

## **Quadrant II – Transcript and Related Materials**

**Programme:** Bachelor of Science (Third Year)

**Subject:** Zoology

**Course Code:** ZOC 103

**Course Title:** Anatomy of animal body systems

**Unit:** Unit 5-Circulatory system

**Module Name:** Evolution of aortic arches in Vertebrates.

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### **Notes-**

#### **Aortic arches in Tetrapods.**

##### **Amphibians:**

In amphibians the aortic arches retain the bilateral symmetry. Of the six pairs of embryonic aortic arches, the fifth one is observed in adult *Cryptobranchus* (Urodele). The sixth arch becomes small. It gives rise to the pulmonary artery and continues as the ductus arteriosus to the dorsal stem. The pulmonary artery may give rise to musculocutaneous artery.

In *Necturus* the first external gill is supplied by the third afferent arch. The base of the sixth arch is absent in *Necturus*. The ductus arteriosus connects pulmonary artery with the dorsal stem.

In anurans (adult), only three pairs of aortic arches (III, IV and VI) are present. But in the tadpole the development of aortic arches correspond to the emergence of external and internal gills. It shows the fate of aortic arches in some amphibians.

##### **Reptiles:**

Only three pairs of aortic arches persist such as third, fourth and sixth. The first, second and fifth pairs of aortic arches disappear. The fifth arch is present in reduced form in some reptiles. The remnant of the radix of aorta between third

and fourth arches is present on each side in some snakes. The ill-defined conus arteriosus is splitted into three vessels.

The fourth arch on the left side which becomes the left systemic arises from the right side of the partially divided ventricle. The fourth arch on the right side arises from the left side of the ventricle. It establishes a connection with a portion of the radix aorta of the right side and becomes the right aortic arch.

The common carotid arch arises from the right aortic arch and becomes divided into external and internal carotid arteries. The sixth aortic arch loses all its connection with radices of aorta and becomes the pulmonary arteries.

The radix of aorta between carotid and systemic arches is present as ductus caroticus in many lizards. Similarly a part of the radix may remain connected with the sixth aortic arch.

This connecting part is known as ductus arteriosus. Ductus caroticus and ductus arteriosus are both present' in Sphenodon. In crocodiles the right systemic arch develops from the left ventricle which gives rise to subclavian and innominate arteries.

### **Birds:**

The birds retain three pairs of aortic arches. These are IIIrd, IVth and VIth . Rest three pairs such as Ist, IInd, and Vth are lost. The third becomes carotid artery, the fourth becomes systemic aorta but retains only the systemic arch on the right side.

The systemic arch on the left side disappears. The right systemic arch originates from the systemic aorta that develops from left ventricle. The sixth arch becomes the pulmonary aorta that divides into two pulmonary arteries and each artery goes to each lung.

### **Mammals:**

The Ist, IInd and Vth aortic arches disappear. The IIIrd, IVth and VIth aortic arches persist of which the right aortic arch of IVth disappears. Only aortic arch on the left side persists.

The IVth becomes the systemic aorta and VIth arch becomes pulmonary aorta. The Ist and IInd aortic arches disappear but the basal stem becomes the external

carotid and 3rd aortic arches become the internal carotid. The dorsal connection between the 3rd and 4th aortic arches disappears.

The right side of 4th aortic arch becomes right subclavian artery. The left subclavian artery arises from the upper part of the left systemic arch. Right and left common carotid arteries with the right subclavian develop from a common aortic arch, called brachiocephalic artery.

In the embryonic stages ductus arteriosus is seen on sides but ductus arteriosus in the left side remains after birth as fibrous band, called ligamentum arteriosum or Botalli.