effect of nandrolone decanoate was, however, much weaker than that of testosterone propionate.

These observation suggest that the effect of steroids on the alkaline phosphatase in the mouse adrenal cortex is more dependent on the virilising properties of the compound than on the anabolic. The weak activation of enzyme after administration of nandrolone decanoate may be evidence of a weak virilising effect of this steroid; one can state that this virilising property will be manifested by the relatively large doses used in this experiment[3].

Zusammenfassung. Verabreichung grosser Dosen Nandrolondecanoat hemmt das restlose Verschwinden der Aktivität alkalischer Phosphatase der Nebennierenrinde bei männlichen kastrierten Tieren und aktiviert das Enzym bei weiblichen Tieren. Der Effekt war wesentlich schwächer als bei Testosteron.

S. Talanti and A. Eisalo

Department of Anatomy, Veterinary College, Helsinki (Finland), June 10, 1962.

[3] We sincerely thank phil. mag. H. Willamo and Messrs. Organon, N.V. Oss, Holland, for a generous gift of nandrolone decanoate employed in this study.

A Study of the Training Possibilities of *Araneus diadematus* Cl.[1]

Though the behavior of spiders appears largely to be organized in rigid patterns which are innate, observations have been reported which show their ability to modify such behavior through experience. When the Peckhams[2] in 1887 'describe an attempt to teach a very interesting docile little female spider of the species *Cyclosa conica* Menge to listen composedly to the vibration of the tuning fork' they find it 'remarkable that one (spider) of them should have learned the sound of the vibrating fork so soon, and should have modified her action accordingly'. Recent observations on conditioning in a flatworm *Dugesia dorotocephala*[3] indicate too that invertebrates are more plastic in their behavior than expected. The description of the spider vibration receptor[4] and its electrophysiological analysis[5] point towards the ability of the spider to discriminate between different frequencies of vibration. It should be possible to measure this discriminatory ability in a spider's learned behavior.

For these experiments the spider *Araneus diadematus* Cl. was used. The adult female lives in the middle of its geometrical orb web and can be enticed to run to any part of that web if a vibrating tuning fork is held against it[6]. Five spiders were kept in individual aluminum frames with removable glass doors in the front and back (for details of method see[7].) They received a minimum diet of house flies and an 8% glucose water solution. In the first phase of the training period the spider was exposed to a dead fly which had been dipped first in AF type Anti-foam liquid emulsion and then in water containing 0.5% (w/v) quinine or 6% glucose. The dead quinine fly–presumed to carry an aversive taste–was thrown into the web first and made to vibrate through the touch of a C tuning fork. About 5 min later the glucose fly–presumably of agreeable taste to the spider–was presented together with a C^1 tuning fork. The spiders reacted in 4 different ways to the presentation which can be described as enwrapping, discarding, biting or no reaction. The experiment was repeated 48 times during 90 days according to the same pattern. After 15 trials all spiders regularly discarded and/or enwrapped the quinine-C fly and bit the glucose-C^1 fly. These results indicate that all spiders learned to distinguish between the first-quinine-C combination and the second-glucose-C^1 combination. In the second phase the sequence was switched for 4 trials. The spiders still bit the glucose-C^1 fly and discarded and/or enwrapped the other fly every time showing that the sequence did not affect the spiders' reaction. In a third phase the taste was paired with the opposite tone four times for each spider. Here they bit the glucose-C fly and discarded and/or enwrapped the other, obviously taking their clue from the taste. Consequently a fourth period of 16 trials was conducted in the same way as the first. The spiders, however, arrived at the originally learned pattern already after 5 trials. This seemed to indicate some retention on the spiders' part of the first learned behavior. In the last phase the flies were replaced by glass beads to which no taste was added. Supposedly the frequency of the tuning fork was now the sole clue for the spiders. The resulting constant behavior of discarding and/or enwrapping the C-bead and biting the C^1-bead indicates that the spiders could discriminate between these frequencies. This constitutes a quantitative behavioral proof for the postulate from Walcott's electrophysiological experiments[5], namely, that a spider can discriminate accurately two frequencies of vibration. The spiders, furthermore, associated each frequency with a previous experience as was shown in the last phase of the experiment. Such a learned behavior could be elicited soon again after several weeks, indicating good retention. These findings together with previous observations that some changes in the web with age depend on the spiders' change in body weight and leg length[8] and that food deprivation can change the mesh width of the web[9] point towards considerable plasticity which is superimposed on the innate patterns of behavior of the invertebrate spider.

Zusammenfassung: Kreuzspinnen verhielten sich verschieden, je nachdem ob eine tote Fliege mit Chininlösung, die durch eine vibrierende C-Stimmgabel in Bewegung gesetzt war, zuerst, oder eine Fliege in Glukoselösung, die durch eine C^1-Stimmgabel vibrierte, als

[1] This work was supported by PHS grant B-1794(C4).

[2] G. W. and E. G. Peckham, J. Morphol. *1*, 383 (1887).
[3] R. Thompson and J. McConnell, J. compar. Physiol. Psychol. *48*, 65 (1955).
[4] M. M. Salpeter and C. Walcott, Exp. Neurol. *2*, 232 (1960).
[5] C. Walcott and W. G. van der Kloot, J. exp. Zool. *41*, 191 (1959).
[6] C. W. Boys, Nature (Lond.) *23*, 149 (1880).
[7] A. Christiansen, R. Baum, and P. N. Witt, J. Pharmacol. *136*, 31 (1962).
[8] P. N. Witt and R. Baum, Behaviour *16*, 309 (1960).
[9] P. N. Witt, Amer. med. Assoc. Arch. Envir. Health, in print.

[10] The help of Dr. P. N. Witt, State University of New York, Upstate Medical Center, Syracuse, N.Y., is gratefully acknowledged.

zweite ins Netz gereicht wurde. Durch Vertauschen der Faktoren konnte gezeigt werden, dass der Geschmack den auslösenden Reiz bildet. Wenn hingegen geschmacklose Glasperlen mit den Tönen kombiniert wurden, richteten sich die Spinnen in ihrem Verhalten nach der Schwingungsfrequenz. Diese Ergebnisse zeigen die Fähigkeit der Spinnen, sowohl zwischen verschiedenen Schwingungsfrequenzen zu unterscheiden, als auch ihr Verhalten der Erfahrung anzupassen.

S. M. BAYS

Department of Pharmacology, State University of New York Upstate Medical Center, Syracuse (USA), June 18, 1962.

Effects of 4-Hydroxy-17-α-Methyltestosterone and Prednisolone on Wound Healing

On the basis of available evidence, the action of anabolic steroids on wound healing appears to consist in promoting reparative processes[1]. This aspect, however, has not been thoroughly investigated, whereas the anti-inflammatory action[2] of cortisone and its congenerous compounds, as well as their inhibitory action on formation of granulation tissue[2,3], has been sufficiently documented.

The present investigation was undertaken to study the effect of an orally active anabolic steroid, 4-hydroxy-17-α-methyltestosterone (Oranabol), on wound healing, and to find out to what extent such action might modify the inhibitory influence of a glucocorticoid compound, Prednisolone.

Sixty eight male mice from Swiss strain, weighing from 40 to 45 g, kept on Rockland diet and fed *ad libitum*, were employed. Under ether anaesthesia a fragment of skin from the dorsal region, of the same size in all animals (5 per 10 mm), was excised. The animals, divided into six groups, received, by *gavage* for a period of ten days, Oranabol and/or Prednisolone[4], according to the following scheme: 1st group, normal saline 0.25 cm^3; 2nd Oranabol 0.5 mg; 3rd, Oranabol 1.0 mg; 4th, Prednisolone 0.5 mg; 5th, Oranabol 0.5 mg and Prednisolone 0.5 mg; 6th, Oranabol 1.0 mg and Prednisolone 0.5 mg. The doses of the compounds were dissolved in normal saline 0.25 cm^3.

At the end of this treatment, all the animals were sacrificed by ether, and the area of skin including the wound was removed, fixed in neutral formaline 10% and

[1] L. LODDI and L. MOGGI, Acta chir. patav. *9*, 607 (1953). – C. W. PEARCE, N. C. FOOT, C. L. JORDAN, S. W. LAW, and C. E. WANTZ, Surg. Gynec. Obst. *111*, 274 (1960).

[2] C. CAVALLERO, Rev. Canad. Biol. *12*, 189 (1953).

[3] G. ASBOE-HANSEN, *Connective Tissues*. Trans. 5th Conf. J. Macy Found (1954), p. 23. – K. KOWALSKY, Endocrinology *62*, 493 (1958).

[4] Oranabol and Prednisolone were kindly supplied by Farmitalia, S.p.A., Milano (Italy).

Summary of microscopic features

Group		Edithelization	Corneification	Fibroblasts	Reticulum	Collagen	Capillaries	Mastzellen	PAS-Positivity	Inflammatory changes	Remarks
I	Saline, 0.25 cm^3 (16 animals)	2+	1+	2+	2+	2+	2–3+	1+	2–3+	2–3+	Wounds repaired: 3 (19%) Good evidence of inflammatory changes
II	Oranabol, 0.5 mg (10 animals)	2–3+	1+	3+	2–3+	1+	2–3+	1+	2–3+	0–1+	Wounds repaires: 5 (50%) More intense repair activity Reduction of phlogistic pattern
III	Oranabol, 1.0 mg (10 animals)	0–1+	0–1+	0–1+	1+	0–1+	1+	1+	1–2+	2+	Wound repaired: 0 Healing response very poor and limited to the marginal zone
IV	Prednisolone, 0.5 mg (10 animals)	0–1+	1+	0–1+	1+	1+	1–2+	1+	1–2+	0	Wound repaired: 0 Healing response and inflammatory changes almost absent
V	Oranabol, 0.5 mg + Prednisolone, 0.5 mg (11 animals)	2+	1+	2+	1–2+	1+	2+	1+	2+	0	Wounds repaired: 2 (18%) Good healing activity, often more marked at the marginal zone
VI	Oranabol, 1.0 mg + Prednisolone, 0.5 mg (11 animals)	2+	1+	1–2+	1–2+	1+	2+	1+	2+	0	Wounds repaired: 2 (18%) Good healing activity, often more marked at the marginal zone

0 = none; 1+ = slight; 2+ = moderate; 3+ = advanced