for periods of minutes or hours (as contrasted with *Staphylococcus aureus* which is killed by exposures of 45 minutes in 1 to 15,000 solution) is readily shown. Transplants made from a tube containing *B. prodigiosus* suspended in 2% gentian violet showed vigorous growth, though the organisms had been exposed to the dye for 4 hours.

The present report deals, however, with survival of *B. prodigiosus* after exposure to dye for periods of months.

In a preliminary experiment, transplants on agar made from a tube containing gentian violet (1 to 15,000) and *B. prodigiosus* showed the organism to be still alive and vigorous at the end of 14½ months. In another experiment transplants made at the end of 26½ months from a similar tube showed just as vigorous growth of the organism as if no dye whatever had been present.

With acid fuchsin, the results were even more striking. Transplants on agar from a tube containing suspension of *B. prodigiosus* set up nearly 46 months ago still show vigorous growth, though the tubes contain 4 drops of 2% aqueous acid fuchsin to 2 cc. of bacterial suspension.

These results indicate once more that the investigations of recent years have proved entirely too general, statements like those of Michaelis,[1] made years ago and doubtless in accord with the then known facts, that "all dye stuffs are, in high concentrations, bacteria poisons."

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Immunological Studies in Relation to Suprarenal Gland. VII. Effect of Bilateral Suprarenalectomy on Acquired Resistance in Rats.

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In previous studies we gathered evidence of the importance of the suprarenal gland in antibody formation through its influence on the water balance in the tissues of the body.[1, 2, 3, 4, 5] That the supra-

[1] Michaelis, L., *Einführung in die Farbstoffchemie für Histologen*, 1902, 26.
[1] Marmorston-Gottesman, J., and Perla, David, *J. Exp. Med.*, 1928, **47**, 713.
[2] Perla, David, and Marmorston-Gottesman, J., *J. Exp. Med.*, 1928, **47**, 723.
[3] Marmorston-Gottesman, J., and Perla, David, *J. Exp. Med.*, 1928, **48**, 225.
[4] Perla, David, and Marmorston-Gottesman, J., *J. Exp. Med.*, 1929, **50**, 87.
[5] Marmorston-Gottesman, J., and Perla, David, *J. Exp. Med.*, 1929, **50**, 93.

renal glands are essential in the mechanism of *natural resistance* has been established by Marine and his coworkers in this laboratory[6, 7, 8, 9, 10, 11] and by other investigators.[12, 13, 14, 15, 16, 17] In an effort to determine the relation of the suprarenal gland to *acquired resistance* the following experiment was carried out.

In a preliminary experiment the M.L.D. of a batch of typhoid vaccine (preparation No. 120, lot No. 199) in suprarenalectomized rats was determined. This was found to be 0.5 cc.* Fourteen rats received 3 intraperitoneal injections of typhoid vaccine at weekly intervals (0.5 cc. and 1 cc.). Five days after the last injection these 14 rats were suprarenalectomized, together with 10 normal uninjected rats. On the sixth day following the operation 8 immunized suprarenalectomized rats were injected with 5 cc. of typhoid vaccine and 6 were injected with 1 cc. intraperitoneally. All the unimmunized rats were injected with twice the M.L.D. (1 cc.).

Results. Within 12 hours all the unimmunized rats died. Those rats that had been immunized and subsequently suprarenalectomized survived the injection of 10 M.L.D.'s for suprarenalectomized rats. Repeated injections of typhoid vaccine prior to suprarenalectomy raise the resistance of rats to more than 10 M.L.D. for suprarenalectomized rats.

Suprarenalectomy apparently does not diminish the acquired resistance to typhoid vaccine.

It has been shown that *Bartonella muris* infection in the adult splenectomized rat cannot be transmitted to the suprarenalectomized rat of infected stock.[18] The rat is spontaneously infected with *Bar-*

[6] Jaffe, H. L., and Marine, D., PROC. SOC. EXP. BIOL. AND MED., 1923, **21**, 64.

[7] Marine, David, PROC. SOC. EXP. BIOL. AND MED., 1924, **21**, 497; *Bull. Acad. Med. Cleveland*, 1924, **7**, 1.

[8] Scott, W. J. M., *J. Exp. Med.*, 1923, **38**, 543.

[9] Flashman, D. H., *J. Infect. Dis.*, 1926, **38**, 461.

[10] Marmorston-Gottesman, J., and Gottesman, J., *J. Exp. Med.*, 1928, **47**, 503.

[11] Marmorston-Gottesman, J., Perla, David, and Vorzimer, Jefferson, *J. Exp. Med.*, 1930, **52**, 587.

[12] Lewis, J. T., *Rev. d. l. asoc. med. Argentina*, 1921, **35**, 529.

[13] Lewis, J. T., *Am. J. Physiol.*, 1923, **64**, 506.

[14] Belding, D., and Wyman, L. C., *Am. J. Physiol.*, 1926, **78**, 50.

[15] Crivellari, C. A., *Compt. rend. Soc. Biol.*, 1927, **96**, 223.

[16] Voegtlin, C., and Dyer, H. A., *J. Pharmacol. and Exp. Therap.*, 1925, **24**, 101.

[17] Steinback, M. M., PROC. SOC. EXP. BIOL. AND MED., 1929, **27**, 142.

* It has been shown that with different batches of typhoid vaccine the M.L.D. for suprarenalectomized rats varies. It is therefore necessary to determine the M.L.D. of each batch of typhoid vaccine used in each experiment.

[18] Marmorston-Gottesman, J., and Perla, David, *J. Exp. Med.*, 1930, **52**, 121.

tonella muris anemia early in life, between the fourth and sixth week. It then becomes a carrier of the *Bartonella muris* and possesses an acquired immunity to the infection. The infection following splenectomy in the adult carrier rat is indicative of a depression in the acquired resistance to *Bartonella muris*. It has been further shown that the acquired resistance to *Trypanosoma lewisi* of normal rats as a result of a previous infection is uninfluenced by subsequent suprarenalectomy. These observations indicate that once a cellular or humoral immunity is established to an infection or an antigenic substance this acquired resistance cannot be broken down by subsequent suprarenalectomy. Bilateral suprarenalectomy, though markedly depressing the *natural resistance* of the adult albino rat to toxins, poisons and bacterial and protozoan infections, does not affect the *acquired resistance* resulting from previous injections of such substances. Acquired and natural resistance are dependent on different physiological processes in the organism and are not merely quantitative variations of the same process as is generally assumed.

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Effect of Injections of Cortin on Resistance of Suprarenalectomized Rats to Histamine Poisoning.

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In a previous communication[1] the protective action of injections of cortin on the resistance of suprarenalectomized rats to typhoid vaccine was reported. In these studies an extract of the cortex of the suprarenal gland, made in this laboratory according to the method of F. A. Hartman, was used. It was found that Hartman's cortin is a highly potent extract of the suprarenal cortex. It is free of toxicity and epinephrin. Repeated injections of cortin will raise the resistance of suprarenalectomized rats to several lethal doses of typhoid vaccine. It was suggested that a cortical extract may be biologically assayed by determining the minimal protecting amount to be administered within 24 hours before and after the injection of the minimal lethal dose of typhoid vaccine for suprarenalectomized adult rats on the 6th day after suprarenalectomy.

[1] Perla, David, and Marmorston-Gottesman, J., PROC. SOC. EXP. BIOL. AND MED., 1931, **28**, 648.