

Army Medical Service of the United States. Many other vaccines are in use, but very few of them have been used on so large a scale.

To decide whether a vaccine is good or bad the only clinical test is whether it will protect from typhoid fever. Arguments in favour of these vaccines are mostly confined to laboratory experiment, and though convinced from that point of view I will not give up our own till I see another vaccine giving better statistical results. The living vaccine of a fredka is perhaps the best. I just mentioned this particular one because it is much advocated by those who bear the greatest name in bacteriology. There is a grave disadvantage to its use, even if it is one which gives a higher degree of immunity than our dead vaccine, and that is because it is a living vaccine. A living typhoid bacteria, under the skin, even if attenuated and even if we know that such a procedure is perfectly safe and will not produce an attack of typhoid fever from the point of view of widespread use, is not advisable. We can never safely proceed to issue a living vaccine widecast over the country. It may get into water, etc., and do harm; we, therefore, adhere to the dead vaccine instead of the living one, if the latter should be slightly better in results.

In regard to the duration of immunity conveyed by our vaccine, we have not as precise information as we would like. It is difficult with a large floating population as an army, where men are going on the road and batches are coming to take their places, to follow the histories accurately. From the knowledge we have our vaccine conveys immunity for about two years. After two years, or better eighteen months, we should revaccinate. Our soldiers in India are inoculated after that lapse of time. Here I would like to state my personal view. The usual criterion which is adopted of testing blood for the presence of immune substances is not necessarily accurate. I have good reason to know that the individual may lose all trace of demonstrable bactericidal substances and agglutinins within six months after inoculation and may still be protected against infection. Our tests for these substances are at best somewhat crude. At present, even if these substances are not found when we test the individual some eight months after inoculation, we are not entitled to say he is not protected.

What have vaccines done? It may be of interest to you to learn our results in the case of our army in India. In the case of inoculation in the army, we have to deal with it from two points of view, protection in peace and protection in war; these are very different problems. In peace, in the foreign service of the army, typhoid fever has been the most serious trouble against which we have to fight. As an example of this, the incidence of enteric of our army in India, where there are 73,000 troops on an average, from the year 1890 and up to the year 1905, there was an average of from 1,500 to 1,600 cases of enteric every year in this garrison, and as regards death, you are fortunate if you can keep the typhoid rate under 25 per cent; 400, 383, 443, 536, 637, 348, etc., are yearly numbers of deaths. That means we were losing in these years practically half a battalion by death from enteric in India every year.

I need hardly quote to you the results of typhoid fever in war. One need only turn to our Bcr war, where out of 380,603 troops we had 57,684 cases and 8,022 deaths from enteric fever in three years. That incidence is appalling especially if one contrasts the 8,022 deaths with the total number of deaths from those either killed in action or who have died in other ways. Here the total number of deaths from other causes than typhoid was 7,702, a less number than for typhoid alone.

The Spanish war of 1898, a recent campaign between two civilized powers, shows precisely similar results. The same thing will happen if any two powers will engage in a war. They will take typhoid fever with them, either in incubation cases or still more deadly in typhoid carriers, or will contract the disease in the country they invade. Given a few sources of foci of infection, and it will under the conditions of field service spread like wildfire. It has always done so and will always do so unless we take precautions against it.

In these recent campaigns every advantage we could think of for improved sanitary appliances, everything we could think of in peace, was brought into service. Good