

vagus inhibitory fiber impulses delivered in a given period of time. If stopping of the heart be taken as an example, we may say that n vagus fiber impulses are necessary to produce this effect. Considering only shocks, each one of which produces a single vagus response volley as determined by the cathode ray oscillograph, a long lasting shock of sufficient intensity will, in certain preparations, stop the heart, *i. e.*, stimulate n vagus fibers. If the shock duration be made shorter, or the intensity be made less, so that each shock stimulates only n/a fibers, *at least* a shocks must be delivered to the nerve before the heart is stopped. Since the effect of a single vagus volley does not last indefinitely, the condition of repeated stimulation may require that more than a shocks be used, this number being dependent upon the frequency of stimulation. It seems probable that a similar argument can be applied to the other so-called iterative nerves.

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Serum Sickness in Rabbits.*

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It is well known that serum sickness appears in a very large proportion of individuals injected for the first time with normal horse serum or with various antisera. For the experimental study of this reaction it is of value to be able to reproduce in laboratory animals a condition analogous to serum sickness in man. We believe that the results reported below are the first ones concerning the occurrence of serum sickness in rabbits.

When a single injection of horse serum is given to rabbits in sufficient quantities either intravenously, intramuscularly, subcutaneously or into the subscapular tissues, there appears, from 3 to 7 days after the injection, a reaction characterized by erythema and edema. This reaction is evident on the rabbit's ears; there is noted a generalized flush which may involve the entire lower three-quarters of the ear, and which may be diffuse, confluent and of even

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intensity, or diffusely distributed, mottled and with discrete darker patches; the edema appears characteristically in the basal third of the ear but may extend upward to involve the entire lower two-thirds of the ear. The edema is frequently so marked that the pitting subsequent to pressure can be noted visually. The erythema and edema may each occur alone but both are usually present. These reactions can easily be differentiated from those occurring in the normal rabbit's ears; here hemorrhages, petechial or more extensive, and small circumscribed patches of erythema may be noted. Such appearances are very common. At times edematous areas often associated with trauma or hemorrhage occur; in the normal animal these latter reactions are usually noted in the upper half or two-thirds of the ear, and such areas were found in only 35 of 147 normal animals which were observed for periods of 2 to 8 weeks.

In a total of 98 animals receiving an adequate amount of normal horse serum, positive reactions (generalized erythema, a basal edema or both) were observed in 66; the percentage of positive reactions being therefore slightly less than 66%. In a majority of the animals the reactions appeared subsequent to injection of the serum into tissues far removed from the rabbits' ears. It appears that at least 5 cc. of serum per kilogram must be injected into the rabbit to bring about a positive result. Quantities as high as 10 cc. per kilogram have been effective. In 8 animals injected with 3 cc. per kilogram no reactions were noted. During the experiments 5 different sera were used. The reactions most frequently appeared on the fifth and sixth days after injection. White rabbits are more satisfactory for use in such experiments, but the reactions have been observed in either brown or black rabbits.

In a more limited number of animals receiving various antisera, similar reactions were produced.

In a number of animals receiving a second injection of horse serum from 4 to 6 weeks after the first one either immediate or accelerated reactions appeared in which edema and erythema were manifest within several hours to 3 days after the injection.

Studies of the precipitin and precipitinogen in the blood of the injected animals at various periods after injection have not demonstrated any obvious relationship between the time of appearance of the precipitin or the observed titers of antigen and antibody on the one hand, and the occurrence of the reactions of serum sickness in the rabbit on the other hand.