

Fig. 2. Freshly dissected corpora allata from adult females of a) *S. gregaria*, and b) *P. americana*, viewed under dark-field illumination. The glands are approximately 300 μm in diameter. The tracheoles are easily visible.

system and of the aerobic respiration required to support high rates of de novo biosynthesis of juvenile hormone during periods of maximum glandular activity⁷.

Résumé. Nous avons comparé in vitro dans les corpora allata de femelles adultes de sauterelles (*Schistocerca gregaria*) et de cafards (*Periplaneta americana*) le taux de composition de la méthyl farnesoate marquée et son

époxydation due à l'hormone juvénile C_{16} . Chez les sauterelles, un surcroît d'acide farnésique stimule l'estérification et l'époxydation, tandis que chez les cafards, une accumulation de méthyl farnesoate dans les glandes et l'indice d'une saturation de l'enzyme oxygénase. Cette contenance oxydative plus basse des glandes de cafard est en rapport avec leur trachéolation peu abondante.

G. E. PRATT, S. S. TOBE and R. J. WEAVER

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Agricultural Research Council, Unit of Invertebrate Chemistry and Physiology, The University of Sussex, Falmer, Brighton (Sussex BN1 9QJ, England), 29 July 1974.

Pinealectomy Inhibits Stimulation of Testicular Development by Long Photoperiods in a Hamster (*Phodopus sungorus*)

In mammals the pineal is generally assumed to have antigonadotrophic effects, which are increased by darkness or short photoperiods, and suppressed by light or long photoperiods^{1,2}. REITER² has suggested that under long photoperiods 'all animals are effectively 'pinealectomized' since photic information is known to be inhibitory to pineal function'. Experiments in 2 species of hamsters corroborated this conjecture: in animals kept in long photoperiods, no effect of pinealectomy on testicular activity was observed, while the gonadal regression which is normally brought about by short photoperiods could be prevented by pinealectomy^{3,4}. However, these observations were made in hamsters that had been kept in long photoperiods before pinealectomy, and had large and active gonads at that time. In sexually quiescent female ferrets, on the other hand, in which long photoperiods can induce estrus already in midwinter, this premature onset of estrus was delayed by pinealectomy⁵. In view of these discrepancies, the effect of pinealectomy under long and short photoperiods was tested in males of the Djungarian hamster *Phodopus sungorus*, a species in which marked

photoperiodic reactions have been described^{4,6-8}. The experiment was started in winter when the animals were sexually quiescent.

Males were used that had been kept under natural light conditions. Between January 4th and 8th, 22 hamsters were pinealectomized (P) following the method given by HOFFMAN and REITER⁹. Nine hamsters were sham-

¹ R. J. WURTMAN, J. AXELROD and D. E. KELLY, *The Pineal* (Academic Press, New York 1968).

² R. J. REITER, *Ann. Rev. Physiol.* 35, 305 (1973).

³ R. A. HOFFMAN and R. J. REITER, *Science* 148, 1909 (1965).

⁴ K. HOFFMANN, *Naturwissenschaften* 61, 364 (1974).

⁵ J. HERBERT, in *The Pineal Gland* (Eds. G. E. W. WOLSTENHOLME and J. KNIGHT; Churchill Livingstone, London 1971), p. 303.

⁶ K. HOFFMANN, *Naturwissenschaften* 59, 218 (1972).

⁷ J. FIGALA, K. HOFFMAN and G. GOLDAU, *Oecologia, Berlin* 12, 89 (1973).

⁸ K. HOFFMANN, *J. comp. Physiol.* 85, 267 (1973).

⁹ R. A. HOFFMANN and R. J. REITER, *Anat. Rev.* 153, 19 (1965).

operated (S), i.e. the skull was opened as in actual pinealectomy, and the confluence of the superior sagittal and transverse sinuses was opened which caused as much bleeding as in actual pinealectomy. 19 controls (C) were left intact. All animals had involuted testes at the beginning of the experiment, as ascertained by palpation, a method that has been shown to be reliable⁸. In 16 comparable hamsters, killed between January 8th and 12th, weight of both testes was 79.8 ± 2.1 mg ($M \pm S.E.$) and weight of accessory glands was 19.9 ± 9.3 mg. On January 8th the animals were placed in light-tight chambers. 9 pinealectomized hamsters, the 9 sham-operated hamsters, and 10 of the untreated controls were exposed to long photoperiods (16 h light/24 h), while 13 pinealectomized hamsters and 9 untreated controls received short photoperiods (8 h light/24 h). After 36 days

in these conditions, all hamsters were sacrificed and the weight of testes and accessory glands was determined.

There was development of testes and accessory glands in all groups, even in the untreated hamsters exposed to short photoperiods. This confirms earlier findings from which it had been concluded that the transition from physiological winter conditions with quiescent gonads to summer conditions with gonadal activity, is based on an endogenous mechanism, and can take place even in short photoperiods while long photoperiods accelerate the process⁶⁻⁸.

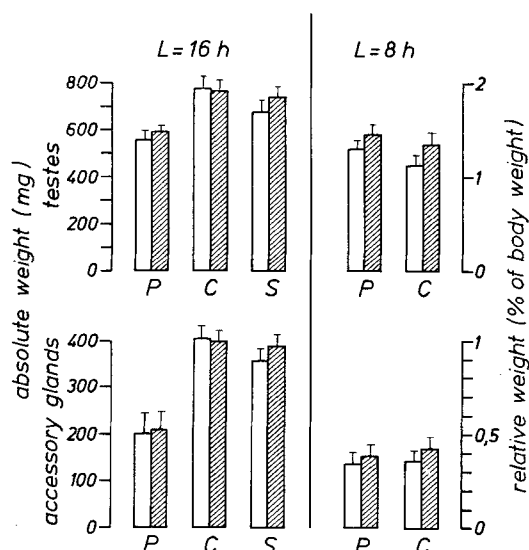
The development of testes and accessory glands was significantly higher in control and sham-operated hamsters kept in long photoperiods than in all other groups (Figure). Contrary to expectation, pinealectomy inhibited the acceleration of gonadal development due to long photoperiods, rather than stimulated gonadal development in short photoperiods: under both light regimes the pinealectomized hamsters did not differ significantly from the short-day controls.

These findings contradict the assumption that light has only an inhibiting effect on the pineal, and suggest that the pineal is not only involved in testicular involution brought about by short photoperiods, but also participates in the mediation of the accelerating effect of long photoperiods on gonadal development. The fact that comparable results were obtained in 2 species as unrelated as the weasel⁵, a mustelid, and the Djungarian hamster, a rodent, indicate that participation of the pineal in the mediation of stimulating effects by long photoperiods is a more general phenomenon, and not based on special physiological properties of a single group. The results also show that in experiments on the function of the pineal, not only the photoperiod in which the animals are kept, but also the phase of their annual cycle has to be taken into consideration, at least in seasonal breeders.

Zusammenfassung. Beim Hamster *Phodopus sungorus* verhinderte Pinealektomie die durch lange Photoperioden bewirkte Beschleunigung der Entwicklung von Hoden und Anhangsdrüsen. Die Befunde zeigen, dass die Epiphyse nicht ausschliesslich antigonadotroph wirkt, sondern auch an der progonadotrophen Wirkung langer Photoperioden beteiligt ist.

K. HOFFMANN and I. KÜDERLING

Max-Planck-Institut für Verhaltensphysiologie,
D-8131 Erling Andechs (German Federal Republic,
BRD), 20 September 1974.



Weight of both testes (above) and of accessory glands (below) from hamsters after 36 days in long ($L = 16$ h) or short ($L = 8$ h) photoperiods. P, pinealectomized; C, untreated controls; S, shamoperated. Open bars, absolute weight; hatched bars, relative weight; means and standard errors are given. Statistics (U-test). Testes: Absolute and relative weight of testes in group C and S in $L = 16$ h significantly higher than in all other groups ($p < 0.05$ to < 0.002) except for difference in absolute weight between P and S in $L = 16$ h ($p < 0.1$); differences between other groups not significant. Accessory glands: Absolute and relative weight of group C and S in $L = 16$ h significantly higher than in any other group ($p < 0.01$ to < 0.002), differences between other groups not significant.

Elevation of Rat Plasma Insulin by Intrathecal Pentobarbital

A controversy exists concerning the genesis of the hyperinsulinemia that accompanies the hyperphagia and obesity of rats with chronic lesions of the ventromedial hypothalamus. Some authors^{1,2} have maintained that the hyperinsulinemia is secondary to the onset of hyperphagia, whereas others³⁻⁷ have suggested that the hyperinsulinemia is a primary effect of the ventromedial lesion and therefore independent of hyperphagia. In the present experiment, the recently developed technique of intrathecal administration of anesthetic was applied to examine the functions of the hypothalamus. The technique has been reported to produce a reversible lesion of the ventromedial hypothalamus⁸⁻¹⁵, an area which constitutes the walls of the ventral portion of the third ventricle of the

brain and which is thus in contact with the cerebrospinal fluid. We observed a rapid and significant increase of plasma immunoreactive insulin (IRI) after the intrathecal administration of sodium pentobarbital that preceded eating by the rats and which therefore could not have resulted from it.

Materials and methods. Subjects were 10 female albino rats maintained on ad libitum food and water. They were each cannulated with a 4.5 mm 27 gauge needle stereotactically implanted into the left lateral ventricle and cemented to the skull¹⁶. The coordinates were: With the nose bar 5 mm above the interaural line, 1.2 mm posterior to bregma and 1.5 mm lateral to the mid-sagittal suture. After a 7-day recovery period, all rats underwent the