activity as was found in the cranial lobe may well be due to reflux of caudal lobe secretion. The unequal enzyme distribution in the Rhesus gland suggests that the cranial lobe, if it is part of the true prostate gland, differs in function from the caudal lobe; as indicated also by differences in morphology and by van Wagenen's observations on the "coagulating" power of the cranial but not of the caudal lobe.[12]

While the function of the "acid" phosphatase of the mature prostate gland in man and in the monkey is not known, it would appear that suitable substrates are present in the seminal fluid (Ivanov,[13] and others) and that the slightly acid reaction of the vaginal secretion affords a favorable medium for its activity.

Summary. As in man, the prostate gland of the mature Rhesus monkey contains high concentrations of an "acid" phosphatase, whereas the prepubertal monkey prostate is virtually devoid of this enzyme. It is shown that testosterone propionate causes a several hundred-fold increase in "acid" phosphatase activity of the prepubertal monkey prostate gland to adult levels. It is inferred that in prepubertal man, so treated, an analogous increase occurs. In the monkey, "acid" prostate phosphatase is elaborated chiefly or solely in the caudal lobe.

10647

Combined Immuno and Chemotherapy of Pneumococcus Rat Infections.

H. M. POWELL AND W. A. JAMIESON.

From the Lilly Research Laboratories, Indianapolis, Indiana.

Fleming[1] has shown that type specific antipneumococcus serum increases the antibacterial action of sulfapyridine *in vitro* against pneumococci. McIntosh and Whitby[2] have shown, moreover, that sulfapyridine does not stimulate phagocytosis or antibody production against pneumococci, but suppresses their growth to a point that biological defense can become effective. Subsequently, we[3] showed that a small dose of broadly acting non-type-specific antipneumococ-

12 van Wagenen, G., *Anat. Rec.*, 1936, **66**, 411.

13 Ivanov, I. I., *Chem. Abstr.*, 1938, **32**, 2584.

1 Fleming, A., *Lancet*, 1939, **2**, 74.

2 McIntosh, J., and Whitby, L. E. H., *Lancet*, 1939, **1**, 431.

3 Powell, H. M., and Jamieson, W. A., *J. Immunology*, 1939, **36**, 459.

TABLE I.
Single Dose Antigen and Chemotherapy of Pneumococcus Infected Rats.
Type and Therapy of Pneumococcus Rat Infections.

Infecting Dose of Pneumococci, cc	I										II									
	Antigen 1	2	5	L	Sul + 1	Sul + 2	Sul + 5	Sul + L	Sul	Controls	Antigen 1	2	5	L	Sul + 1	Sul + 2	Sul + 5	Sul + L	Sul	Controls
10^{-1}	1	1	2	1	7	4	5	6	1	1	1	1	3	1	1	1	S*	1	2	1
10^{-2}	2	2	S	5	S	S	S	S	1	1	2	1	5	2	3	1	7	2	4	2
10^{-3}	3	2	2	2	S	S	S	S	3	2	1	2	5	1	3	3	S*	4	4	1
10^{-4}	3	1	S	S	S	4	S	S	S	1	3	1	5	2	3	3	5	2	4	2
10^{-5}	S	S	S	5	S	3	S	S	1	2	S	1	S	S	3	3	S	4	2	2
10^{-6}	S	2	S	S	S	S	S	6	3	2	3	2	S	5	S	3	S	S	S	2
10^{-7}										S	S	4	S	S	S	4	S	S	S	3
10^{-8}																				S
10^{-9}																				

Infecting Dose of Pneumococci, cc	V										VIII									
10^{-1}	1	1	1	1	2	3	1	1	2	1	3	1	1	1	1	1	1	1	2	1
10^{-2}	1	1	1	1	2	4	2	1	2	1	2	3	1	2	3	S	7	4	2	1
10^{-3}	1	1	1	1	3	5	2	1	2	1	3	2	1	4	S	2	S	S	2	2
10^{-4}	3	1	2	2	S	S	2	2	2	2	3	3	2	4	S	S	2	S	S	2
10^{-5}	7	2	1	2	3	3	S	2	2	1	S	S	2	S	S	S	S	2	2	2
10^{-6}	2	1	2	2	S	2	2	2	3	2	S	2	2	4	S	S	S	4	3	2
10^{-7}	2	2	2	4	S	S	S	S	3	2										S
10^{-8}	S	2	S	S	3	S	S	2	2	2										
10^{-9}										S										

Legend: (1) Antigens 1, 2, and 5 made respectively from pneumococcus cultures DRI, type II and type V; Antigen L made from same cultures pooled. Sul = sulfapyridine.

(2) Numbers refer to day of death, after infection, of each rat; S = survival 7 days.

*These rats at termination of test were in poor condition and died of pneumococcus peritonitis two days later.

cus serum, of itself only partially effective, becomes highly effective when fortified with a single partially effective dose of sulfapyridine. This enhanced effectiveness was demonstrated in rat infections with pneumococci of 6 different types, and simplification of treatment was attained through use of a single broad antiserum.

Maclean, Rogers, and Fleming[4] have recently shown the importance not alone of passively introduced pneumococcus antibody but also antibody actively incited by pneumococcus vaccine in the combined immuno and chemotherapy of pneumococcus infection in mice and rabbits. These authors have made a strong case for combined

[4] Maclean, L. H., Rogers, K. B., and Fleming, A., *Lancet*, 1939, **1**, 562.

use of vaccine and sulfapyridine in treatment of pneumonia. They considered the utilization of 30 types of vaccine.

Inasmuch as we have used pneumococcus vaccine some of which has given broad effects in rabbits,[3, 5] it became of interest to test the combined therapeutic effectiveness of the vaccine and sulfapyridine directly in different types of pneumococcus rat infections. This report gives the results of these tests in a comparative way.

The pneumococcus cultures and vaccines used have been described heretofore.[3, 5] Vaccines made from certain cultures, namely, DRI, type II, and type V, had been found to incite the broadest antibodies in rabbits, hence vaccines of these separate and combined types were used in the experiments herein described. Since exposure of the vaccine to 37°C for a week appeared to enhance immunizing properties against heterologous type infections, this procedure was adhered to in preparation of these vaccines which always appeared preponderately gram negative. Preparation of somewhat similar pneumococcus vaccine almost 30 years ago by Rosenow[6] and Rosenow and Hektoen[7] should be mentioned.

Rats of 90-100 g weight were injected intraperitoneally with decimal dilutions of pneumococcus cultures I, II, V, and VIII. Separate groups of these were given the following respective treatments promptly after infection: (a) 1 cc pneumococcus vaccine subcutaneously; (b) 25 mg sulfapyridine orally; (c) treatment (a) and (b) together; (d) no treatment and kept for controls. Treated and control rats were observed for 7 days, and except in a few instances the survivors were discarded at this time. The results of these tests are shown in Table I and indicate that:

1. Pneumococcal antigen in a single dose exerts a definite therapeutic effect evidenced by prolongation of life or complete survival of pneumococcus infected rats. This effect is both homologous and heterologous as to type when certain culture antigens are used.

2. Enhanced therapeutic effects are obtained by combined use of one dose each of antigen and sulfapyridine.

3. These results verify and extend those of Maclean, Rogers, and Fleming, and simplify the vaccine needs in that a single antigen instead of 30 may suffice.

---

[5] Powell, H. M., and Jamieson, W. A., *Science*, 1939, **89**, 392.

[6] Rosenow, E. C., *J. A. M. A.*, 1910, **54**, 1943.

[7] Rosenow, E. C., and Hektoen, L., *J. A. M. A.*, 1913, **61**, 2203.