

synthesis or a decrease in pituitary ACTH stores. Regardless of the mechanism involved in the decrease in pituitary ACTH content, this decrease is not reflected in plasma ACTH, adrenocortical secretion, or the adrenocortical response to stress. Thus, the present findings provide further evidence that pituitary ACTH content can dramatically decrease without affecting the functional integrity of the pituitary adrenal system^{9,10}.

Zusammenfassung. Es wurde festgestellt, dass Melatonin, ein angebliches Hormon aus der Pinealis, keine spezifische Wirkung auf die Sekretion von ACTH aus dem Hypophysenvorderlappen hat.

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⁹ J. VERNIKOS-DANELIS, *Endocrinology* 72, 574 (1963).

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Hormonal Control of the Reproductive Diapause in the Grasshopper, *Oedipoda miniata*

LEVY¹ observed that in the grasshopper, *Oedipoda miniata*, a reproductive inactivity or 'adult diapause', lasting from May–October, occurs under field conditions in Israel. During this reproductive diapause, adults feed and are quite active, but neither mating nor egg-laying takes place. The effect of implanted active corpora allata on this reproductive diapause constituted the subject of the present study.

A stock of *O. miniata* was reared in the laboratory from hatching till moult to adult stage. As expected the adults obtained entered into reproductive diapause. At the age of 17–52 days after moult to adult stage, 3 groups, each composed of a male and a female batch (9–13 grasshoppers per batch), were set up. The following treatments were administered: (1) implantation of active corpora allata, (2) sham operation and (3) no operation (unoperated controls). The implanted corpora allata were obtained from sexually mature (22–34 days after moult to adult stage), male *Locusta migratoria migratorioides* donors; such glands were shown to be active when used for heterospecific implantations². Two pairs of corpora allata were implanted through the neck membrane into each *O. miniata* receptor. Sham operated controls received pieces of mandibular muscles (obtained from the same donors). The unoperated controls were simply separated from the stock. Each batch was put into a 12 l Perspex cage. After a recovery period of 3 days methodical observations on the sexual behaviour were started and egg-laying was checked daily.

Implantation of active corpora allata led to intensive egg-laying in receptor females (Table). The first egg-pod was laid on the 10th and the last on the 21st day after implantation; from the 22nd day onwards no more egg-pods were laid (in the field egg-laying period lasts over 2 months¹), although 5 females survived till the 39th day after implantation when they were killed and dissected. In 4 females resorption bodies³ were found in place of the proximal oöcytes; the next oöcyte in the ovarioles was usually small, only 0.7–1.0 mm long. In the fifth female a few full sized eggs (about 5 mm long) were found in the oviduct, but otherwise the state of the ovarioles was similar to that observed in the others. It seems that while implantation of active corpora allata led to the termination of the reproductive diapause by inducing egg-laying, the implanted glands probably became gradually inactive.

No egg-laying occurred in the control females (Table). Most of these controls were dissected between the 33rd and 40th day after treatment. No noticeable differences

were found between sham operated and unoperated females. The maximal length of the proximal oöcytes varied between 0.7 and 1.4 mm in different females, and no, or small quantities of yolk were seen in these oöcytes. These small oöcytes were frequently found in the process of resorption.

Implantations of active corpora allata led to prominent sexual behaviour in the male receptors. The intensity of sexual behaviour reached a maximum during the second and the third week of the observations, then it greatly decreased. The sexual behaviour of the receptor males was more intensive toward receptor than toward control females, but even in the latter case it was still prominent. These results indicate that implantation of active corpora allata led to the termination of the reproductive diapause by inducing intensive sexual behaviour. It seems, however, that the implanted glands became

Egg-laying in female receptors of *O. miniata* (following implantation of 2 pairs of active corpora allata obtained from sexually mature *Locusta migratoria migratorioides* males, as compared with controls

Treatment	No. of females used	No. of females surviving more than 5 days following treatment	No. of egg-pods laid
Receptors of active corpora allata	10	8 ^a	15 ^b
Sham operated controls	13	9	0
Unoperated controls	9	9	0

^a Out of these 8 females one died on the 11th day, another one on the 18th day and a third one on the 27th day after implantation.

^b All the egg-pods were laid between the 10th and the 21st day after implantation.

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gradually inactive in the receptor males (as in receptor females, see above).

Sham operated and unoperated control males exhibited very faint sexual behaviour which was even less intensive toward control than toward receptor females. The very faint sexual behaviour of the male controls may be explained by supposing that either the controls' own corpora allata are functioning at a sub-normal level during reproductive diapause, or the corpora allata do not completely control male sexual behaviour in *O. miniata* (as is the case in *L. migratoria migratorioides*⁴).

The results show that the corpora allata play a major role in the control of the reproductive diapause in *O. miniata*. This role does not seem to be a trigger mechanism; the continuous presence of the corpus allatum hormone seems to be necessary for continuous egg-laying and for continuous intensive male sexual behaviour. It is not claimed here, however, that the corpora allata are the sole or the primary organs controlling reproductive diapause; other endocrine organs, such as the brain neurosecretory cells may be also involved especially in other species⁵.

The corpora allata seem to regulate reproductive and/or adult diapause in the red locust, *Nomadacris septemfasciata*² and in the Colorado beetle, *Leptinotarsa decemlineata*⁶. Topical application of a synthetic 'juvenile hormone like substance' terminated adult diapause in the alfalfa weevil, *Hypera postica*⁷. However, termination

of reproductive diapause induced by implantation of active corpora allata is reported first time in the present paper⁸.

Résumé. La greffe de 2 paires de corpora allata provenant de criquets migrateurs mâles adultes (*Locusta migratoria migratorioides*), provoque la rupture de la diapause reproductive chez *Oedipoda miniata* adulte, la ponte chez les femelles et chez les mâles, un comportement sexuel très actif. Chez les témoins non opérés ou ayant subi une opération factice, la diapause reproductive persiste.

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14 October 1968.

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⁷ W. S. BOWERS and C. C. BLICKENSTAFF, Science 154, 1673 (1966).

⁸ The support of these investigations provided by a grant (No. 2 b/3 1967-68) from the Anti-Locust Research Centre, London, is gratefully acknowledged.

Effect of Ergocornine on the Luteal 20 α -Hydroxysteroid Dehydrogenase in Pseudopregnant and Pregnant Rats

When ergocornine is given to female rats both pregnant and pseudopregnant, the pregnancy or pseudopregnancy is interrupted and ovulation will occur within 72 h¹.

This process is assumed to involve the ovary, the pituitary and, presumably, the hypothalamus.

LINDNER and SHELESNYAK² found that ergocornine treatment in pseudopregnancy reduces progesterone (P) and increases 20 α -hydroxyprogesterone (20 α -HP) content in the ovary, leading to a P/20 α -HP ratio of 0.24-0.45 against a 1.9-3.8 ratio found in the untreated animals.

In the ovary the 20 α -HP content can be correlated to that of 20 α -hydroxysteroid dehydrogenase (20 α -HSD)³.

The presence of this enzyme in the rat ovary can be substantiated histochemically only within the corpora lutea (C.L.)⁴. It appears in the newly formed corpora lutea in the late diestrous^{5,6}. The corpora lutea of pregnancy lack this enzyme⁷.

Hence, the conclusion can be drawn that ergocornine exerts its effects on pregnancy and pseudopregnancy through the appearance of the 20 α -HSD activity in the corpus luteum.

A series of experiments have been performed with the aim of investigating this mechanism of action.

First series: Adult female rats with regular 4-5 days estrus cycle were made pseudopregnant by mating with vasectomized male rats and then divided into groups. Ergocornine was given in aqueous suspension by s.c. injections, 100 μ g daily from the first day of pseudopregnancy. The details of the treatment schedule are shown in Table I. The control animals received daily s.c. injections of the vehicle used to prepare the suspension of ergocornine: 0.4% tween 80, 0.5% carboxymethyl-cellulose, 0.9% benzyl alcohol, 0.9% NaCl, up to 100% distilled water.

Second series: Pregnant female rats were treated daily with 200 μ g of ergocornine given by s.c. injection following the schedule in Table II. At sacrifice the ovaries were removed as soon as possible, rapidly frozen with CO₂; cryostatic sections were prepared following the procedure previously described⁶. The sections were processed for the developing of the 3 β -hydroxysteroid dehydrogenase (3 β -HSD) reaction to identify the C.L. and for the 20 α -HSD reactions according to BALOGH⁴.

Results. (1) Pseudopregnancy. The results are shown in Table I. The data show that the newly formed C.L. do not display any 20 α -HSD activity, at least until the ninth day of pseudopregnancy.

After daily administration of 100 μ g of ergocornine the 20 α -HSD activity appeared within 2-3 days in all the C.L. of the treated animals.

(2) Pregnancy. The data are summarized in Table II. Ergocornine treatment can cause the onset of the 20 α -HSD activity in the pregnancy C.L. after 2-3 daily

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