

is not the main factor; for with 12.66 g of N per day for the winter against 11.75 for the summer, the phenols remain low. Likewise, nothing definite may be concluded from the urinary volumes, or from the number of defecations per day, which latter were almost the same per season.

Furthermore, we have no direct evidence that with the diet employed one ingests more phenol-forming bacteria during the summer than the winter, nor that the pH of the intestine differs markedly with the season.

Finally, we must consider the seasonal difference in the intensity of sunlight. Koch and Reed<sup>1</sup> found that in about two-thirds of the dogs which they studied, an exposure to ultra-violet light gave higher figures for substances of probable phenol character in the blood, which substances reacted with the uric acid reagents of Benedict or of Folin. Also, since tyrosin is acted upon by sunlight to give melanins, and by bacteria to give phenols, it may be worth while to investigate further if the extra sunlight has to do with the higher phenol excretion during the summer.

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#### Influence of some salts which change P. D. on the phagocytosis of pneumococci.

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It has long been known that virulent strains of pneumococci or other bacteria are not readily ingested by leucocytes and that avirulent strains are generally ingested readily. It has also been established that the presence of acids, alkalies, salts and other reagents modify the velocity or the extensiveness of phagocytic reactions.

In studies on the parallel relations between virulence, electrophoretic potential difference (P. D.), agglutinability and other characteristics of bacteria, strains of pneumococci of different

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<sup>1</sup> Koch and Reed, *A. J. Physiol.*, 1926, lxxv, 351.

virulence for white mice were examined in considerable detail.<sup>1</sup> The pneumococci designated A are virulent Type I organisms. The strains B and C are variants of A which were derived by Blake and Trask by growing strain A in the presence of specific anti-serum. The minimum fatal doses for white mice are:  $0.5 \times 10^{-7}$  cc. for A;  $0.5 \times 10^{-3}$  cc. for B; and  $0.5+$  cc. for C. The P. D. is highest on A and lowest on C.

The experiments reported here were undertaken to determine the extent to which A, B and C strains of pneumococci are taken up by phagocytes under conditions which were designed to decrease or increase the P. D. It has been established<sup>1</sup> that the virulence for white mice is altered in a parallel manner when the P. D. is increased or decreased.

It has been found that in the presence of normal rabbit serum or of immune horse serum, the sequence of decreasing phagocytic indices is: C, B, A. For the opsonic indices, the series is:  $A = B > C$ . The enhancement of phagocytosis by the presence of unheated or heated immune serum is approximately proportional to the concentration of the serum.

It has been found<sup>1</sup> that the sequence of the relative magnitudes of the P. D. values for the A, B and C strains is inverted by frequent washings with water from  $A > B > C$  to  $C > B > A$ . It was found, correspondingly, that the sequence of the phagocytic indices was also inverted.

If the P. D. on the pneumococci be reduced by such a salt as lanthanum nitrate, the phagocytosis is increased proportionately. If the P. D. be increased by sodium oleate,<sup>2</sup> the phagocytosis is proportionately reduced. The phagocytic indices were similarly modified successively when suspensions of the pneumococci were treated with lanthanum nitrate, washed, and then with sodium oleate, and when the procedure was reversed.

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<sup>1</sup> Falk, I. S., Gussin, H. A., and Jacobson, M. A., *J. Inf. Dis.*, 1925, xxxvii, 481; Falk, I. S., Jacobson, M. A., and Gussin, H. A., *ibid.*, 495, 499; Falk, I. S., and Jacobson, M. A., *ibid.*, 507; 1926, xxxviii, 182, 188.

<sup>2</sup> Cf., Falk, I. S., and Yang, S. Y., *J. Inf. Dis.*, 1926, xxxviii, 1, 8.