

day herpes virus. When treated by radiotherm their rectal temperatures reached 110°F. and both animals died during the night in consequence of overheating.

Two more rabbits were again inoculated with the "Frank" 7 day virus and these received 7 hours of radiothermy daily for 6 successive days. The average rectal temperature was 108°F. One rabbit reached a temperature of 110.2°F. and died, the other died with typical symptoms 7 days after inoculation as did the 2 control animals similarly inoculated.

Since a temperature of 108°F. failed to protect the rabbits and 110°F. killed them it was of interest to determine the results of heat *in vitro*. We found nothing in the literature to indicate that a critical temperature of 109.4°F. (43°C.) had ever been employed with herpes virus. Consequently, the El-1 strain was heated at 109.4°F. for ½ hour and 7 hours respectively which corresponded to the duration of one radiotherm treatment. Each heated virus material was injected in duplicate rabbits and all 4 died within 5 to 6 days, including the control animal which died in 3 days. These results corroborate those obtained with radiothermy.

Within the limitations of the material at hand it appears that radiothermy in the dosage employed fails to protect rabbits against herpes virus.

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Further Observations on the Transformation of Type-Specific Pneumococci by In Vitro Procedures.

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Dawson and Sia^{1, 2} described a method for inducing transformation of pneumococcal types by an *in vitro* technique. In this procedure the transformation of pneumococci from one specific S type into other specific S types was effected through the intermediate stage of the R form. The method consisted in growing small inocula of R forms, derived from S forms of one specific type, in media containing vaccines prepared from cultures of heterologous S types.

¹ Dawson, M. H., and Sia, R. H. P., *J. Exp. Med.*, 1931, **54**, 681.

² Sia, R. H. P., and Dawson, M. H., *J. Exp. Med.*, 1931, **54**, 701.

Under these conditions the R forms frequently were transformed into S forms of the same type as the vaccine. In the course of this study it was observed that the nature of the R culture selected materially affected the results obtained. Thus R cultures which were only partially stabilized in the R form were more readily transformed into S forms of heterologous types than were R cultures which were more definitely stabilized in the R form. This observation suggested the possibility that, under certain circumstances, S forms of one specific type might be directly transformed into S forms of the other specific types.

To insure purity of the strains selected single-cell cultures of a Type II S pneumococcus were obtained.* The virulence of the strains employed was such that 1 cc. of a 10^{-8} dilution of a 15-hour broth culture was invariably fatal for white mice. Small seedings (one drop of a 10^{-8} dilution) of this single-cell II S culture were inoculated into media containing homologous anti-serum together with large quantities of vaccine prepared from a Type III S culture. Control measures adopted to insure the sterility of the vaccines were similar to those described in previous communications.^{1, 3} The cultures were incubated at 37°C. and blood agar plates were streaked at daily intervals for 4 days. In the majority of instances numerous typical III S colonies appeared on plates streaked from cultures which had been incubated for 48 hours. The remaining colonies on such plates were all of the II S variety and no R colonies were observed. These experiments demonstrated that type-specific S pneumococci could be transformed from one specific S type into other specific S types by growth in homologous immune serum in the presence of heterologous S vaccine. Although it was not possible to demonstrate the occurrence of intermediate R forms during the transformation the conditions of the experiment suggest the probability that the transformed organisms passed through a phase comparable to the R state during the transformation process.

Experiments were next arranged to determine the effect of seeding small inocula of S pneumococci in media containing heterologous anti-serum as well as vaccines prepared from heterologous S cultures. One drop of a 10^{-7} dilution of a single cell II S culture was inoculated in media containing Type I serum and III S vaccine. As in preceding experiments the cultures were incubated at 37°C. and

* We are indebted to Mrs. M. S. Ingalls of the Department of Bacteriology, College of Physicians and Surgeons, Columbia University, for assistance in obtaining single-cell cultures.

³ Dawson, M. H., *J. Exp. Med.*, 1930, **51**, 99, 123.

plates were streaked at daily intervals for 4 days. Under these conditions, in occasional instances, it was possible to obtain typical III S colonies on plates streaked from cultures which had been incubated for 24 hours. In these experiments it was again impossible to demonstrate the occurrence of R forms during any phase of the transformation process. Furthermore the conditions provided were those most unfavorable for the development of R forms. However it is not possible to affirm that during the transformation the S organisms may not have passed through a phase comparable to the R form. In any case a new procedure for the transformation of pneumococcal types is presented.

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The Influence of Liver Extract and Acute Infection on Reticulocytes and Bone Marrow of Pigeons.

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The exact mechanism of the action of the potent material effective in pernicious anemia is still obscure. Certain facts are firmly established, however, such as the prompt reticulocyte response which this material induces, and that infection can inhibit this reaction to varying degrees. The potent material does not influence the peripheral blood of normal rats, rabbits, and dogs, nor, as a rule, does it effect anemias experimentally produced in these animals. However, pigeons seem to be peculiarly sensitive to the potent material. Relatively pure liver extracts injected intravenously, as well as commercial liver extracts fed by mouth, will cause a typical reticulocyte response in normal pigeons.¹ It has been tentatively suggested that this reaction is due to the partially megaloblastic type of bone marrow found in these birds.

To elucidate further the action of liver extract on the red blood cells in the bone marrow, and to obtain some possible explanation for the failure of an adequate reticulocyte response in pernicious anemia patients suffering from infections, the following experiments

¹Vaughan, J. M., Muller, G. L., and Zetzel, L., *Brit. J. Exp. Path.*, 1930, **11**, 456.