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Chapter 12

Image PowerPoint

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Artery (target) → Arteriole → Capillary → Venule → Vein (target)

Arteries change in size externally and lumen, elasticity

Structural differences in vessel walls correlate with function

Carry blood – a connective tissue

Arteries carry blood away from heart

Veins carry blood to heart

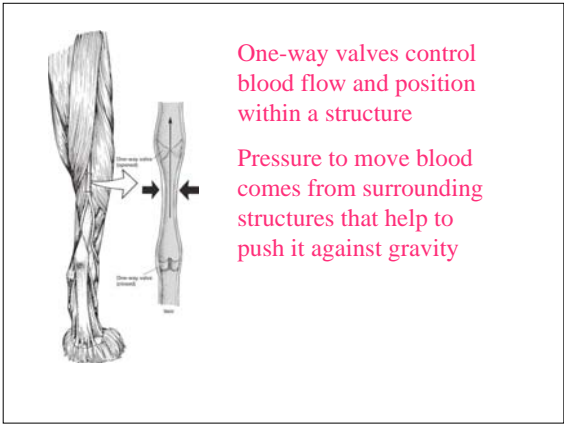
Blood flow pattern similar in all groups

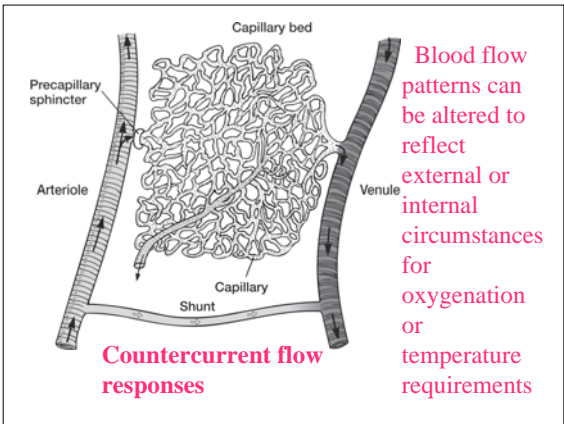
Learn the meaning of circulatory terms

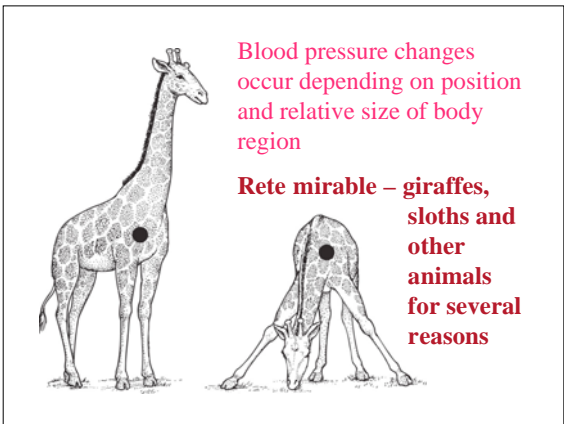
Systole
Diastole
Blood pressure


Total cross-sectional area

Aorta 130 mm Hg
120 mm Hg
Arterioles 30 mm Hg
20 mm Hg
Capillaries
Venules 12 mm Hg
5 mm Hg
Vein 0











Single pump – single circuit – fishes

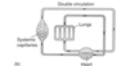
Restricted to low pressure systems



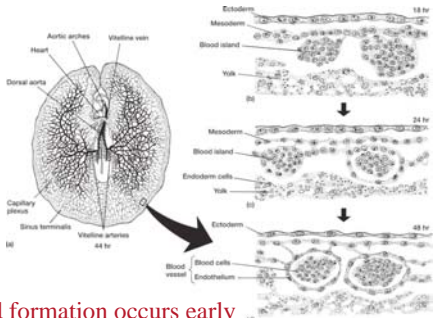
Double pump – two pumps in parallel



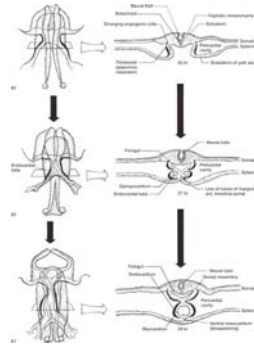
Divides pulmonary from systemic circuit



Can allow for higher pressure systemic circulation



Blood formation occurs early in embryonic development



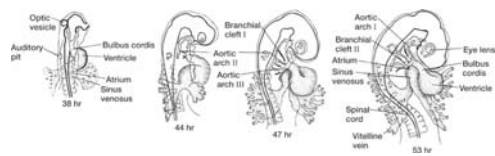
Chick embryo

First, primordial endocardial tubes form

Tubes fuse to form heart lining

Thickened epimyocardium forms peritoneum

Myocardium forms muscular walls of heart chambers



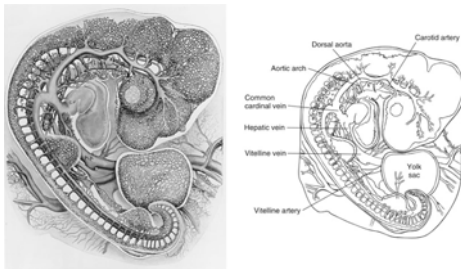
Heart grows and specializes into four chambers

Sinus venosus

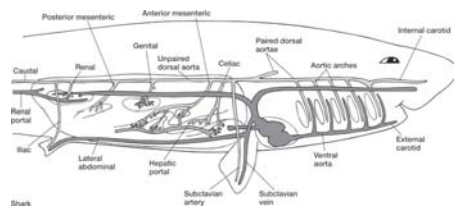
Atrium

Ventricle

Bulbus cordis



Identify structures and their functions



Fish circulation pattern – single pump system

Heart with four chambers

Sinus venosus, atrium, ventricle and bulbus arteriosus

Aortic arches

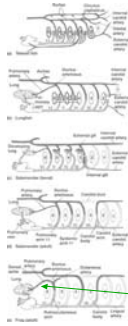
Aortic arches vary among organisms up to 15

Afferent arteries deliver blood to gills

Efferent arteries carry blood away from the gills

Six pairs of aortic arches is usual for gnathostome fishes and tetrapods

- **Chondrichthyans** – 1st pharyngeal slit reduced = spiracle
 - Ventral section of aortic arch I does not appear
 - Instead artery from adjacent collector loop supplies spiracle = **afferent spiracular artery**
 - Dorsal section of arch I forms, and becomes the **efferent spiracular artery**
- **Arches II – VI** – merge and cross connect to form collecting loops of gills
- Anterior and poster halves are **pretrematic** and **posttrematic** branches

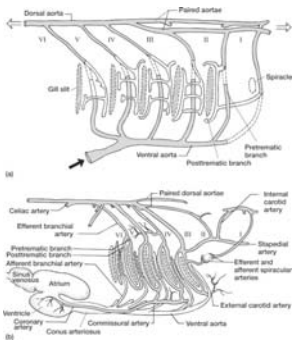


How aortic arches become specialized in different vertebrates

Arches are reduced and the pattern of arteries alters

Shows the origins and formation of the internal and external carotid arteries

Location of **ductus arteriosus** and **associated pulmonary artery**

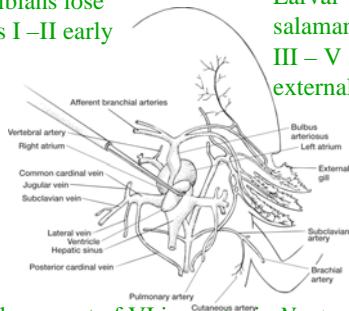


Aortic arch development in a shark

Development of collecting loops and pretruncal and posttruncal arterial branches

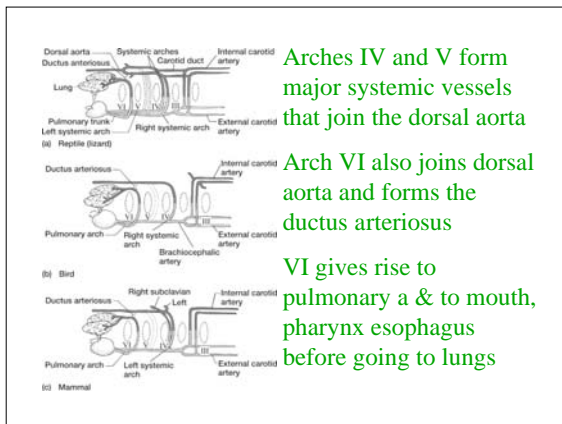
Amphibians lose Arches I – II early

Larval salamanders - III – V support external gills



Dorsal remnant of VI in neotenic *Necturus* forms base of pulmonary artery (exception to usual)

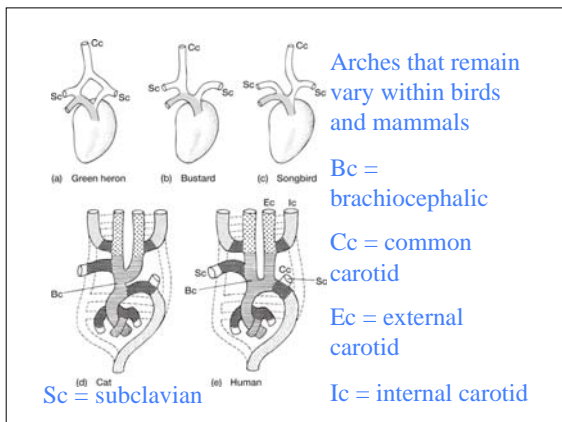
- Normally adult salamanders lose external gills but retain arches III – V
- Complete arch in adult salamanders VI makes pulmonary artery to lungs
- Carotid duct (between III – IV) = carotid duct closes at metamorphosis
 - Therefore carotids receive blood from ventral aorta
 - Become common carotids
 - Carotid bodies occur at external and internal bifurcation



Arches IV and V form major systemic vessels that join the dorsal aorta

Arch VI also joins dorsal aorta and forms the ductus arteriosus

VI gives rise to pulmonary a & to mouth, pharynx esophagus before going to lungs



Arches that remain vary within birds and mammals

Bc = brachiocephalic

Cc = common carotid

Ec = external carotid

Ic = internal carotid

Sc = subclavian
