from the blastopore; hence protostome means 'first mouth'. Among the deuterostomes, the mouth does not form from blastopore. Instead it may give rise to anus.

In this group the mouth is the second opening, hence called deuterostome. The differences on the basis of embryological development have strongly supported by analysis of phosphate-containing storage molecules that are found in muscles and are used in the synthesis of ATP.

Protostomes (e.g., Annelids, arthropods and molluscs) contain arginine phosphate and deuterostomes (e.g., echinoderms and chordates) contain creatine phosphate.

Table 2 : Characteristic features of the adult deuterostomes

i) Absence of chitin
ii) Tripartite body
iii) Mesodermal skeleton
iv) Intra epidermal nervous system

Table 3 : Characteristics of the Phylum Chordata

<ol style="list-style-type: none">1. Presence of a dorsal rod-like supporting structure, called notochord, generally derived from the dorsal wall of the embryonic gut.2. Presence of dorsal, hollow tubular nervecord, arises by invagination of the neural ectoderm.3. Presence of pharyngeal slits, help in filtering and respiration among primitive groups.4. Presence of a post anal tail (except the adult sessile, urochordates). <p>These features are present in some parts of the life cycle. Other features are :</p> <ol style="list-style-type: none">i) Heart situated ventrally — no specialized heart in cephalochordates; a median ventral aorta which is contractile, and drives the blood forwards.ii) Blood flow pattern — dorsally backwards and ventrally forwards.iii) Endostyle — the iodine secreting tissue in protochordates (Urochordates and Cephalochordates) and regarded as the precursor of the thyroid gland of higher vertebrates.iv) Cephalization — a condition of concentration of principal sense organs in a head and brain.

Although the chordates share many common features with the non-chordates, the fundamental organisation is different. The differences are shown in Table 4 Chordata.

Nature of Sexes:

Majority of chordates are dioecious (the sexes are separate) but in a few hemichordates and in majority of urochordates the hermaphroditism predominates.