

of their respective body weights. Estimating that rat No. 3, which weighed 52 gm. at the beginning of the experiment, contained about .040 per cent magnesium, or 21 mg. magnesium, it gained approximately 10 mg. During the same period, it ate about 1000 gm. diet, containing 12 mg. It must, therefore, have absorbed and retained nearly all the magnesium it received. This is in marked contrast to its inability to utilize all of the Ca and P of a diet, even when they are present in inadequate amounts.

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A report on the preparation of pneumococcic antitoxin.

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In the present paper I wish to make a brief report of results obtained in an effort to produce a pneumococcic antitoxin. This work is the outgrowth of our observation that bacterial toxins are rendered non-toxic by soaps of some of the unsaturated fatty acids, particularly sodium ricinoleate, and that the antigenic properties of such detoxified toxins remain unimpaired. We have further called attention to the fact that pneumococci, streptococci and certain other micro-organisms are either killed in a short time in aqueous solutions of sodium ricinoleate, or lose their powers to infect. Larson and Nelson¹ showed further that there is a rapid development of agglutinins in rabbits against both pneumococci and streptococci following the injection of soaped cultures of these organisms.

Ten cc. or more of a virulent broth culture of soaped pneumococci may be injected intraperitoneally into rabbits without causing an infection. Agglutinins appear in the blood stream as early as 24 hours following such injections. This observation led us to attempt to produce an antipneumococcic serum by this method. Pneumococci of various types were passed through a series of mice in order to increase their virulence as much as pos-

¹ Larson, W. P., and Nelson, E., *Proc. Soc. Exp. Biol. and Med.*, 1925, xxii, 357.

sible. They were then grown in veal infusion broth which contained 1 to 2 per cent peptone. Parke-Davis' and Witte's peptones were used, since these products have been found by others to be best for toxin production. The whole cultures were treated with sodium ricinoleate solutions of a pH of 7.8, so the final concentration of the soap was 1 per cent. The pH of the cultures was adjusted to 7.4 before the soap was added.

Rabbits and sheep were then immunized with these soaped cultures. Sheep were given as much as 200 cc. at one time. It was found that the blood serum of immunized animals would cure infected rabbits in a large percentage of cases.

The serum was then tried out on cases of lobar pneumonia at the Minneapolis General Hospital during the late winter and spring of 1925. A preliminary report of our results has been published by Larson and Fahr.² The rapid drop in temperature following the administration of the serum and the relief of subjective symptoms indicated that the serum actually contained antitoxin.

Using our cultures, Olson³ succeeded in isolating a toxin which gave a skin reaction in rabbits and produced changes, such as hemorrhage and even hepatization, in the lungs of mice following intraperitoneal injection. Olson showed further that the toxin was neutralized by our serum, proving that it actually contains pneumococcic antitoxin. The writer found that the toxin isolated by Olson gave skin reactions in approximately 50 per cent of normal individuals, while three cases who had received antitoxin gave a negative test. We are thus able to standardize the antitoxin in terms of the number of skin doses of toxin which are neutralized by one cc. of serum. Our antitoxin is now being used experimentally in several medical centers.

² Larson, W. P., and Fahr, *Minnesota Medicine*, 1925, viii, 424.

³ Olson, J. G., *Proc. Soc. Exp. Biol. and Med.*, 1926, xxiii 295-334.