

subject of immunity, and in conclusion I would like to say a few words as to the practical application of these points.

We have in the first place the prevention of small-pox by the vaccine virus, that is, an active immunity, of course. In all probability vaccinia is a modified form of the small-pox virus, and the immunity depends upon the introduction of the living organism and its reaction. The individual is left with an active immunity, and as General Sternberg has shown, the blood of that individual is able to render the poison inert.

Then we have in the treatment of rabies another instance of active immunity, having nothing whatever to do with serum therapy or passive immunity. Its prolonged period of incubation after the bite gives time to immunize. Sometimes the symptoms come on before the immunity is fully established, and then of course the treatment is a failure. In all probability it is possible to immunize from cholera, typhoid fever and plague. In the latter case it has been carried on upon a large scale in India, and there seems to be evidence that this active immunization from plague is quite effective, and the scientific men who have gone to India have, to a considerable extent, so far as I can learn, immunized themselves to the disease. Hoffkine is also using the killed cultures of cholera to prevent that disease. There is no danger, of course, of cholera being produced from the killed culture. I suppose there is not much reason to question that in that way human beings can be rendered more or less insusceptible to cholera, and if there had been any occasion, as there came near being during our late war, to vaccinate against typhoid fever, it might have been done.

Now as regards the application of passive immunity, which perhaps interests practitioners more than what I have been speaking of. Of these the only one thoroughly established and about which we are capable of judging from full information is the diphtheria antitoxine. The tetanus antitoxine is a strong serum, but we cannot recognize tetanus in the human being until a large amount of the poison has combined with the nerve cells and so much damage is done that the antitoxine which only neutralizes the toxine is not able to offer hopeful prospects. The method of treatment offers some chance, but on the whole the evidence is rather discouraging as to the antitoxine treatment of tetanus. The later statistics, however, as we secure stronger and stronger toxins, are growing better. The treatment of snake-bite by antivenine is based upon scientific principles, and is working well in India. In antityphoid serum, etc., we have little healing but marked preventive powers. It is rather extraordinary that the antistreptococcus serum should have gotten into such vogue, for the question is still an open one, and it has been found that there is no guarantee that it is