It has been observed that a number of ultracentrifugally homonegeous proteins investigated in our laboratory showed sedimentation coefficients which were dependent upon the rotor velocity at which they were determined (POLSON)[23]. Thus it was found that the 3 proteins γ-globulin, ovalbumin and hemocyanin of Jasus lalandii when spun at rotor velocities below 20,000 rpm showed sedimentation coefficients which were approximately 11% higher than those obtained at velocities above 40,000 rpm. If this is a general phenomenon with proteins, it would indicate that their molecular weights, as determined by the velocity method, need revision. A consequence of this would be that the f/f_0 values of proteins would become smaller than that at which they are quoted, which would result in the numerical 4.1 in the empirical equation moving closer to HATCHECK's value of 4.5 and further away from Einstein's figure of 2.5.

An interesting conclusion may be drawn from the Figure. By extending the straight portion of the graph into the region below $f/f_0 = 1$ it would appear that the abscissa is intersected at a position very close to the origin or approximately $f/f_0 = 0.06$. Considering the experimental error involved and the approximate correctness of the slope of the straight line, it may be concluded that the line could justifiably pass through the origin. The simple empirical relationship $f/f_0 = {}^1/_{0.61} \log [\eta]/V$ appears to represent a true relationship at $f/f_0 = 1$ and > 1 between the frictional ratio, intrinsic viscosity and partial specific volume.

The empirical relationship fails to apply to substances of which frictional ratios f/f_0 are less than 0.90. Values below $f/f_0 = 1$ are shown by substances of low molecular weight which have molecular volumes of the same order of magnitude as those of the dispersion medium. Such substances have intrinsic viscosities which decrease rapidly with decreasing molecular volume to vanish when the molecular volume of the dispersion medium is reached (POLSON)[24], hence $\log [\eta]/V = 0$ when f/f_0 is still finite[25].

Zusammenfassung. Es wurde ein empirisches Verhältnis zwischen Reibungskonstante und «intrinsic» Viskosität abgeleitet, woraus sich eine neue Konstante für die Einsteinsche Gleichung ergab.

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[23] A. POLSON, in press.

[24] A. POLSON, Nature *187*, 482 (1960).

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Effect of Castration and Testosterone Administration on the Noradrenaline Content of the Vas Deferens and the Seminal Vesicle of the Guinea-Pig

The large amounts of noradrenaline found in the internal accessory male organs of the guinea-pig[1,2], are due to an unusually rich supply of adrenergic nerves, emanating from short adrenergic neurons, with their cell bodies located close to the target organs[3,4]. The same pattern of innervation is present also in other species[2,4]. (For further references c.f. SJÖSTRAND 1965[2]).

Since the development and size of the accessory male genital organs is dependent on the presence of androgenic hormones, it appeared to be of interest to study the effect of testosterone administration and castration on the noradrenaline content of the vas deferens and the seminal vesicle of guinea-pig, and thus obtain some quantitative data on the effect of androgens on the adrenergic innervation of internal male genital organs.

Material and methods. Young guinea-pigs having an initial weight of about 300 g were used. They were divided in 5 groups with 4–6 animals in each group. One group served as untreated control group. The animals of 2 other groups were castrated 28 days before killing. The guinea-pigs of one of these castrated groups and those of another non-castrated group received the following injections i.m.: 16 days before killing each animal received 10 mg testosterone propionate, 40 mg testosterone valeriate and 75 mg testosterone undecylenate oil solution (0.5 ml Triolandren® solution). On the 8th, 6th, 4th and 2nd day before killing each animal received 1 mg testosterone propionate in oil solution (Perandren®). These groups are referred to as 'testosterone low dose'. The animals of the last group received the following injections i.m.: 16 days before killing each animal received 30 mg testosterone propionate, 120 mg testosterone valeriate and 225 mg testosterone undecylenate (1.5 ml Triolandren® solution). On the 8th, 6th, 4th and 2nd day before killing each guinea-pig was given 3 mg testosterone propionate (Perandren®) ('testosterone hight dose'). The animals in all groups received the same care and food during the 4 weeks the experiment lasted. All animals were sacrificed by a blow on the head. The vas deferens and the seminal vesicle were taken out, cleaned and their contents were squeezed out. The noradrenaline content of the organs was determined according to EULER and LISHAJKO[5] in the same manner as described earlier[1,2]. The noradrenaline is expressed as hydrochloride. All data obtained from the 'experimental' groups are compared with those of the control group and their significance tested by the *t*-test (FISHER[6]).

Results. The results are shown in the Table.

Discussion and conclusions. From the present study on the guinea-pig it seems evident that castration increases the noradrenaline concentration of the vas deferens and the seminal vesicle, but has no certain effect on the total amount of noradrenaline in these organs. On the other hand, large doses of testosterone tend to decrease the

[1] N. O. SJÖSTRAND, Acta physiol. scand. *56*, 376 (1962).

[2] N. O. SJÖSTRAND, Acta physiol. scand. *65*, Suppl. 257, (1965).

[3] B. FALCK, CH. OWMAN and N. O. SJÖSTRAND, Experientia *21*, 98 (1965).

[4] CH. OWMAN and N. O. SJÖSTRAND, Z. Zellforsch. *66*, 300 (1965).

[5] U. S. VON EULER and F. LISHAJKO, Acta physiol. scand. *51*, 348 (1961).

[6] R. A. FISHER, Edinburgh (1936).

Effect of castration and testosterone administration on the noradrenaline content of the vas deferens and the seminal vesicle of the guinea-pig

Treatment	No.	Body weight g	Weight of pair of vasa deferentia g	Noradrenaline in vas deferens µg/g tissue wet weight	Noradrenaline in vasa deferentia total amount µg	Weight of pair of seminal vesicles g	Noradrenaline in seminal vesicle µg/g tissue wet weight	Noradrenaline in seminal vesicles total amount µg
Controls .	5	424 ± 17	0.10 ± 0.01	10.0 ± 0.7	1.0 ± 0.1	0.49 ± 0.09	3.7 ± 0.2	1.8 ± 0.4
Castrated	5	444 ± 18	0.06 ± 0.00 [b]	13.8 ± 0.4 [b]	0.8 ± 0.0	0.25 ± 0.03 [a]	5.4 ± 0.3 [b]	1.3 ± 0.2
Testosterone 'low dose'	6	428 ± 13	0.12 ± 0.01	10.9 ± 0.5	1.3 ± 0.1	0.61 ± 0.04	3.0 ± 0.2	1.8 ± 0.1
Testosterone 'high dose'	4	458 ± 13	0.16 ± 0.01 [b]	7.5 ± 1.0	1.2 ± 0.2	0.87 ± 0.08 [a]	2.8 ± 0.3 [a]	2.3 ± 0.0
Castrated + testosterone 'low dose'	4	413 ± 28	0.11 ± 0.00	8.9 ± 0.5	1.0 ± 0.1	0.71 ± 0.07	2.7 ± 0.2 [a]	1.9 ± 0.2

[a] Different from controls $P < 0.05$; [b] different from controls $P < 0.01$.

concentration of noradrenaline in the seminal vesicle, but not in the vas deferens; the total amount of noradrenaline in both the seminal vesicle and the vas deferens are not overtly affected. When judging these results it should, however, be kept in mind that the number of animals in each group is small and that there is a rather large range in the individual noradrenaline values. Anyhow the present findings would imply that testosterone has no marked effect on the adrenergic innervation (noradrenaline content) per se of the vas deferens and the seminal vesicle of the guinea-pig. Castration and testosterone administration probably mainly affects non-nervous tissues such as the smooth muscle and the secretory mucosa of the organs[7,8].

Zusammenfassung. Die Noradrenalinkonzentration im Vas deferens und den Vesiculae seminales erhöht sich nach Kastration, wird aber nach Behandlung mit Testosteron leicht vermindert. Der gesamte Noradrenalingehalt erfährt jedoch nach keiner der beiden Behandlungen eine bedeutende Veränderung verglichen mit unbehandelten Kontrollorganen. Das bedeutet, dass Androgene keinen ausgesprochenen Einfluss auf die adrenergische Innervation per se haben, sondern hauptsächlich Gewebe, wie Glattmuskel- und sekretorische Zellen, influieren.

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Effect of Chronic Hypogastric Denervation on the Noradrenaline Content of the Vas Deferens and the Accessory Male Reproductive Glands of the Rat

Hypogastric denervation in the rat and other species does not reduce the noradrenaline content of the vas deferens and the accessory male genital glands, when the organs are examined 3 weeks after denervation[1,2]. This seems to be due to the fact that these organs are innervated by short adrenergic neurons[2-5].

Since resection of the inferior mesenteric ganglion in male rodents causes permanent sterility in contrast to resection of the lumbar sympathetic chain, which only produces temporary sterility[6], it seemed to be of interest to examine whether prolonged decentralization and hence inactivation of the short adrenergic neurons would produce a reduction in noradrenaline content of the male organ due to nervous atrophy.

Material and methods. Nine male rats of the Wistar strain, initially weighing about 200 g, were used. Four rats were subjected to resection of the hypogastric nerves. Five animals were left as untreated controls. The animals, controls as well as operated ones, were sacrificed 9 months after denervation. The rats then weighed about 500 g. The vasa deferentia and the accessory male genital glands were taken out and cleaned. Their contents were squeezed out and the organs were homogenized in 20 ml of 10% trichloroacetic acid. After extraction the noradrenaline content was estimated according to the method of EULER and LISHAJKO[7]. The noradrenaline is expressed as µg-free base/g wet tissue weight. At the time of killing the vas deferens and the accessory male glands of the denervated specimens were extended and filled with spermatozoa

[1] N. O. SJÖSTRAND, Acta physiol. scand. *56*, 376 (1962).

[2] N. O. SJÖSTRAND, Acta physiol. scand. *65*, Suppl. 257, (1965).

[3] B. FALCK, CH. OWMAN and N. O. SJÖSTRAND, Experientia *21*, 98 (1965).

[4] CH. OWMAN and N. O. SJÖSTRAND, Z. Zellforsch. *66*, 300 (1965).

[5] CH. OWMAN and N. O. SJÖSTRAND, Experientia *22*, 759 (1966).

[6] Z. M. BACQ, Am. J. Physiol. *96*, 321 (1931).

[7] U. S. VON EULER and F. LISHAJKO, Acta physiol. scand. *51*, 348 (1961).