

small-pox by vaccination. The fundamental nature of this was not understood until Pasteur's experiments in 1880. Since that time we have discovered the specific germs of a large number of diseases, and it has been found possible to produce immunity against nearly all of the pathogenic diseases by methods of vaccination. The immunity produced in that way, by the inoculation of an animal with virus, is known as active immunity, and it is brought about by the introduction of the germs of the disease, or their products. The discovery that it was possible to produce active immunity by the use of the chemical products of the germs is one of fundamental importance. It was really made in this country by Theobald Smith and some one associated with him in the study of hog cholera, and the most interesting forms of experimental immunity are those produced in this way. The induction of that sort of immunity is always attended by a certain amount of reaction, and it takes time for the immunity to be brought about. The reaction usually takes place partly at the seat of vaccination and partly constitutional, and it is questionable whether any substantial active immunity can be brought about without attending reaction. The reaction that attends the introduction of cow-pox is a good illustration. You have a local reaction and a certain amount of constitutional disturbance. It is also to be noted that it takes a certain amount of time, a matter of days, or perhaps weeks, before the substantial immunity is attained.

Now it was found by those first interested in the theoretical question that the cells and fluids, particularly the blood of animals that had been rendered actively immune, that these humors of the body had acquired new and extraordinary properties which they did not possess before. We are concerned more particularly with the presence in the blood of such animals of protective or healing substances, though they are not the only changes in the blood, for we have agglutinine, for instance, which has no healing or protective power whatever. As regards the healing and protective substances found in the blood of those actively immune, they can be transferred to another animal or individual, and can also produce immunity there, but the immunity brought about by transferring to another animal substances produced by vaccination in the first animal is very different from the natural immunity, and it is spoken of as passive immunity, the conception being that the protection through the immunity substance generated by the first animal is transferred, but the individual receiving this will not have any marked reaction, really no reaction at all, the immunity coming on at once, or after a very short period, and it is also of only transitory duration.