

# Venous System

Comparative study in Vertebrates

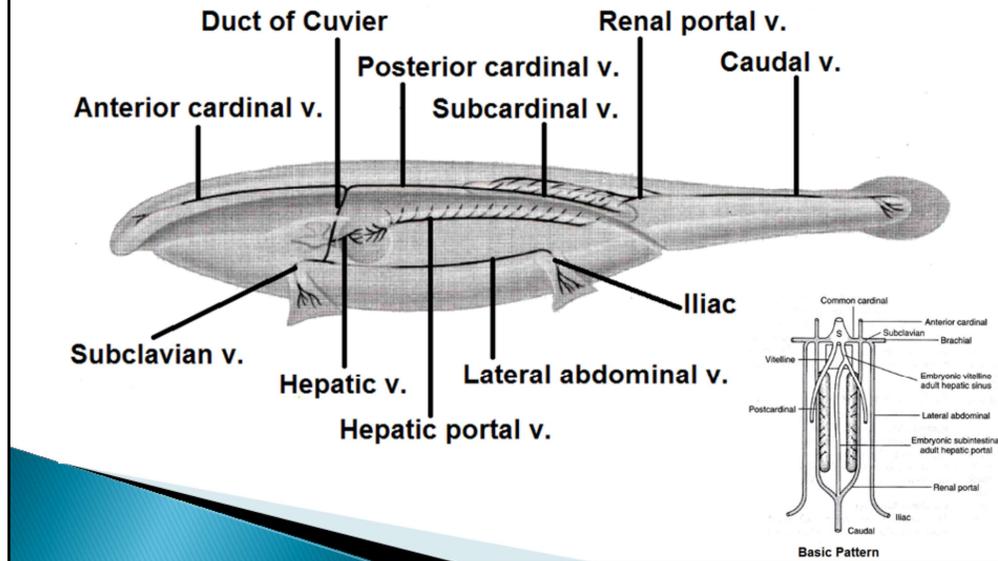
Lecture 12

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# Class Outline

- ▶ Generalized venous system
- ▶ Comparative study of venous system in vertebrates
  - Fish
  - Amphibians
  - Reptilians
  - Birds
  - Mammals

# Generalized Venous System



As these developments occur, **paired anterior cardinal veins** form in the dorsolateral head and drain caudally toward the heart, and **paired posterior cardinal veins** form in the dorsal body wall and course anteriorly toward the head.

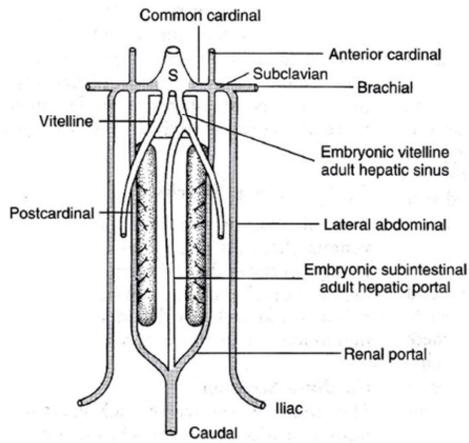
At their posterior ends, the posterior cardinal veins join with one another and receive **the caudal vein** from the tail.

**At the level of the heart**, the **anterior and posterior cardinal veins come together** to form the **paired common cardinal veins, or ducts of Cuvier**, which enter the sinus venosus laterally.

Several **subcardinal veins** form around the developing kidneys and interconnect with the nearby posterior cardinal veins. Long veins, the **lateral abdominal veins**, form in the lateral body wall, run the length of the trunk, and empty into the common cardinal veins.

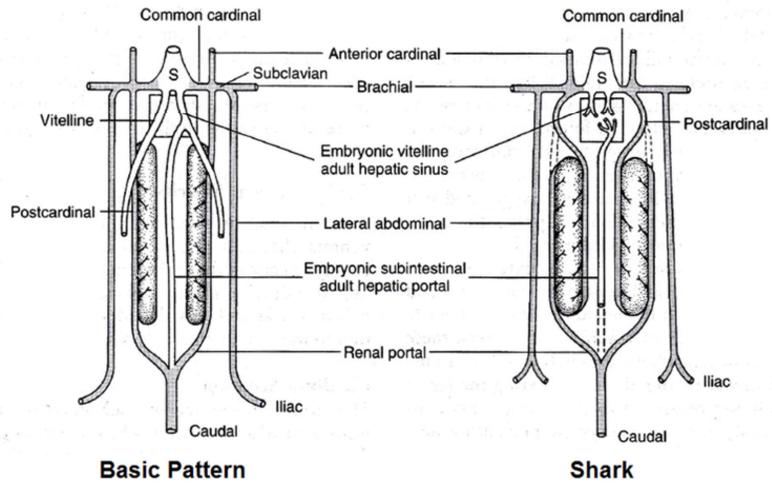
In addition to draining the lateral body wall the common cardinal veins also receive blood from the pelvic appendages via **the iliac veins** and from the pectoral appendages via **the subclavian veins**.

# Generalized Venous System

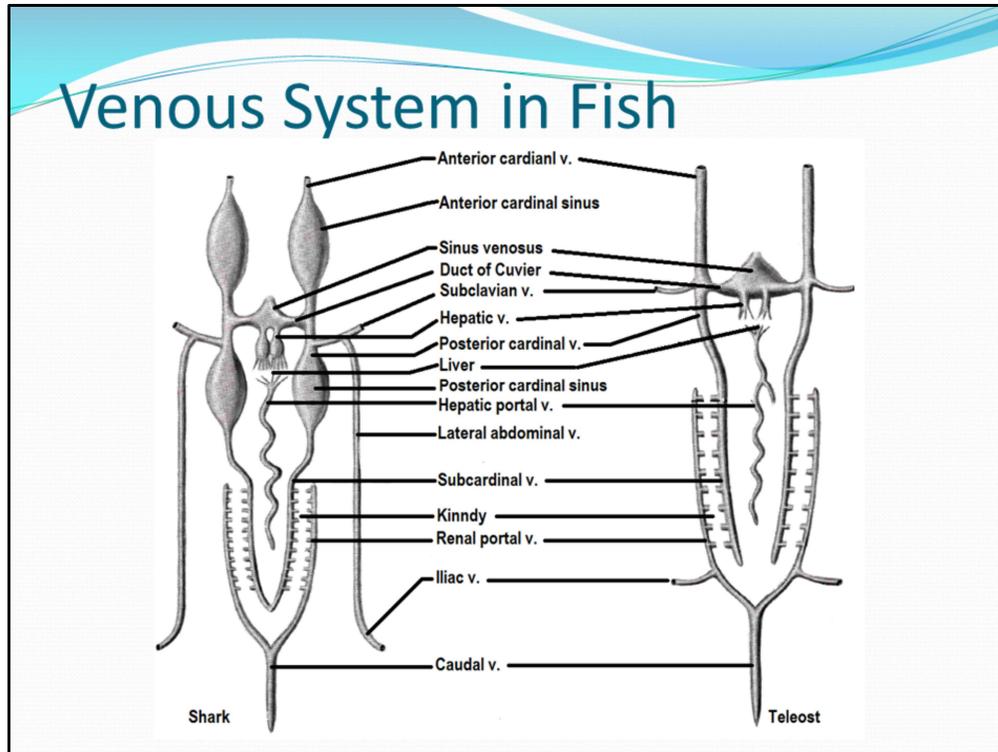


**Basic Pattern**

# Venous System in Fish



## Venous System in Fish



Most **teleosts** lack **lateral abdominal veins**. The **iliac veins** drain into either the posterior cardinals or the renal portals, and the **subclavian veins** drain directly into the duct of Cuvier.

In **chondrichtheans** there are large sinuses in the blood vascular system, particularly along the anterior and posterior cardinal veins.

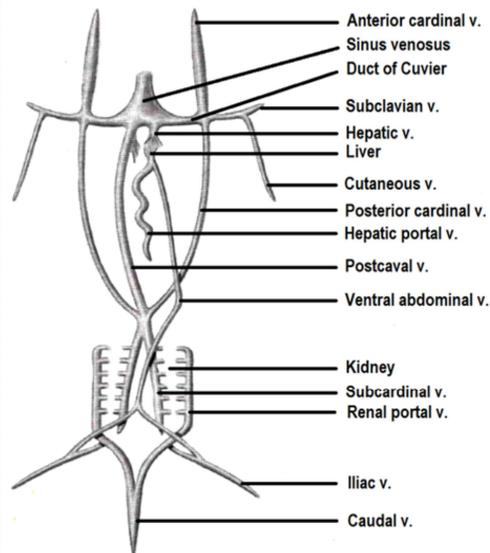
On each side, as the lateral abdominal vein is forming, the portion of **the posterior cardinal vein just anterior to the level of the kidney is lost**.

Blood coming from the caudal region (the primary muscular region in fish) must henceforth pass into **the posterior part of the posterior cardinal, then into the subcardinal, and then through the capillary beds of the kidney**.

The **subcardinal vein** then **drains anteriorly** into the **anterior part of the posterior cardinal vein**, and from there blood is **carried to the duct of Cuvier and to the heart**.

Above is the renal portal system, filtering blood from the tail through a kidney capillary system before sending it to the heart.

## Venous System in Amphibia



The **largest vein** returning blood to the **amphibian** heart is the **postcaval**. It arises between the kidneys and passes anteriorly through the liver to the sinus venosus; it **does not** itself **go through** the **capillary network**, but from the hepatic veins it receives blood which has come through the liver sinusoids.

The **postcaval vein** has two **separate embryonic** origins. **Anteriorly** this vein develops from a **caudal evagination** of the right hepatic vein; **posteriorly** it is a **continuation** of the **right subcardinal vein**.

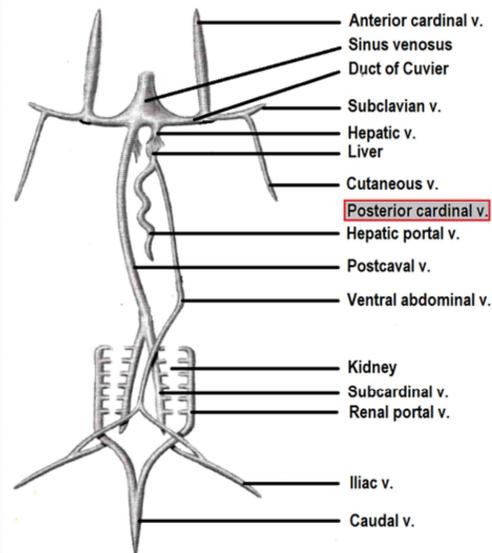
The **posterior and anterior parts** of the **lateral abdominal veins** become separated.

The **posterior parts** of the lateral abdominal vein receive blood from the **iliac veins**; the **right and left posterior parts** then move together ventrally and **form the midline ventral abdominal vein**.

The ventral abdominal vein then **passes through** the **ventral mesentery** of the alimentary canal and **empties into the hepatic portal vein**.

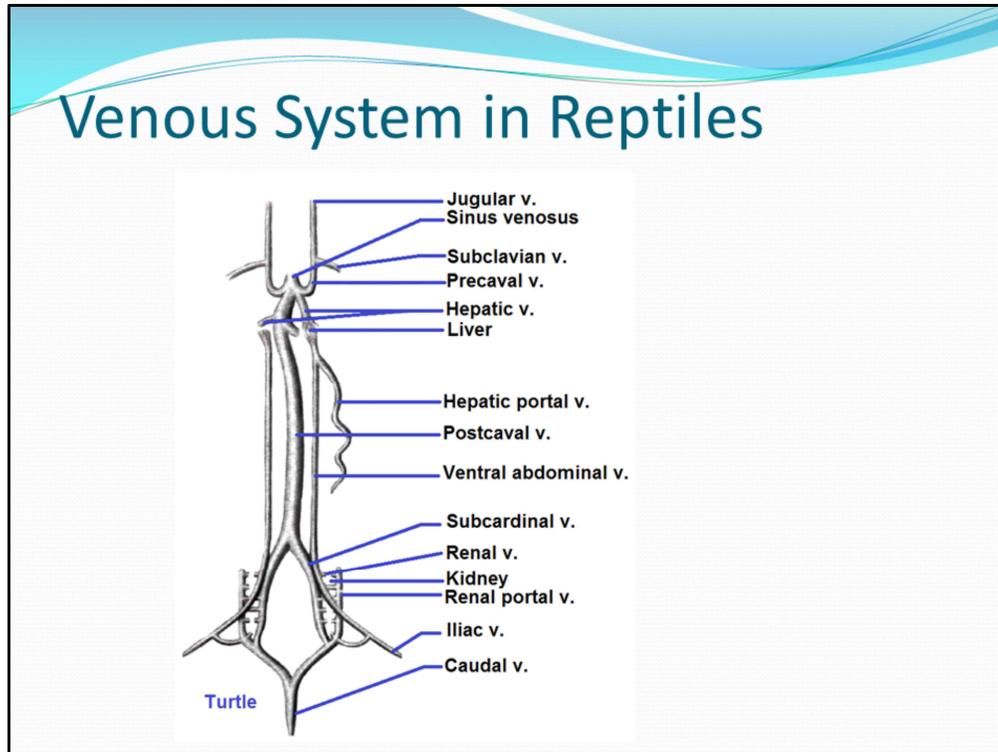
The **anterior parts** of the lateral abdominal veins **remain as cutaneous veins** draining the skin and superficial muscles from the trunk region, and then, **joined by the subclavian veins**, drain into the ducts of Cuvier.

## Venous System in Amphibia



In **anurans** the **posterior cardinal veins** are **lost**, and the **postcaval vein alone drains** the kidneys and most of the posterior body; in **urodeles**, although the posterior cardinal veins are retained, the postcaval vein nevertheless carries most of the blood from the posterior body.

## Venous System in Reptiles



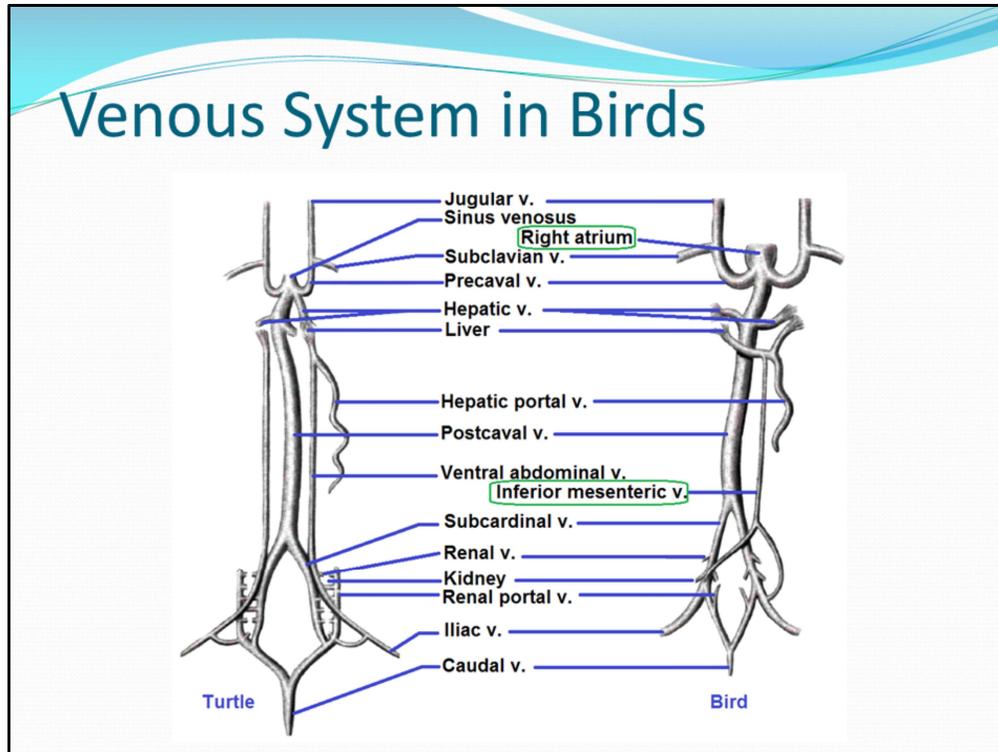
The reptilian venous system is much like the anuran's. The **postcaval vein is the primary vein** of the posterior body, since the anterior portions of the posterior cardinal veins have completely disappeared, **in amniotes**.

Since **no posterior cardinal veins drain into the common and anterior cardinals**, these two vessels cannot be distinguished; the term **precaval vein** is used to denote them. The **anterior cardinal vein distal** to the precaval vein is called **the jugular vein**.

**Blood from the hind limb may pass** to either the **renal portal vein or the hepatic portal vein** by way of the **ventral abdominal veins**. The blood in the renal portal vein does not have to pass through the capillaries in the kidney, since there are many anastomoses between the renal portal and the postcaval veins.

The **hepatic portal system** is similar in all craniates. It drains chiefly the **stomach, pancreas, intestine and spleen** and terminates in the capillaries of the liver.

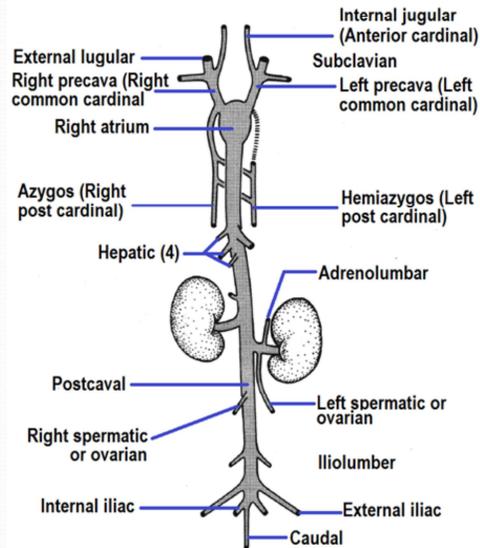
## Venous System in Birds



The **venous system of birds** is nearly identical to that of reptiles except that **in birds the renal portal circulation is almost completely lost**, and the iliac veins drain directly into the postcavals (although some branches pass through the kidney, perhaps with slight renal portal circulation).

Because of this **large connection between the iliac and postcaval veins**, the ventral abdominal vein, here called **the inferior mesenteric**, is quite small and carries little blood.

## Venous System in Mammals



The **mammalian system is also similar to that of reptiles**; the hepatic portal is basically the same, but with increased drainage by the postcaval. The abdominal vein is not present in adult mammals.

The **anterior segment of the right postcardinal vein persists** under the name **azygos**, and **part of the left postcardinal persists** as the **hemizygos**. These two veins drain the intercostal space.

Next Class

14 December 2015

*Thank  
You!*