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The effect of suprarenalectomy in the rat on agglutinin formation.

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Many general facts have been accumulated from chemical and pathological studies which show that the suprarenal glands are in some way involved in the resistance of the organism to infections and intoxications.

Immunological studies in relation to suprarenalectomy are very limited. Gates, in 1918, was unable to demonstrate any noteworthy difference in hemolysin and agglutinin formation in a small series of partially suprarenalectomized guinea pigs and rabbits. Také and Marine have recently reported that rabbits with high grade but sublethal insufficiency showed hemolysin titers averaging more than twice as high as the controls.

The difference in results probably depends largely on the degree of suprarenal insufficiency produced. Removal of one suprarenal will rarely produce appreciable insufficiency, while removal of one gland and a portion of the other leaves behind tissue that possesses a great but variable and uncontrollable capacity to undergo regeneration. The most suitable laboratory animals for the study of suprarenal insufficiency are rabbits and rats in whom both main glands may be removed with a fairly high percentage of survival. Approximately 50 per cent of rabbits and 75-80 per cent of rats will survive this operation.

We wish to report the results of further studies in which rats were used as the test animal and agglutinin formation as the indicator of reaction. The rat compensates rather rapidly following removal of both main glands as has been shown by numerous studies on its susceptibility to a large variety of poisons. It is evident, therefore, that in studies involving suprarenal insufficiency in the rat, one must take into consideration the time factor in addition to removal of both main glands.

In a series of preliminary tests for agglutinin formation we used rats that had survived suprarenalectomy for from 30 to 50 days. Agglutinin titers for these animals showed no noteworthy

differences from their strain, age and weight controls. Some of these rats received as high as 2 cc. of standard typhoid vaccine with no clinical reactions. The conclusion drawn from these experiments was that rats which had survived suprarenalectomy in excellent condition for from 30 to 50 days had compensated and were unsuitable for studies involving suprarenal insufficiency.

We, therefore, began to immunize animals 8 and 13 days after suprarenalectomy. No animals were used unless they were alert, active, eating, and had not lost appreciably in weight. It is the general experience that most rats in good condition one week after operation would probably make a complete recovery and survive indefinitely.

Four animals, two males and two females, that were suprarenalectomized eight days previously were injected together with four strain, age, sex, and weight controls with 0.25 cc. of vaccine. All the operated animals reacted severely to the injection, becoming dull, weak, and unable to walk; three died within six hours following the injection, while the controls showed no reactions. Normal rats of similar weight and age readily withstand 5 cc. of vaccine. This series demonstrated a marked diminution in the resistance of recently suprarenalectomized rats to typhoid vaccine. The surviving operated rat and two controls were given two additional doses of 0.25 cc. of vaccine on the third and sixth succeeding days and were bled from the tail on the third, sixth and ninth days following the last injection. The highest titer developed by the operated rat was 1200, while the highest developed by one normal rat was 200 and by the other 600.

As a result of the high mortality in immunizing rats eight days after suprarenalectomy, two additional series comprising nine suprarenalectomized and nine control rats were immunized beginning the thirteenth day after operation. All rats survived the 0.2 cc. vaccine given at three day intervals; the controls showed no reactions while most of the suprarenalectomized rats became dull and weak immediately after injection but recovered before the next injection. The animals were bled from the tail on the third, sixth and ninth days after the last injection.

The average titers of the suprarenalectomized animals for the first, second and third titrations were 900, 750 and 650, while those of the controls were 400, 250 and 250. In other words, the

titers of the suprarenalectomized animals were between two and three times higher than those of the controls.

SUMMARY

These studies indicate that recently suprarenalectomized rats may succumb to one-twentieth of the dose of standard typhoid vaccine which normal rats readily withstand. Further, it has been shown that consideration of the time factor is important since animals tend to compensate for a suprarenal insufficiency by hypertrophy of accessory or unremoved portions of the main glands. Failure to take these features into consideration accounts in large part for the conflicting statements that have appeared in the literature. Finally, the fact that recently suprarenalectomized animals show a much higher antibody response to a given dose of antigen than do normal animals, clearly indicates that the suprarenal glands play a more important rôle in immunologic reactions than has heretofore been suspected, and it is our belief that this phenomenon is principally associated with the cortex or interrenal gland.

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The acid-base balance in pneumonia.

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As a part of the study being made of the respiratory and metabolic disturbances occurring in pneumonia, the acid-base balance and the arterial oxygen unsaturation of pneumonia patients have been determined. Thirty observations have been made on 16 patients. The pH was determined directly by Cullen's colorimetric method and checked in 12 instances by electrometric measurements. The CO_2 content, O_2 content and O_2 capacity were determined on the Van Slyke constant volume blood gas apparatus. The analyses to be reported were performed on arterial blood drawn at least once from each patient during the