acid with high absorption at 2350 A.U. persisted through the third day. The skin received almost none of this material for 2 days, but on the third day large amounts of the changed acid were deposited (Fig. 1, curve 3). The brain showed a small but appreciable response to tung oil feeding. The order of the curves is the same as for blood, which suggest that the immediate blood supply may control the results; but the amount of blood present can not account for all of the absorptive acid, as the brain lipids were several times the total blood lipids.

Conclusions. Eleostearic acid is quickly changed to a new acid *in vivo*. Distribution and metabolism of this acid has been followed by spectroscopic analysis and large differences found among several tissues.

9375 P

Reaction of the Supraoptic Nucleus to Hypophysectomy.*

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The origin and significance of the hypothalamico-hypophyseal neural system are still controversial. Keller, Noble and Hamilton[1] and Mahoney and Sheehan,[2] who interrupted these fibers in the infundibulum, rather minimize their rôle. On the other hand, Ranson and co-workers seem to have established a very close connection between lesions in this system and at least diabetes insipidus.

The origin is generally regarded as being the paired supraoptic nuclei, 2 more dorsally situated paraventricular (filiform) nuclei and some less definitely localized cells in the tuber cinereum. In the dog retrograde degeneration of the supraoptic nuclei 10-16 days after destructive lesions in the processus infundibuli and infundibulum was noted by Kary,[3] Lewy,[3] Maiman[3] and Broers.[4] Hare[5] re-

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1 Keller, A. D., Noble, W., and Hamilton, J. W., Jr., *Am. J. Physiol.*, 1936, **117**, 467; PROC. SOC. EXP. BIOL. AND MED., 1936, **34**, 794; Keller and Noble, *Proc. Am. Physiol. Soc.*, 1936, **48**, 90.

2 Mahoney, W., and Sheehan, D., *Brain*, 1936, **59**, 61.

3 Kary, K., *Virchows Arch. f. path. Anat. u. Physiol.*, 1924, **252**, 734; Lewy, F. H., *Zentralb. f. d. ges. Neurol. u. Psych.*, 1934, **37**, 398; Maiman, R. M., *Z. f. d. ges. Neur. u. Psych.*, 1930, **129**, 666.

4 Broers, H., *Diss. Inaug. Kemink en Zoon*, Utrecht, 1932.

5 Hare, H., *Proc. Am. Physiol. Soc.*, 1937, **49**, 70.

ports a loss of more than half of these cells in hypophysectomized dogs. In the cat, Fisher, Ingram, Hare and Ranson[6] further showed that unilateral destruction of the neural lobe of the hypophysis or electrolitic interruption of the nerve fibers before entering the infundibulum causes atrophy of the homolateral supraoptic nucleus. They produced retrograde degeneration also in monkeys.[7] Changes in other nuclei apparently have not been clearly demonstrated. An increase in neuroglia cells has been mentioned.

Mahoney and Sheehan,[2] as a result of placing silver clips on the infundibulum of dogs and monkeys, could see no definite evidence of retrograde degeneration. In the chimpanzee, Mahoney[8] found no hypothalamic change of note 17 days after hypophysectomy. Mahoney and Sheehan found cells with pale centers and peripheral clumping of Nissl granules (features repeatedly taken as evidence of degeneration) in normal supraoptic and paraventricular nuclei. Malone[9] showed this many years ago in colored plates of these nuclei in man, monkey, lemur and cat. Greving[10] presents the same features by means of photomicrographs. We can confirm this as being normal histology in man, monkey, dog, cat, and rat. The nucleus is frequently very eccentric in the larger cells.

In the light of the above we have studied the hypothalamic nuclei following hypophysectomy in 29 albino rats. Twenty-one of these were operated on when 21 days of age (40-56 gm.) and 8 when mature (180-260 gm.). Suction through the pharyngeal route, without damage to the brain, was the method used. The animals were sacrificed from one week to 6 months later. Various amounts of anterior lobe tissue happened to be retained in some cases so that various degrees of stunting occurred.

By 10 days a very definite loss of cells in the supraoptic nucleus is apparent. By 6 months only 1/5 of the cells may be left in rats operated upon at weaning age. Many of the cells remaining are normal in appearance. Occasionally an enlarged cell is encountered and others are hyperchromatic and atrophic with pycnotic nuclei. No reaction is apparent on the part of the neuroglia. In the older group the cell loss is even greater. About 90% may disappear in

6 Fisher, C., Ingram, W. R., and Ranson, S. W., *Arch. Neur. and Psych.*, 1935, **34**, 124; Fisher, Ingram, Hare and Ranson, *Anat. Rec.*, 1935, **63**, 29; Ingram and Fisher, *Anat. Rec.*, 1936, **66**, 271.

7 Ingram, W. R., Fisher, C., and Ranson, S. W., *Arch. Int. Med.*, 1936, **57**, 1067.

8 Mahoney, W., *Proc. Am. Physiol. Soc.*, 1936, **48**, 105.

9 Malone, F. F., *Johns Hopkins Hosp. Reports*, 1914, Monographs, N.S. No. 4.

10 Greving, R., *Handbuch der Mikroskopischen Anatomie* (v. Möllendorff), 1928, **4**, 917.

149 days. The cells remaining are either associated with the infundibular stump still attached to the brain and the median eminence of the tuber cinereum or are part of non-hypophyseal circuits. Retrograde degeneration in the supraoptic nucleus of the rat is sufficiently extensive to leave no doubt about this nucleus being primarily concerned with the neural lobe of the hypophysis. There are indications that the ventrolateral or magnocellular portion of the paraventricular nucleus also reacts to hypophysectomy by a loss of cells, but to a lesser extent. More extensive studies along this line are being carried on by Dr. L. S. Meriwether. The technical skill of Mr. Dwight Ingle, who performed the operations is gratefully acknowledged.

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Augmentation of Gonad Stimulating Hormone of the Hypophysis by Copper

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In a recent report[1] it was shown that zinc sulphate in combination with antuitrin S augmented the weights of the ovaries of immature rats above that obtained with antuitrin S alone. In contrast to this, zinc sulphate had no augmentative effect when given in combination with pituitary implants. Copper, on the other hand, seems to differ from zinc in certain of these ovarian augmentative reactions. Fevold, *et al.*,[2] obtained ovulation in rabbits by intravenous injections of copper salts but failed to do so with zinc. In these rabbits the copper may have altered the response of the gonad stimulating hormones present in the blood. It, therefore, seems likely that a similar mechanism might be induced in immature rats by combinations of copper salts and pituitary implants. The data on this point are described in the present study.

The recipients were albino rats of approximately 38 gm. body weight. All donors were normal adult male rats. The pituitary implants were made in the abdominal cavity under ether anesthesia. Copper sulphate was given intraperitoneally once or twice daily in doses up to one-third of a milligram at a time in one cubic centi-

[1] Emery, F. E., *Am. J. Physiol.*, 1937, **118**, 316.

[2] Fevold *et al.*, *ibid.*, 1936, **117**, 68.