

All are familiar with the use of modified anthrax vaccine for transferring immunity to cattle and sheep. The experiment on which this was based was made on a group of sheep. One-half of these sheep were injected with a dose of modified anthrax serum. After a few days, all the sheep were injected with a fatal dose of the same serum. Those which had been earlier injected withstood the fatal dose, while those which had not been injected at all died. This method was adopted by the government for the general protection of live stock. The same method has been adapted to hydrophobia, forming the Pasteur treatment. This work of Pasteur was with attenuated living virus, and many other men discovered that if we take the products of bacterial growth and inject them into animals, it will produce immunity to infection by that bacterium which produces the poison. Then the jump was made to the theory that in certain diseases, peculiar protective antitoxins are produced in the blood, which can be transferred to people and confer on them passive immunity. Thus it was a series of steps from Jenner to Pasteur who carried through experiments and produced a larger and more comprehensive way of applying similar principles.

These protective substances are formed not only against poisonous substances, but against all types of certain proteid materials, whether it be diphtheria toxin, the product of cholera, or certain poisonous proteids however introduced. In assimilating these substances, the cells transform them and then produce in themselves certain other substances which we call antibodies to the substances injected. These substances which the cells produce are not in themselves anti-poisonous. They are simply antibodies to whatever proteid substances are injected.

When we come down to the question of those antibodies which are of importance to us, we divide them especially into three classes, that is, we have antitoxins which act upon these cellular poisons. Certain bacteria tend to throw out into the fluid in which they are grown, these soluble poisons and these poisons which we call the extra-cellular poisons, have that remarkable effect in animals of creating antitoxins, and when the two come together the antitoxin unites with the poison and renders it inert. These are simply against the extra-cellular poisons. The various endotoxins do not make these antibodies in the same way, but the protoplasm of the bacteria, just the same as egg albumen, will make an antibody which will attach itself to it, and having attached itself to the bacteria, tends to render them incapable of further mischief. We know that it is normally in us through our natural immunity, that these substances will unite with the sensitized bacteria, that is, these antibodies unite with the ferments of the blood and become bactericidal substances.

Many writers seem to refuse to accept this theory, as the phagocytes take up certain substances themselves, even the pathogenic bacteria, and some believe that these phagocytes, or "policemen of the body," take up and destroy the bacteria. Then certain workers found among these bodies, certain bodies which unite with the bacteria, and these sensitized bacteria were not destroyed by ferments in the blood, but that they had to be taken up by the leucocytes in the blood and so destroyed. Thus we have three types of substances.