ling, and their mammary glands showed definite signs of involution as early as 4 days after the operation. This finding is particularly interesting in view of the fact that complete hysterectomy performed on the day of delivery does not interfere in any way with lactation.

7184 C

Survival of Adrenalectomized Rats After Cortical Hormone Treatment.

ROBERT GAUNT AND JO HOWLAND GAUNT. (Introduced by W. W. Swingle.)

From the Department of Biology, College of Charleston, Charleston, S. C., and The Biological Laboratory, Cold Spring Harbor, N. Y.

Within the last few years much work has been done concerning the survival of rats after adrenalectomy.[1] We had supposed that animals kept alive by injections of the cortical hormone following adrenalectomy would show approximately the same life-span after injections were stopped as those untreated after removal of the adrenals. However, in the course of other investigations in which we made prolonged cortical hormone injections into adrenalecto-

TABLE I.
Table Showing Survival Periods of Adrenalectomized Rats after Withdrawal of Cortical Hormone Treatment.

No.	Sex	Extract Used	cc. per day	No. Days Injected	Days Survival After Withdrawal		Accessory Tissue Found
					Died	Killed	
300	♀	Eschatin (P. D. & Co.)	1	26		112	3 macroscopic
301	♀	"	1	10		138	1 "
303	♀	"	1	21	31		0
307	♀	"	1	20		120	1 "
311	♀	"	1	24	60		0
332	♀	Swingle-Pfiffner	1	4	8		0
336	♀	"	1	19	15		0
337	♀	"	1	4		90	1 "
338	♀	"	.75	6		87	1 "
340	♀	"	1.5	9	2		0
341	♂	Eschatin and Swingle-Pfiffner	.5	22	26		0
342	♂	"	"	23	24		0
343	♂	"	"	22		49	1 "
344	♂	"	"	17		44	1 "
345	♂	"	"	18	24		0
346	♂	"	"	22	25		0

[1] Gaunt, R., *Am. J. Phys.*, 1933, **103**, 494.

mized rats, we found that rats show a much higher percentage of indefinite survival after extract treatment is withdrawn than they do when untreated following adrenalectomy. (Table I.)

The animals used were of a colony which had previously been shown to survive adrenalectomy for 30 days or longer in only 5% of the cases.[1] The average life-span of those not surviving adrenalectomy we had previously found to be 7 days. (A later control series of 15 animals showed an average survival of 10 days, with none surviving indefinitely.) Technique of operation and care was as previously described, except in cases to be subsequently mentioned. In all cases the injections of extract were begun at the time of operation, and given generally in divided doses twice daily—in a few cases once daily. Only the healthiest of animals were used. Ages ranged from 2.5 to 4.5 months. The cortical extract was kindly furnished by Dr. W. W. Swingle of Princeton University and Dr. Oliver Kamm of Parke, Davis & Co., to whom the authors are grateful for making this work possible. The dosage of extract given was probably in all cases far in excess of the minimum needed to maintain life.

We have observed the effects of extract treatment for varying lengths of time on 16 rats. Seven of these 16 cases survived in good condition after extract was discontinued, showed no sign of adrenal insufficiency, and were consistently gaining weight when they were killed for autopsy. In all 7 cases macroscopic cortical accessories, determined to be such by histological examination, were found on the left side near the junction of the adrenal and renal veins. In one case (No. 300) an accessory was found on the right side near the posterior vena cava just anterior to the renal vein. These accessories were in most cases located very close to the renal vein. It would have been impossible for this reason to have removed them at the first operation along with the main gland by the now widely used technique of removing the pedicle and surrounding tissue along with the adrenal. In one case (No. 311) the animal survived 60 days after extract withdrawal. Although no accessories were found in this animal, depleted ones at least must have been present to have supported life such a length of time.

In this colony of rats approximately 50% survive adrenalectomy for 30 days or longer after the withdrawal of extract treatment, while not more than 5% survive after adrenalectomy when untreated. It might be supposed that the injection of the cortical hormone, by eliminating the need for functional cortical tissue, would suppress the hypertrophy of cortical rests. Just the oppo-

site, however, seems to be true. These results show that cortical accessories, capable of hypertrophy, are present in a large percentage of rats even in those colonies where an hypertrophy sufficiently rapid to maintain life does not usually occur following adrenalectomy.

The extension of the lives of these animals by administration of extract probably causes a higher percentage of survival by allowing time for the hypertrophy of accessories. Our data, however, do not indicate that the percentage of survival bears any relationship to the length of the injection periods. Three of the cases that survived until killed for autopsy were injected only 4, 6, and 10 days; while some treated for much longer periods succumbed soon after extract withdrawal. Previously we have reported[1] 3 cases in which rats in late stages of adrenal insufficiency were revived with one or 2 injections of the cortical hormone and then developed accessories and survived. That surgical shock is not the cause of the greater percentage of deaths after adrenalectomy than after extract withdrawal is reasonably certain. The operation is simple, the trauma slight, and the recovery rapid; and Martin has demonstrated the difficulty, that amounts almost to an impossibility, of "shocking" a rat by surgical manipulation.[2]

The stock diet fed the experimental animals contained 1% NaCl Because of the recent reports[3] indicating the value of NaCl in extending the survival in other forms, Rats Nos. 341 to 346 inclusive were given a diet rich in NaCl for 15 days after hormone injections were stopped. After this the regular diet was resumed. This treatment apparently helped the rats in this group which were without cortical accessories, as they showed a long life-span and did not die until the salt content of their diet was reduced. We are now trying to determine how completely salt will suffice to maintain life in cases of this kind.

The recent confusion of opinion as to what percentage of rats survive adrenalectomy is related to the question of how many have accessories. Our results show that the numbers surviving adrenalectomy will not indicate necessarily what percentage possess microscopic accessories capable of hypertrophy. It is probable that extract treatment, by giving the accessories time to develop, may show much more accurately how many of a given strain have accessories.

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[2] Martin, S. J., *Am. J. Phys.*, 1932, **100**, 180.

[3] Pertinent references given by Rubin, M. I., and Krick, E. T., PROC. SOC. EXP. BIOL. AND MED., 1933, **31**, 228.

These results also indicate that the rat is not an entirely suitable specimen for the standardization and assay of cortical extracts, because of this variability in response to extract administration. Only by first keeping adrenalectomized rats on extract for a considerable period, then removing the extract and selecting the ones which develop adrenal insufficiency, could an animal suitable for accurate assay work be obtained.

7185 P

Antigenic Action of the Specific Polysaccharide of Pneumococcus Type I in Man.

THOMAS FRANCIS, JR. (Introduced by O. T. Avery.)

From the Hospital of the Rockefeller Institute for Medical Research.

Francis and Tillett[1] demonstrated that following the intradermal injection of minute amounts of the type-specific polysaccharide of Type I, II or III Pneumococcus in humans, there developed in the serum of these individuals homologous type-specific agglutinins. In addition, the serum of individuals so treated was found to possess the capacity of conferring passive protection upon mice against infection with pneumococci of homologous type. These results were confirmed by Finland and Sutliff.[2]

Recently, it has been shown that the specific polysaccharide of Type I Pneumococcus exists as an acetyl polysaccharide.[3] The acetyl compound is capable of completely absorbing the type-specific antibodies from an homologous immune serum and of inducing type-specific active immunity in mice. The acetyl polysaccharide is readily converted into its deacetylated derivative by treatment with dilute alkali. The chemical and immunological properties of the deacetylated polysaccharide are identical with those of the soluble specific substance in the form in which it was originally isolated[4]; it is non-antigenic in mice and only partially absorbs the type-specific antibodies from Type I anti-pneumococcus serum.

The recognition of the specific polysaccharide in acetyl form raised the question as to whether the antigenicity of the pneumo-

[1] Francis, T., Jr., and Tillett, W. S., *J. Exp. Med.*, 1930, **52**, 573.

[2] Finland, M., and Sutliff, W. D., *J. Exp. Med.*, 1931, **54**, 637.

[3] Avery, O. T., and Goebel, W. F., *J. Exp. Med.*, 1933, **58**, 731.

[4] Heidelberger, M., and Avery, O. T., *J. Exp. Med.*, 1923, **38**, 73.