

Effect of Egg White in Oral Vaccination Against Pneumococcus.

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The development of resistance to pneumococcus infection in young rats following the oral administration of various pneumococcus products has been reported by Ross.¹ Feeding of pneumococcus cultures to rats and rabbits was also done by Maeji² with similar results. That the mucous membrane of the gastro-intestinal tract is an effective site for the introduction of antigen, for the purpose of protecting the animal against pneumococcus infection, is also indicated in the work of Cooper³ on sub-mucosal injection of vaccines in rabbits. Besredka⁴ has shown that bile is useful in sensitizing or preparing the intestinal mucosa for the absorption of antigens; Arnold⁵ and Finder⁶ have investigated the effect of bile and egg-white on gastric secretion and on intestinal permeability to bacteria and antigens. The latter work shows that following the ingestion of egg-white and bile separately or in mixtures there is a definite lack of gastric response and an increased permeability of the small intestine.

The present work was undertaken (1) to confirm the experiments on oral immunization against pneumococci; (2) to simplify the procedure for producing an effective antigen in quantities suitable for human experiments; (3) to investigate the effect of preliminary preparation of the gastro-intestinal mucosa; and (4) to study the effect on pulmonary pneumococcus infections.

This report shows the effect of preparing the gastro-intestinal mucosa of the rat by feeding egg-white 30 minutes before the pneumococcus antigen is given. Young white rats of fairly uniform size (60-80 gm.) were fed 5 cc. of antigen; half of the animals received 5 cc. egg-white 30 minutes previous to the feeding of antigen. Five days later all animals were tested for immunity by intraperitoneal injection of 0.25 cc. of graded dilutions of broth culture of

¹ Ross, V., *J. Exp. Med.*, 1930, **51**, 585.

² Maeji, Y., *Acta Scholae med. univ. imp.*, Kyoto, 1929, **12**, 295.

³ Cooper, M., *J. Inf. Dis.*, 1926, **38**, 491.

⁴ Besredka, A., "Local Immunization," Williams & Wilkins, 1927.

⁵ Arnold, L., and Finder, J., *PROC. SOC. EXP. BIOL. AND MED.*, 1928, **25**, 615.

⁶ Finder, J., *PROC. SOC. EXP. BIOL. AND MED.*, 1930, **27**, 985.

the homologous type of virulent pneumococcus. At the same time, untreated animals were inoculated with the same organisms for the determination of the lethal dilution. In all experiments included in this resumé the lethal dose was found to be 0.25 cc. of a 1:100,000,000 dilution of an 18-hour culture of the type I strain used. The animals were fed and tested in 4 lots.

The toleration of many lethal doses (indicated by survival) was noted in all animals receiving antigen. If the maximum dose survived by animals in one group is taken as an index of the titer of the immunity developed in that group, we find results as indicated in the accompanying chart. The ordinates indicate the maximum

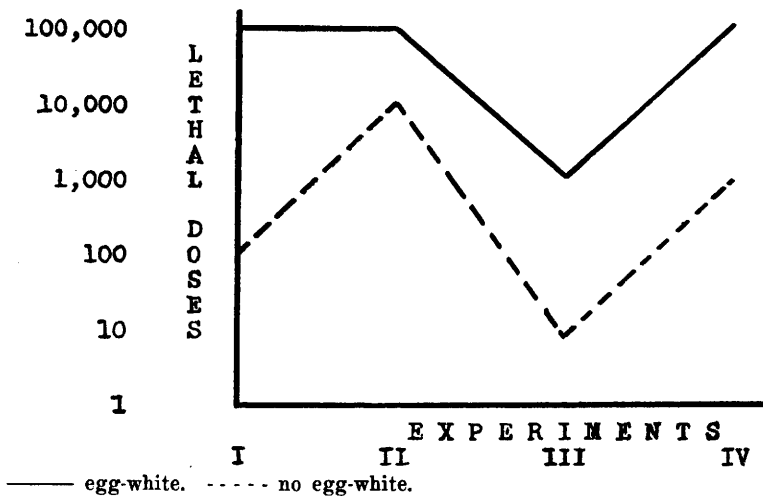


FIG. 1.

Effect of egg-white in oral vaccination against pneumococcus—4 experiments.

dose survived by each group; the abscissas indicate the separate experiments. It will be seen that all the animals developed a resistance to many lethal doses of the virulent culture. It is also clear that in every case those rats receiving a preliminary dose of egg-white exhibited a greater resistance to infection than those not fed egg-white.

Further comparative experiments of this sort are now being undertaken to find what effect egg-white has upon the duration of immunity and upon the rapidity of its appearance.