

ence of twenty years having been absolutely demonstrated in hundreds of outbreaks and thousands of cases, the question to be determined is: Upon what factors in vaccination do such satisfactory results depend? Briefly, these are:

1. A normal vaccine, that is, one where the assumed microbe of the disease is actively present.
2. The use of a vaccine when fresh and active.
3. The absence of extraneous microbes in the vaccine.
4. The careful inoculation of patients and subsequent treatment of the wound.

The question arises at once, What is normal vaccine? In my experience it is a lymph which produces a history of evolution of the vesicle exactly as set forth by Professor T. A. Ackland, one of the officers of the English Royal Commission (1889-1896) to enquire into alleged injuries due to abnormal vaccinations, and which is found in "Allbutt's System of Medicine," Vol. 2. Its stages are: (1) scarification and immediate inflammatory reaction, subsiding within a few hours; (2) on the third or fourth day, pale red papules appearing, which during the next five days develop into compound vesicles, becoming pustules on the ninth day; (3) vesicles distended with lymph and plump at first, but as the lymph thickens, the centre becomes depressed, forming a scab and surrounded with a distinctly raised marbled border; (4) an area of redness and inflammatory thickening of tissue around the pustule of an inch or more in diameter; (5) a decrease from tenth day of the inflammatory area and a drying of the scab which falls by the twentieth day; (6) a cicatrix usually with a hard scar centre with rays more or less distinct.

The same article gives a table showing variations in the development of the pock, most of which it states are, however, slight, such as abnormal rapidity or delay in the evolution of the vesicle. In the same work, in another monograph by Dr. M. Copeman, dealing more especially with the morphology, chemistry and preparation of vaccine, he there points out how bovine lymph has in England taken the place of humanized, and then proceeds to speak of glycerinized lymph. He speaks of the practically constant presence of extraneous microbes in lymph, and notes his experiments as early as 1891, which proved that a 50 per cent. solution in water of chemically pure glycerine to one part of vaccine pulp, set aside from light for a few weeks, removes all saprophytes as well as tubercle bacillus and streptococcus. Thereafter follows the satisfactory statement that in vaccine thus properly produced "we have then a preparation which, while even more efficient as vaccine than the original lymph, can be produced entirely free from extraneous organisms," and he points out how scientific workers in France, Germany, England, and America have borne