

gus and its absence in the stomach<sup>3</sup> might be considered as indicating that it is not present in the esophagus. The increased absorption of strychnine, epinephrine, nicotine and ephedrine could not be explained on this basis. The increased absorption after alcohol irrigation may be due to removal of mucin. This does not appear to be the case as reintroduction of considerable mucin either with the drugs used or for some interval before introduction of these drugs did not appreciably diminish their absorption. There was no apparent adsorption of the drugs by the mucin. The mucin normally present prior to alcohol irrigation may, however, be distributed so as to act as a mechanical barrier which is not adequately reconstructed by introducing mucin.

Macht<sup>4</sup> has related the low absorbability of the esophagus as compared with the stomach to the histological types of their mucosae.

From our results and those of Macht, it is apparent that the absorptive ability of the esophagus is normally poor, that it is not increased by distention, but that it may be considerably increased by such procedures as lavage with alcohol.

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**Leucocyte Counts and Bacteremia Studies in Rats Orally Immunized Against Pneumococci.**

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Various experimenters<sup>1</sup> have shown that young rats can be vaccinated *per os* against multiple lethal doses of virulent pneumococci. Ross has shown that the blood serum of such orally immunized animals contains antibodies which may be demonstrated by means of the passive immunity conferred upon other animals to which it is transferred. Besides this indication of a general humoral resistance to infection, we have seen no attempts at explanation of the mech-

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<sup>3</sup> Best, C. H., and McHenry, E. W., *J. Physiol.*, 1930, **70**, 23.

<sup>4</sup> Macht, D. I., *J. Pharm. and Exp. Therap.*, 1923, **22**, 123.

<sup>1</sup> Killian, H., *Z. f. Hyg. u. Inf.*, 1924, **102**, 279. Eguchi, C., *Ibid.*, 1925, **105**, 74. Kimura, R., *Ibid.*, 1927, **107**, 390. Ross, V., *J. Immunol.*, 1926, **12**, 219. Maëji, Y., *Acta Scholae med. univ. imp.*, Kioto, 1929, **12**, 295.

anism of the immunity of such animals, and it was thought that studies of the leucocyte response, together with blood culture examinations, might throw some light upon the subject.

The method consisted of making periodic tests of the peripheral blood of a series of normal rats and comparing the results with those of a series of rats previously immunized with egg-white and Type I pneumococcus autolysate, as already described.<sup>2</sup> Both sets of rats were inoculated intraperitoneally with 100 fatal doses of the homologous strain of pneumococci. Blood was obtained under sterile precautions from the tail of the animal; examinations were continued as long as the unvaccinated rats survived (2 to 4 days).

From work done on normal persons, it was expected that the leucocyte counts would be subject to wide fluctuations. This proved to be the case. One feature of the leucocyte counts, however, was constant; the immunized animals, after the first 6 hours following injection, showed an appreciably higher white cell count than the unvaccinated controls. This may be attributed to increased mobilization of leucocytes without any considerable diapedesis into the peritoneum. The lower counts in the unvaccinated animals probably reflect the loss of leucocytes which go to make up the exudate in the peritoneal cavity. This loss may go on until a leucopenia occurs, especially if the rats do not die until the third or fourth day.

The growth of pneumococci from 0.1 cc. of blood seeded on blood agar plates was recorded only as negative or positive, with an indication of the amount of growth in the positive cases. All of the unvaccinated controls showed organisms in the cultures within 7 to 12 hours following the inoculation. The amount of growth rapidly rose to 4 plus, the maximum to be obtained. Among the vaccinated animals which survived (96%), none showed a positive blood culture at any time. The remaining 4% of vaccinated animals, which did not survive 100 fatal doses, exhibited an intermediate condition as regards the leucocyte count and the number of pneumococci cultured from their blood; they also lived longer than the controls. While, under the conditions of this experiment, no pneumococci were found at any time in the blood cultures of the animals which survived, it is possible that invasion of the blood stream may have taken place. This may be demonstrable with larger samples of blood.

Whenever there were sufficient pneumococci to be detected in the blood, the outcome was invariably death of the animal.

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<sup>2</sup> McDaniels, H. E., *PROC. SOC. EXP. BIOL. AND MED.*, 1931, **28**, 587.