

Neonatal growth and anatomy

Embryo

An embryo is an early stage of development of a diploid eukaryotic organism. In general, an embryo develops from a zygote, the single cell resulting from the fertilization of the female egg cell by the male sperm cell. The zygote possesses half the DNA of each of its two parents. This zygote will begin to divide by mitosis to produce a multicellular organism. The result of this process is an embryo.

Age range: From fertilization, Day 1 to 8th weeks.

Fetus

A fetus is a prenatal human between the embryonic state and birth. The fetal stage of development tends to be taken at beginning at the nine weeks after fertilization to birth. The fetus generally implies an embryo that has developed to the point of being recognizable as a human. A fetus is also characterized by the presence of all the major body organs.

Age range: From 9th week to birth.

Neonates/newborn

Newborn or neonate refers to an infant in the first 28 days after birth. It is basically the first 4 weeks of life.

Age range: From birth to 28 days of life.

Infants

An infant or baby is the very young offspring of a human or other animal. The term "infant" is typically applied to young children between one month and one year of age.

Age range: From second month to 1 year of life.

Toddler

A toddler is a child 12 to 36 months old. The toddler years are a time of great cognitive, emotional and social development.

Age range: From 12th to 36th month of life.

BLOOD CIRCULATION

Fetal Circulation

During pregnancy, the unborn baby (fetus) depends on its mother for nourishment and oxygen. All the necessary nutrition, oxygen, and life support from the mother's blood goes through the placenta and to the baby through blood vessels in the umbilical cord. Waste products and carbon dioxide from the baby are sent back through the umbilical cord blood vessels and placenta to the mother's circulation to be eliminated.

Oxygen rich blood in the unborn baby follows this pathway:

1. The enriched blood flows from **placenta** through the **umbilical cord** (basically called **umbilical vein**) to the **liver** and splits into two branches.
2. Majority of the blood then reaches the **inferior vena cava**, a major vein connected to the heart through **ductus venosus**.
3. A small amount of this blood goes directly to the **liver** to give it the oxygen and nutrients it needs.
4. In the **heart**, blood enters into the **right atrium**, the chamber on the upper right side of the heart.
5. When the blood enters the right atrium, most of it flows through the **foramen ovale** into the **left atrium**.
6. Blood then passes into the **left ventricle** (lower chamber of the heart) and then to the **aorta**.
7. Blood is then sent to the **heart muscle** (myocardium), **brain** and **lower body part**, well as whole circulatory system.

Oxygen poor blood in the unborn baby follows this pathway:

1. After circulating, the blood returns to the **right atrium** of the heart through the **superior vena cava**.
2. About two thirds of the blood passes through the **foramen ovale** from **right atrium** to **left atrium**, but the remaining one third is passes into the **right ventricle**, toward the **lungs**.
3. Most of this blood is bypassed away from the **lungs** through the **ductus arteriosus** to the **aorta**.
4. This blood (containing carbon dioxide and waste products) is then enters the **umbilical arteries** and flows into the **placenta** for purification and coming back to fetus again.

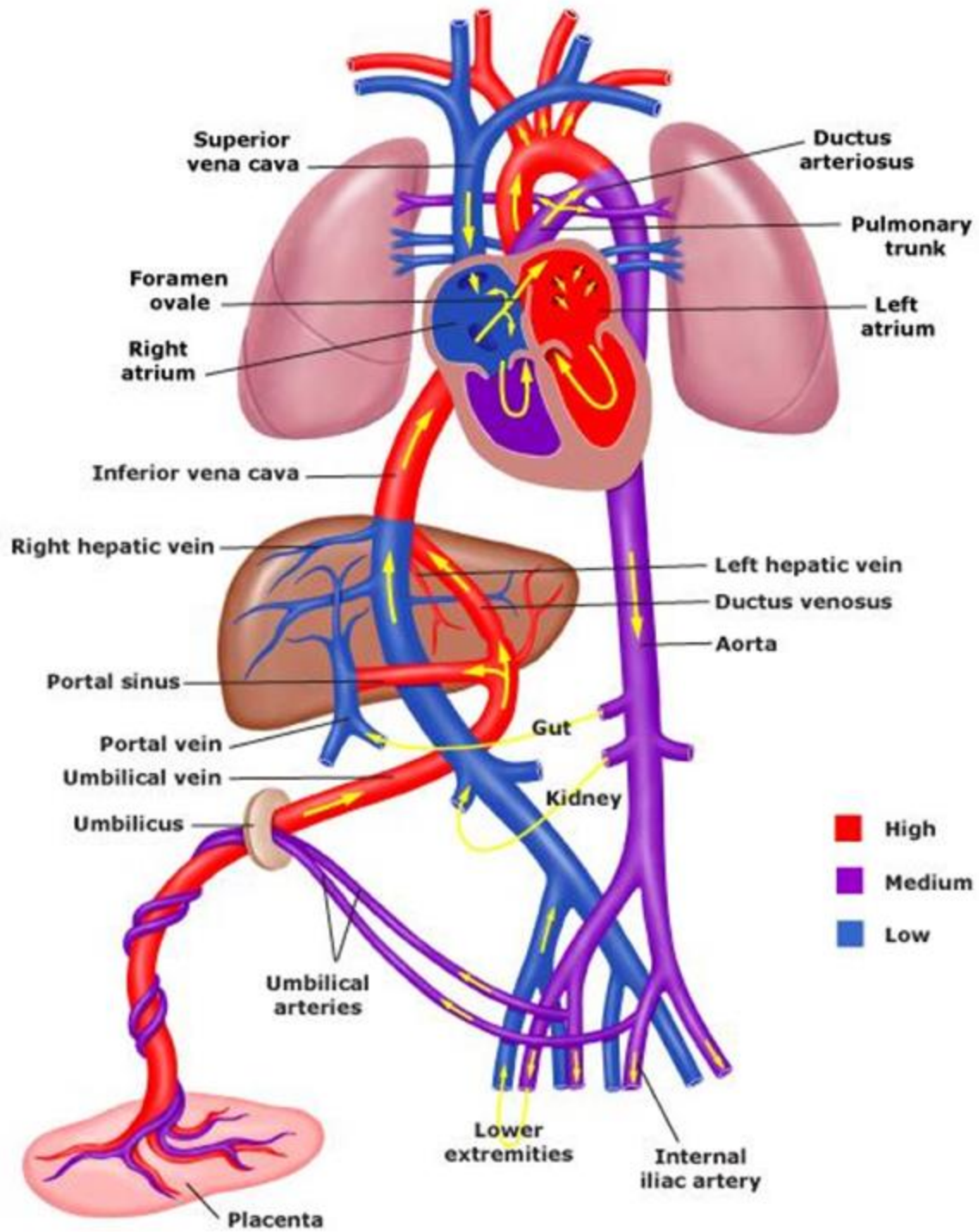


Fig: Fetal circulation

#Adult Circulation

The human circulatory system has two-part systems (**systemic** and **pulmonary**) whose purpose is to bring oxygen-bearing blood to all the tissues of the body. In the **systemic loop**, the blood circulates into the body's systems, bringing oxygen and collecting carbon dioxide waste. In the **pulmonary loop**, the blood circulates to and from the lungs, to release the carbon dioxide and pick up new oxygen.

The Pulmonary loop (Controlled by right side of heart)

1. From the **right atrium (10)** the oxygen poor blood reaches into the **right ventricle (1)** through the **tricuspid valve**.
2. During ventricle contraction, the blood is pushed into the **pulmonary artery (2)** that divided into two main parts: one to the **left lung (3)** and one to the **right lung (3)**.
3. Here, in lungs carbon dioxide rich blood is converted into oxygen rich blood.
4. The fresh, oxygen-rich blood returns to the **left atrium (5)** of the heart through the **pulmonary veins (4)**.

The systemic loop (Controlled by left side of heart)

1. The **oxygen-rich** blood coming from the **lungs (3)** enters the **left atrium (5)** of heart through **pulmonary vein (4)**.
2. As the chamber fills, it presses open the **mitral valve** and the blood flows down into the **left ventricle (6)**.
3. During the ventricle **contraction**, the blood on the left side is forced into the **aorta (7)**.
4. The blood leaving the aorta brings oxygen to all the body's cells through the network of **arteries** and **capillaries (8)**.
5. The used blood from the body returns to the heart through **veins**.
6. All of the blood from the body is eventually collected into the two largest veins: the **superior vena cava (9)**, which receives blood from the **upper body**, and the **inferior vena cava**, which receives blood from the **lower body** region.
7. Both veins, reach the blood into the **right atrium (10)** of the heart.

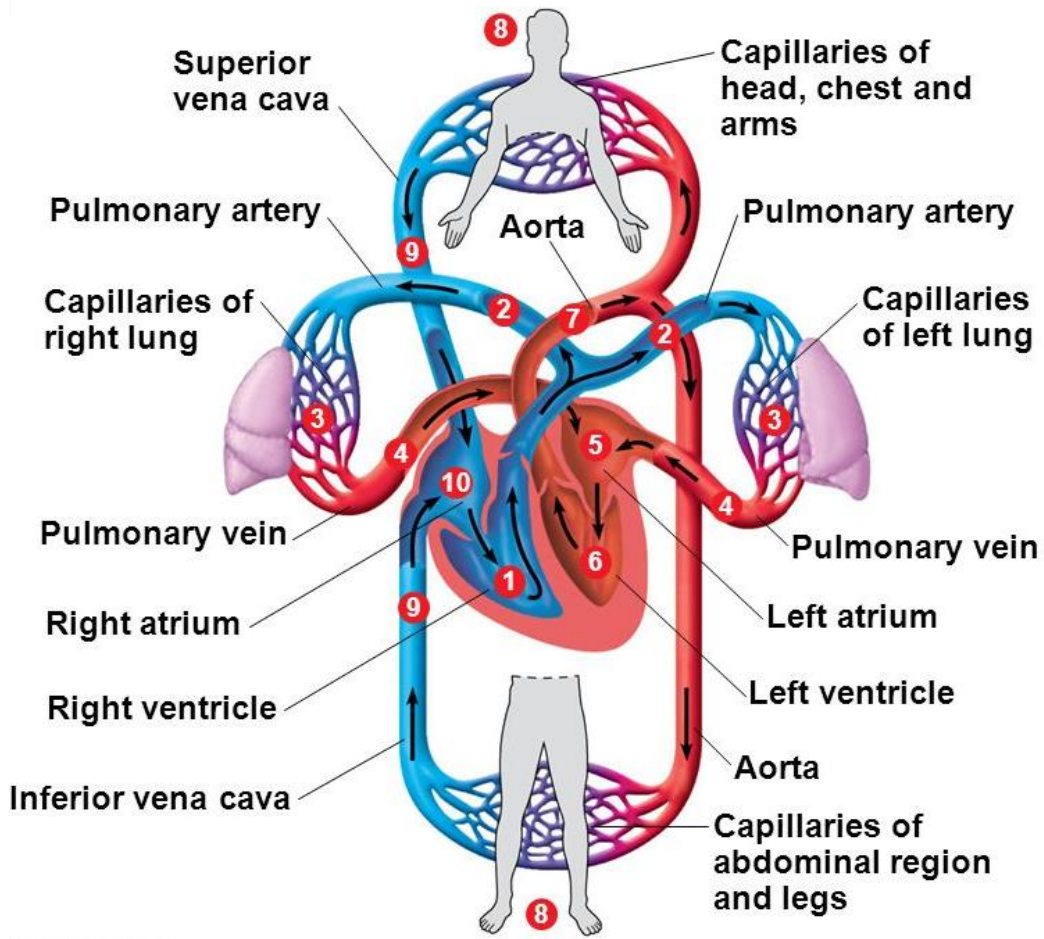


Fig: Systemic and pulmonary circulation

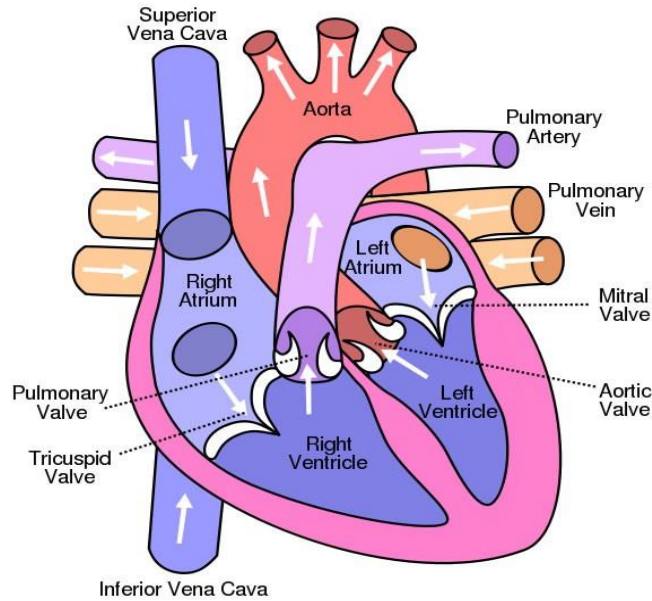


Fig: Circulation into the heart