

the body-cells begin making antitoxin they make a great deal more than is needed to neutralize all the toxin which the invaders have manufactured.

Hence it is that a person who has successfully come through some infectious disease, smallpox or scarlatina, for instance, can not, for some time thereafter, be reinfected with the poison of that disease; his blood contains an *excess* of the antitoxin of that disease so that any toxin of that kind happening to be produced within him is immediately neutralized. He is immune from or refractory to this infection for a certain time, it may be years. He has fought a good fight microchemically, and his tissues now rest from their labors.

Man has taken advantage of this natural chemical immunity to confer an artificial immunity on himself. When a person gets over an attack of diphtheria, it is because his body-cells, stimulated by the poison of diphtheria (diphtheritin), produced sufficient anti-diphtheritin to neutralize the poison; but it is clear that if he can get anti-diphtheritin ready made, the diphtheritin in his body will be neutralized all the quicker. He makes use of the horse. A horse, which has recovered from an attack of diphtheria and thus has in his blood plenty anti-diphtheritin (specific antitoxin) has some of his blood drawn off. If a little of this blood, specially treated, be injected into the person suffering from diphtheria, the person will recover, or if it be injected into a person about to go into the infection of the disease, that person will not take the disease. This is conferred immunity; it has been conferred on man by the horse's blood-serum.

Thus we have three kinds of immunity from infection:

- I. An original, congenital refractoriness towards the disease which may be called *natural* immunity;
- II. *Actively acquired* immunity, the ordinary condition of having come successfully through an infectious illness.
- III. Artificially or *passively acquired* immunity, or conferred immunity, one of the latest triumphs of biological science.

All these varieties are chemical means of defence.

Coming under the head of chemical means of defence, we have the existence of an acid in the gastric juice. It is well known that when the acid (hydrochloric) is present in the stomach in the proper quantity, it is uncommon to be infected by microorganisms through the alimentary canal. The author knew of an officer who had come through a severe epidemic of cholera in the West Indies, and who, on being asked if he had been afraid, said: "I had no fear as long as I knew that my digestion was not out of order." We and the other mammals are not the only animals whose alimentary canals are guarded by a free acid; there has been discovered in the Mediterranean a mollusc (*Dolium*