

## Fish Cardiovascular System

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### Abstract

Animal circulatory systems differ in the number of heart chambers and the number of circles through which blood flows.

Fish have the simplest circulatory systems of vertebrates and unidirectional blood flows from the chambered heart through the gills and then to the rest of the body.

The function of the circulatory system is to distribute nutrients, oxygen and hormones to all parts of the body and remove metabolic waste that is transported to the excretory organs. The circulatory system consists of two anatomically connected circles, which are blood, venous arteries, or primary blood vessels. Through it blood flows and the secondary lymphatic system or lymphatic system, through which the lymph flows.

**Keywords:** Animal Circulatory Systems; Heart Chambers; Lymphatic System

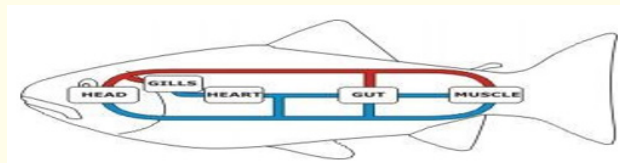
### Introduction

In fish, the system contains only one circuit, in which blood is pumped through the capillaries of the gills and into the capillaries of body tissues. This is known as a single cycle. Thus, the fish heart is only one pump (consisting of two rooms). Fish have a closed circulatory system. The heart pumps blood into one loop throughout the body. In most fish, the heart contains four parts, include two chambers, an entrance and an exit, the first part is the venous sinus, a thin-walled sac that collects blood from the veins of the fish before being allowed to flow into the second part, the atrium and is a large muscle room. The atrium acts as a one way waiting room and sends blood to the third part, the ventricle. The ventricle is another muscular chamber with thick walls and pumps blood, first to the fourth part, an artery bulb, a large tube and then exits from the heart. The arterial compass connects to the aorta, through which blood flows into the gills of oxygen [7].

### Fish cardiovascular system

The cardiovascular system can be considered as the transportation system in the body. This system contains three main components:

the heart, blood vessels and blood itself. The heart is the system and vascular pump similar to the methods of birth. The blood can be considered as a liquid that contains the oxygen and nutrients the body needs and carries the waste that must be removed. The coming information describes the structure and function of the heart and the cardiovascular system.



**Figure 1**

### The heart

Fish have what is often described with a two-chambered heart, consisting of the atrium to receive blood and the ventricle to pump it. The fish heart contains entry and exit chambers which may be called chambers, so they are also sometimes described as three or

four chambers, depending on what is calculated as a chamber. The atrium and ventricle are sometimes considered “real rooms”, while others are “attached rooms” [1].

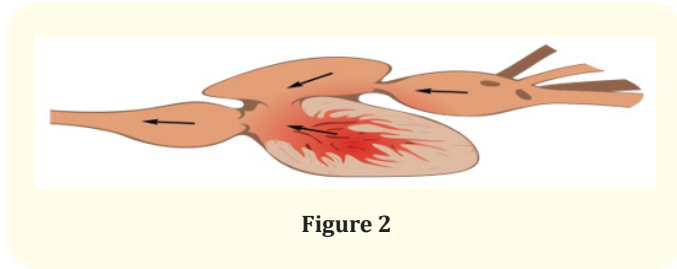


Figure 2

The four parts are arranged as follows:

1. The venous sinus, a thin-walled sac or reservoir with some cardiac muscle that collects deoxygenated blood through the incoming hepatic and cardinal veins [3].
2. Atrium, which is a thicker muscle room, and sends blood to the ventricle [3].
3. The ventricle, a thick-walled muscle room that pumps blood into the fourth part, which is the flow stream. Usually tubular in fish with elongated bodies, pyramidal with a triangular base in another, or sometimes a sac-like in some marine fish [3].
4. The outlet tract (OFT) to the ventral aorta consists of the conical tubular artery, bulbous artery or both. Conus arteriosus, which is usually found in the most primitive species of fish, is found to help blood flow to the aorta, while arteriosus does not occur [3].

Bone valves, consisting of connective tissue similar to the flap, prevent blood from flowing back through the parts. The valve between the sinuses and the atrial atrium is called the atrial valve that closes during ventricular contraction [1]. Between the atrium and ventricle there is a bone valve called the atrioventricular valve, and between the arterial ventricle and the ventricle is a bone valve called the ventricular valve. Conus arteriosus contains a variable number of half-moon valves [4].

In fish, the heart pumps blood first to gills where gases are exchanged, and then the blood follow to the rest of the body. This is a good balance, as the gills of the fish must be thin-walled to facilitate gas exchange, and therefore cannot tolerate high blood pressure. At the same time, the blood pressure will decrease when the blood cells press through the platelets, and the blood pressure that re-

mains after the blood passes through the gills must be high enough to push blood around the body [5].

The fish heart needs to generate the driving pressure for both the gills (lungs in mammals) and the body since they are connected in series [8].

### Vascular system “blood vessels”

The ventral aorta delivers blood to the gills, where it oxygenates and flows through the dorsal aorta to the body.

Fish have the simplest circulatory system, consisting of only one circuit, in which blood is pumped through the capillaries of the gills and into the capillaries of body tissues. This is called a single cycle.

Veins and capillaries. The diameter of the arteries is almost identical throughout the body and circulates blood to the entire body, losing very little pressure. The veins collect blood from the capillaries and carry it to the heart, and act as a reservoir where the blood can accumulate, creating a low blood pressure system. The walls of the veins and arteries consist of three layers: the outer sheath (the outer tunic), the middle lid (the middle tunic) and the inner lid (the endothelial tunic), with various degrees of development depending on the type of vessel [2].

The arteries branch into capillaries at each gill, and through the psoriatic branching arteries converge to the dorsal double aorta that connects to one dorsal aorta extending back to the tip of the tail. Each aortic pair sends my back a branch that goes to the front end. To irrigates the members and muscles of the head. All of these arteries distribute oxygen-rich blood to organs and muscles while the venous system returns carbon-rich blood to the heart [6].

The caudal vein, coming from the tail, is divided into two branched renal veins into the capillaries in the kidney (excretory system). Blood comes out of the kidneys through the posterior cardinal veins, which open in the Couvre ducts that open in the venous sinus of the heart. The hepatic portal system consists of veins that collect blood from the digestive tube, bladder, and spleen and turn into a hepatic vein that enters the liver where it is divided into capillaries in the sinuses. Blood is collected from the sinuses by the hepatic veins leaving the Liver and opening in the venous sinus. From the front of the body. Blood flows through the cardinal veins of the anterior and the jugular veins to the Cover ducts [6].

## Blood

Blood is a tissue made up of a phase of solid cells, including different types of cellular components or blood cells. The fluid or humoral stage at the plasma. It is an aqueous substance with a complex composition. Blood cells account for 30 - 50% of the total blood volume. And they are divided into [9]:

1. Red blood cells or erythrocytes: Red blood cells are oval shaped and nucleated. Red blood cells carry respiratory gases.
2. White blood cells or leukocytes: White blood cells are classified into granular leukocytes or granulocytes (basophils eosinophils and neutrophils) and agranular leukocytes (lymphocytes, monocytes and macrophages) Lymphocytes are the most numerous leucocytes in general terms.
3. Platelets: Lymphocytes generally work in the immune response, and thrombotic cells participate in blood clotting. The latter is a functional equivalent of platelets in mammals as well in immature forms in the bloodstream of red blood cells where maturation is completed. Plasma is usually not found in the bloodstream but rather in secondary vascular tissues.

## Conclusion

Fish have a single circuit for blood flow and a two-chambered heart that has only a single atrium and a single ventricle. The atrium collects blood that has returned from the body, while the ventricle pumps the blood to the gills where gas exchange occurs and the blood is re-oxygenated; this is called gill circulation. The blood then continues through the rest of the body before arriving back at the atrium; this is called systemic circulation. This unidirectional flow of blood produces a gradient of oxygenated to deoxygenated blood around the fish's systemic circuit. The result is a limit in the amount of oxygen that can reach some of the organs and tissues of the body, reducing the overall metabolic capacity of fish.

In fish, the heart only has one atrium and one ventricle. The oxygen depleted blood that returns from the body enters the atrium and then the ventricle and is then pumped out to the gills where the blood is oxygenated, and then it continues through the rest of the body.

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