

alleged by Schmidt and Woolridge, by examination of a blood drop either upon a slide or in the moist chamber.

If the blood is examined under the microscope, the filaments of fibrin will begin to appear in a period which will vary between ten seconds and two or three minutes. Before coagulation begins, the red corpuscles and the blood-plaques are plainly seen, without any apparent change, and the white corpuscles as well, without any apparent signs of disintegration or dissolution. In fact, the amoeboid movements of the white corpuscles can be made out long after the filaments of fibrin have made their appearance. Even in the blood of the horse, as studied under the microscope, in a very fine glass tube, the steps of coagulation have appeared to be the same, according to my observation, as in blood from other sources. The clot forms very gradually, and afterward the white corpuscles can be seen working or squeezing their way out of it into the serum, with no appearance of anything like disintegration. It is possible that erroneous conclusions concerning the disintegration of the leucocytes have been reached on account of mistakes in regarding the blood-plaques as disintegrated leucocytes.

Concerning the relation of the red corpuscles to coagulation, investigations have been made and their results published by Landois. He observed, in frogs and rabbits, that when their blood was drawn the red corpuscles aggregated in lumps, the hæmoglobin was lost, filaments of fibrin appeared, and the red corpuscles broke down. These observations were made ten years ago and have been confirmed, but it is still uncertain whether the red corpuscles are converted into fibrin.

The subject of the relation of the blood-plaques to coagulation is a new one. Filaments of fibrin can be readily seen projecting from the *granule-masses* of the hæmatoblasts, and Schultze and Ranvier have thought that they became centers for coagulation. The fibrin sets or forms in a thick network about the granule-masses, but it is also found, independently of the plaques, in the serum, resembling fine crystalline bodies. That the blood-plaques are centers for coagulation appears to be demonstrated by the introduction of a small piece of thread into the active circulation (*e.g.*, into the femoral vein of a dog). After it has been left there for some minutes, it is found on withdrawing it that the blood-plaques have collected upon it. Red and white corpuscles are also found upon the thread, but the plaques are much more conspicuous, and if the thread is placed in a coagulable solution, after the red and the white corpuscles have been washed away, clotting will promptly take place, and the more abundant the plaques the firmer will be the clot. The objection has been advanced that the thread has absorbed fibrin ferment, in addition to collecting the plaques, and that it is this, and not the plaques, which produces the clot in the coagulable solution. This is possible, but it has not yet been absolutely demonstrated. Eberth's investigations showed that the plaques were the first elements from the blood which settled upon the wounded portion of a vessel, and hence were the first elements in the formation of a thrombus. Eberth, Hayem, and Bizzozero have also shown that if a needle is passed over a vessel, detaining or retarding the blood-current, the blood-plaques are the first elements which collect upon the wall of the vessel, forming masses which constitute the chief element in the white thrombi. In the active circulation the plaques are seen with the red corpuscles near the center of the vessel, a few of them being at the periphery or in the *still layer* of the blood-current, with the white corpuscles. On the other hand, when the blood-current is slow the plaques are scattered irregularly among the