

mice responses were done using a t-test (Student's distribution) of mean differences.

As indicated in the table genetically obese mice (*ob/ob*) demonstrated a very significantly higher pituitary MSH activity than their lean littermates (*ob/+* or *+/+*). This is in agreement with Beevor et al. who demonstrated elevated α -MSH and CLIP levels in obese mice using radioimmunoassay. Since the frog skin bioassay could be described as measuring total biologically active MSH's as well as any melanophore-stimulating activity exhibited by ACTH it would be very interesting to know the pituitary MSH activity after neutralization with an anti-ACTH antibody which does not cross react with MSH. Using the results obtained by Edwardson and Hough³ who measured pituitary ACTH of obese mice one can calculate the approximate portion of frog skin darkening produced by the intrinsic ACTH. Kastin et al.⁸ propose that 1 milliunit of ACTH exerts an MSH activity of approximately 1 unit. Thus, the results demonstrated in this paper would be decreased by 2% for the lean controls and 0.6% for the obese mice if the frog skin darkening ability of ACTH were subtracted from the total.

The results lend further support to the concept that these

pituitary polypeptides, namely ACTH, β -endorphin, CLIP, and the MSH's share a common precursor molecule^{9,10}. It would appear that there is increased synthesis of this entire complex of pituitary polypeptides in the genetically obese mouse and that the MSH portion of this complex demonstrates full biological activity.

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Effects of surgical sympathectomy on catecholamine concentrations in the posterior pituitary of the rat¹

R.H. Alper, K.T. Demarest and K.E. Moore

Department of Pharmacology and Toxicology, Michigan State University, East Lansing (Michigan 48824, USA), 23 April 1979

Summary. Approximately one-third of the norepinephrine in the posterior pituitary of the rat is contained in terminals of sympathetic nerves which originate in the superior cervical ganglia; the remaining norepinephrine and dopamine appear to be in nerves of central origin.

Catecholamine-containing axon terminals have been demonstrated histochemically in the posterior pituitary of the rat and other mammalian species²⁻⁶. Dopamine (DA)-containing nerves terminating in this region appear to originate primarily in the arcuate nucleus of the hypothalamus; they constitute the tuberohypophyseal DA system⁷. There is controversy concerning the origin of norepinephrine (NE)-containing nerves in the posterior pituitary, but there have been suggestions that they are either of central origin⁶ or that they represent sympathetic NE fibres originating in the superior cervical ganglia⁵. The differentiation of NE and DA nerves using histofluorescent techniques can be difficult, but recently developed radioenzymatic assays have made it possible to quantify the catecholamines in the posterior pituitary^{8,9}. The present report describes the effects of bilateral superior cervical ganglionectomy (SCGX) on the NE and DA contents of several brain regions, including the posterior pituitary.

Methods. Male Sprague-Dawley rats (Spartan Research Animals, Inc., Haslett, MI) weighing 225–275 g were

housed 3/cage in an animal room maintained at $24 \pm 1^\circ\text{C}$, with automatic light from 07.00 to 21.00 h each day. Superior cervical ganglia were removed bilaterally under Equithesin anesthesia; in sham-control animals the ganglia were isolated, but not removed.

Animals were decapitated between 08.00 and 11.00 h 7 days after surgery. The median eminence was dissected from the hypothalamus as described previously¹⁰. The pituitary gland was removed from the sella turcica and, while being viewed under a dissecting microscope, the posterior pituitary (neurointermediate lobe) was teased away from the anterior pituitary. The median eminence, posterior pituitary and pineal gland were homogenized in 30 μl 0.2 N perchloric acid containing 10 mg% EGTA. The corpus striatum was dissected and homogenized in 50 vol. of the same 0.2 N perchloric acid solution. Homogenates were centrifuged in a Beckman Microfuge and DA and NE were analyzed in 10 μl aliquots of the supernatant using a modification of previously described radioenzymatic assays^{11,12}. The protein content of the pellets was deter-

Effect of superior cervical ganglionectomy on catecholamine concentrations in various brain regions

Treatment	No. of Animals	Dopamine (ng/mg protein)		Striatum	Norepinephrine (ng/mg protein)		Pineal
		Median eminence	Posterior pituitary		Median eminence	Posterior pituitary	
Sham-controls	15	112.3 \pm 7.4	6.3 \pm 0.3	100.9 \pm 3.5	52.7 \pm 4.4	2.7 \pm 0.3	3.8 \pm 0.4
Ganglionectomized	10	111.9 \pm 9.0	6.8 \pm 0.3	94.8 \pm 3.8	41.4 \pm 5.1	1.7 \pm 0.3*	<0.5**

Values represent means \pm 1 SE. Animals were operated 7 days prior to sacrifice. *Significantly different ($p < 0.01$) from sham-controls.

**The minimal concentration of NE that could be measured in a single pineal gland.

mined by the method of Lowry et al.¹³. Data were initially evaluated by a 1-way analysis of variance and differences between means were determined using the Student-Newman-Keuls' test¹⁴.

Results and discussion. NE and DA concentrations in various brain regions of rats subjected to SCGX or a sham operation are summarized in the table. Control values for NE and DA contents of the posterior pituitary are in agreement with those reported earlier by Saavedra et al.⁸ but are substantially lower than those reported by Holzbauer et al.⁹. SCGX did not alter the dopamine concentration in any of the brain regions analyzed. The NE content of the median eminence was slightly, but not significantly, reduced by SCGX. On the other hand, the NE concentration was significantly reduced in the posterior pituitary and completely depleted from the pineal gland. These results suggest that NE in the pineal gland is contained exclusively in sympathetic nerves which originate in the superior cervical ganglia, while approximately, one-third of the NE in the posterior pituitary is contained in terminals of these peripheral nerves.

Histochemical fluorescent studies have revealed a rich network of fine fluorescent varicose catecholaminergic nerve fibres distributed throughout the neurointermediate lobe of the rat⁴. In addition, fibres of coarser varicosities are located around the larger blood vessels in the neural lobe. Some of these coarser fibres disappear while the network of fine fluorescent fibres is unaltered by bilateral SCGX. The results of the present investigation suggest that the coarser fluorescent fibres contain NE since only this amine declines following sympathectomy. Björklund et al.⁴ originally proposed that both NE and DA nerve fibres in the posterior pituitary were of central origin, while only a

few fibres in this tissue were of sympathetic origin. In a subsequent report⁵, however, it was stated that 'noradrenergic innervation of the neurointermediate lobe is probably exclusively of peripheral sympathetic origin'. The results summarized in the table are consistent with the original proposal and suggest that the posterior pituitary contains both NE and DA nerves of central origin, with DA nerves predominating.

- 1 This study was supported by USPHS grant NS09174. R.H. Alper is a predoctoral student supported by USPHS Training grant GM07392. K.T. Demarest is supported by NIH Fellowship NS06026.
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Precocene-induced metamorphosis in the desert locust *Schistocerca gregaria*¹

G.C. Unnithan, K.K. Nair² and A. Syed³

Department of Biological Sciences, Simon Fraser University, Burnaby (British Columbia, Canada V5A 1S6), 23 March 1979

Summary. 50–100% of the 2nd, 3rd and 4th instar nymphs of *Schistocerca gregaria* exposed to precocene 2 by contact method metamorphosed precociously from the instar treated. The corpora allata of the precocious adults were degenerate. Topical application of a juvenile hormone analogue (ZR-512) induced in the precocious adults the colouration characteristic of sexually mature adults.

Precocene 2 extracted from the plant *Ageratum houstonianum* induced precocious metamorphosis in the milkweed bug *Oncopeltus fasciatus*^{4,5}. Further studies showed that in *O. fasciatus* precocene inhibited the growth of the corpus allatum (CA)⁶ and induced extreme degeneration of the parenchyma cells of the CA^{7,8}. Recently Schooneveld⁹ observed similar effects in the CA of precocene-treated 4th instar nymphs of *Locusta migratoria migratorioides*. Although topical application of precocene 2 induced precocious metamorphosis in *L. migratoria*^{10,11}, this method of precocene application was ineffective in inducing precocious metamorphosis in the desert locust, *Schistocerca gregaria*. On the contrary when we exposed *S. gregaria* nymphs to precocene by contact method⁵ inside Petri dishes coated with precocene a high proportion of the treated nymphs metamorphosed precociously. The results are presented in this paper.

Materials and methods. Precocene 2(6,7-dimethoxy-2,2-dimethyl chromene) was obtained from Zoecon Corpora-

tion, Palo Alto, Ca. and Aldrich Chemical Co., Milwaukee, Wisc. Various concentrations of it were made in spectrograde acetone. Groups of 6–10 newly-moulted 2nd, 3rd and 4th instar nymphs were exposed to concentrations of precocene residue (10–25 µg/cm²) for 24 h in Petri dishes (15×2 cm) at 35 °C (table). The control insects were also kept for 24 h at 35 °C in Petri dishes which were previously treated with acetone only. After treatment the control and precocene-treated insects were transferred to rearing cages and fed regularly on wheat bran and fresh wheat blades and maintained at 35 °C, 16 h photophase and 20–30% relative humidity. For light microscopy CA of 1-day-old normal female adults and of precocious adults from precocene-treated 4th instar nymphs were fixed in paraformaldehyde-glutaraldehyde mixture and embedded in Spurr low viscosity medium⁷. Semithin sections were examined after staining in toluidine blue.

In another series of experiments 1-month-old female and male precocious adults from precocene-treated 3rd instar nymphs were treated topically on the abdomen with 2 doses