

Notes on Physiology for Probationers.

LECTURES DELIVERED TO THE NURSES AT THE
NATIONAL HOSPITAL FOR HEART DISEASE.

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CIRCULATION OF THE BLOOD.—
Before commencing any discussion on the circulation, it is essential that you should fully realize that there are two distinct conditions of the blood; one when it is purified—arterial blood—the other when it is in an impure state—venous blood; briefly, this difference is mainly due to the fact that, in arterial blood, we have oxygen united to the hæmoglobin, which exists as oxy-hæmoglobin, but there are many other distinctions between these two kinds of blood, and these will be more appropriately considered in the lecture on Respiration. It is in the lungs that the process of purification takes place, and the work of the heart consists not only in sending pure blood to all parts of the body, but in sending the impure blood to the lungs for purification. You will therefore perceive that we can divide the circulation of the blood into two distinct parts—the systemic and the pulmonary circulation. The systemic circulation is the name given to the course the purified blood takes when it leaves the heart and is distributed to the body (system) generally, and, becoming impure, is returned as venous blood to the heart; the pulmonary (lung) circulation is the course the impure blood takes from the heart to the lungs, and becoming purified returns as arterial blood to the heart. Speaking generally, the pure blood travels in vessels called arteries, the impure blood in veins, and when the blood is in a transitional stage between purity and impurity it is travelling in minute blood-vessels called capillaries, the only exception that you need remember is the case of the pulmonary vessels. The pulmonary artery conveys impure blood from the heart to the lungs, and the pulmonary vein conveys purified blood from the lungs to the heart; the reason of this anomaly in nomenclature is due to the fact that all vessels conveying blood from the heart are named arteries, and, similarly, those conveying blood to the heart, no matter from what source, are termed veins. There is one other point which I trust you will pay special attention to, and it is that the blood is contained in a closed series of tubes, which are continuous with each other, the same as the elastic tubes of this model (model shown demonstrating the circulatory system); this fact being realized, you will see that it is quite immaterial where I commence the description of the

course of the blood, so long as I finish at the same point, and, for convenience, I will take as my starting point the left ventricle.

The Aorta is the large artery which takes the blood from the left ventricle; it is guarded by the aortic semilunar valves, and upon leaving the ventricle it arches round to the left and runs straight down the body in front of the back, where it divides into two large arteries which supply blood to the lower extremities and pelvis; before its division it gives off numerous branches, the first three conveying blood to the head, neck, and upper extremities, and the remaining branches being employed in distributing blood to the chest and abdomen; thus you will see purified blood is conveyed to every part of the body by arteries which are directly or indirectly branches of the aorta; the blood then passes through the capillaries and onwards into the veins, and this impure blood finally finds its way into the two large veins, the superior and inferior venæ cavæ, which enter the right auricle; from this chamber of the heart it proceeds through the tricuspid valve into the right ventricle, and as the blood is now in a state of impurity, it is transmitted to the lungs by the pulmonary artery, which breaks up into smaller arteries, and finally into capillaries, where it undergoes purification and is returned by the pulmonary veins to the left auricle, and finally passes through the mitral valve into the left ventricle, the point we started at, once more ready to pursue its course through the body. The systemic, or general circulation, may be said to commence at the aorta and to end at the right auricle, whilst the pulmonary circulation starts at the commencement of the pulmonary artery and finishes at the left auricle, where the pulmonary veins enter that chamber.

In following the above description of the course of the blood through the body, it will be seen that the blood flows in one constant direction, and the great factor—but, as you will see later, not the only one—in causing this, is the contraction of the heart, and it now behoves us to consider this important subject in detail. In those animals which are very low down in the scale of development, we have an example of the simplest type of a heart; in their case it consists of a single chamber, which is capable of drawing blood into it by suction, and of expelling blood from it by its contraction. Now, to prevent the blood which has come to the heart by the vein being returned into the vein instead of the artery, some kind of a valve must exist; little higher up the scale we find this heart divided into two parts—one, the auricle, which receives a vein; and the other, a ventricle, from which proceeds an artery—these two chambers being in communication with each other by an orifice guarded by a valve. Still higher in the scale we get the auricle divided into two parts,

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