

Notes on Physiology for Probationers.

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

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BLOOD.—The substance which circulates through the heart and blood vessels is called the blood, and it is composed of fluid and solid elements, in the proportion of two-thirds fluid to one-third solid. The fluid is called the *Liquor Sanguinis* (the liquid of the blood), or the *Plasma*; it consists of water containing a small amount of albumen and a substance called *Fibrinogen*.

Corpuscles.—The solid part is the corpuscles, of which there are two kinds, the red and the white; the former are 500 times more numerous than the latter, and are excessively minute discs, being about 1-3000th part of an inch in diameter, therefore thousands could rest on the head of an ordinary pin. The chief constituent of the red corpuscles is *Hæmoglobin*, which is the active agent in carrying oxygen from the lungs to the tissues; it does this on account of its being able to unite with oxygen very readily and, at the same time, in a very loose manner, so that it can give it up again to the tissues quite as readily as it took it from the lungs. When *Hæmoglobin* is combined with oxygen, it is called *Oxy-hæmoglobin*; and when it has given up the oxygen it took from the lungs, it is called *Reduced Hæmoglobin*.

These red corpuscles are formed chiefly in the bone-marrow, and are destroyed in the Spleen—which is a gland in the Abdominal Cavity.

The disease *Anæmia*, or that condition which most of you are familiar with, which occurs chiefly in young girls who have been deprived of fresh air and exercise, and characterised by the greeny sallowness of the skin, shortness of breath, and very often constipation and some irregularity of the menstrual discharge, is due to diminution in the amount of *Hæmoglobin* or to diminution in the number of *Corpuscles*.

The causes of *Anæmia* are either deficiency in the production of the red corpuscles or their being too easily broken up in the system, and, which is equivalent to this, their discharge from the body—a circumstance which occurs in severe bleeding.

Coagulation of the Blood.—When blood is first shed, it remains as a fluid for a very short time, it soon coagulates or clots; the first change is that it becomes thick and viscid, and then forms a jelly-like mass, and later, a fluid exudes from this jelly leaving the "clot"; the fluid is called the *Serum*.

The clot consists chiefly of corpuscles; and the

fluid is the *Liquor Sanguinis*, except that the *Fibrinogen* which exists in the *Liquor Sanguinis* whilst it is circulating in the body has become converted into *fibrin* and keeps the corpuscles together in the formation of the clot.

Coagulation is favoured by:—

1. Contact of the blood with foreign matter.
2. A moderate temperate, e.g., 100° Fahr.,

and is retarded by:—

1. Contact with the lining membrane of healthy blood vessels.
2. Cold.
3. The addition of certain chemicals.
4. Certain conditions of the blood.

So long as the blood flows along healthy blood vessels and is itself normal, it will not coagulate; but in some diseases, as *White Leg*, it coagulates within the living blood vessels, and, when it does so, the clot is called a *Thrombus*.

The coagulation of the blood is the great factor in the natural arrest of *Hæmorrhage*, i.e., Nature's method of stopping bleeding.

Having thus briefly drawn your attention to some of the more important facts about the Blood, I shall now describe to you the course of the blood through the body, and give you the reasons how this fluid is propelled along the blood vessels; and, in the first place, it is necessary for you to understand how the Heart does its work.

The Heart is a muscular organ of the involuntary type, that is, our will is entirely incapable of altering its action; it is hollow and weighs about 10 oz. In shape it resembles a cone, the broad end being uppermost, and is called the base of the heart; the pointed end or apex points downwards and to the left side. It is situated nearly in the middle of the chest, the larger part, however, being on the left side of the middle line (the "middle line" is the term used to denote an imaginary vertical line running straight down the body and dividing it into two equal parts), and it is partly covered by the lungs.

The heart is covered by a sac called the *Pericardium*. This sac consists of two layers of membrane which are continuous with each other, and between them there is some fluid which allows their rubbing against each other with as little friction as possible. The inner layer is quite smooth and is in intimate connection with the heart; the outer layer is much rougher, and is attached to some of the surrounding parts; thus it is by this sac that the heart is kept in its position.

The Heart is divided into two parts by a partition, these parts being termed the Right side and Left side. Each part is itself divided into two, the upper one is the smaller, and is called the *Auricle*, the lower one is the *Ventricle*; therefore,

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