

As may be noted from Table I, the reduction of saliva greatly increases the incidence of rat caries. This is in accord with a previous demonstration by us.<sup>8</sup> Normal animals on the caries-producing diet average 9.1 cuspal involvements and 3.5 carious teeth per animal; those with salivary glands extirpated average 40.0 cuspal involvements and 10.5 carious teeth per animal; and desalivated rats receiving 3 mg of fluorine per day average 6.0 cuspal involvements and 2.3 carious teeth per animal. In all the rats the lower teeth were more involved than the upper. Since the average number of carious teeth in the last group is lower than normal it seems that the beneficial effect of fluorine is more potent than that of the saliva acting independently. Likewise, a reduction of 80 to 85% of these carious afflictions in these desalivated rats receiving fluorine (Group III, Table I), shows that the fluorine has a caries-inhibiting effect even when oral secretions are at a minimum. The relative frequency of occurrence of fractures and advanced cavities in the control and fluorine groups suggests that while the fluorine does not prevent the initial fracture of the teeth it does prevent the subsequent progressive destruction. These findings indicate that the fluorine has a direct and persistent action on the tooth or in the region where food and bacteria come in contact with the tooth surface and in this way retards the progress of decay.

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#### Degeneration of the Infundibular Nerve Fibers Without Precipitating Diabetes Insipidus.\*†

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In a previous report<sup>1</sup> we demonstrated that the denervation theory can not hold rigidly in explaining the causation of d. i. providing the elaboration of the antidiuretic principle is confined solely to hypophysical tissue. Our experiment does not invalidate the denervation theory if hypothalamic tissue possess antidiuretic secretory powers.

<sup>8</sup> Cheyne, V. D., *PROC. SOC. EXP. BIOL. AND MED.*, 1939, **42**, 587.

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† Pars nervosa is used as synonymous to Wislocki's<sup>7</sup> usage of neurohypophysis.

<sup>1</sup> Keller, A. D., and Hamilton, J. W., *Arch. Surg.*, 1938, **37**, 760.

Sato<sup>2</sup> and Trendelenburg<sup>3</sup> suggested that the hypothalamus does possess latent antidiuretic secretory powers. This appeared less remote after Geiling's<sup>4</sup> strong evidence pointing to the pars nervosa as elaborating the antidiuretic principle. Scharrer<sup>5</sup> has postulated a secretory function for the cells of the supra-optic and paraventricular nuclei and Finley's<sup>6</sup> work could well support such an interpretation. Wislocki<sup>7</sup> and particularly Gersh,<sup>8</sup> on the basis of indirect anatomical evidence, would limit the antidiuretic secretory powers solely to the pars nervosa.

With a view of attempting to gain further insight into the aforementioned problem the following experiment was executed in 8 cats. The ventral portion of the hypothalamus, particularly that portion adjacent and posterior to the optic chiasm, was first isolated from the rest of the hypothalamic tissue and then removed with forceps. This insured complete separation of the hypophysis from the hypothalamus with more encroachment upon the hypothalamus than in our previous experiment<sup>1</sup> and also eliminated the possibility of leaving infundibular nerve fibers taking origin from cells located in the hypothalamic tissue immediately adjacent to the hypophysial stalk.

The cats were maintained on a daily food intake of 100 cc undiluted evaporated milk and 50 g of Baloration. Water was available for 22 hours of each 24. Five of the cats were sacrificed from 2 to 8 months after operation, the remaining 3 are still under observation. The water exchange showed no deviation from the normal in 7 of the 8 cats, while one exhibited a mild increase. The water exchange exhibited no noteworthy increase during thyroid and salt feeding.

Histological studies showed that infringement upon the tissue of the pars nervosa (central sloughing with enlargement of the infundibular cavity) was greater than in our former experiments.<sup>1</sup> In instances there was essentially no tissue of the pars nervosa remaining, certainly there was little likelihood that the fragments which remained contained functional secretory cells. In instances there was no drastic disappearance of the cells of the supra-optic nuclei. This was appreciated in our original series but was not reported, except privately, because the question was raised as to whether our termination dates allowed sufficient time for retrograde degeneration to occur.

<sup>2</sup> Sato, G., *Arch. Exp. Path. Pharm.*, 1928, **131**, 45.

<sup>3</sup> Trendelenburg, P., *Klin. Wschr.*, 1928, **131**, 45.

<sup>4</sup> Geiling, E. M. K., *Bull. Johns Hopkins Hosp.*, 1935, **57**, 123.

<sup>5</sup> Scharrer, E., *Z. f. d. ges. neurol. u. psychiat.*, 1933, **145**, 462.

<sup>6</sup> Finley, K. H., *A. R. N. M. D.*, 1938, **18**, 94.

<sup>7</sup> Wislocki, G. B., and King, L. S., *Am. J. Anat.*, 1936, **58**, 421.

<sup>8</sup> Gersh, I., *Am. J. Anat.*, 1939, **64**, 407.

These cells frequently degenerate following operative procedures in the region of the hypophysial stalk. Indeed it is difficult to section the stalk through its proximal extent without degeneration of these nuclei. The fact that these cells do not always degenerate following section of the infundibular nerve fibers does not question that their axis cylinders contribute to the "infundibular nerve trunk." It does demonstrate that factors other than mere section of the axis cylinders are responsible for their disappearance.‡

In view of Sato's and Scharrer's work could it be possible that the cells of the supra-optic nuclei, or other hypothalamic tissue, elaborate sufficient antidiuretic substance to maintain a normal fluid exchange in the absence of the tissue of the pars nervosa and ventral hypothalamus? We have found that separating the hypophysis and the hypothalamus at the junction of the two frequently results in d. i. in the cat and usually in the dog. It is true that these experiments, as well as in the series of partial and total hypophysectomies,<sup>9</sup> there has been a rough correlation between the appearance of d. i. and the degeneration of the supra-optic nuclei. Whether or not this association is merely coincidental is as yet problematic.

*Conclusions and Comments.* The tissue of the pars nervosa in its entirety plus that of the ventral extent of the hypothalamus is not essential for the maintenance of a normal fluid exchange in the cat. Therefore, unless a tissue of the adenohypophysis secretes the antidiuretic principle, tissue elsewhere (hypothalamus) must possess this power. This conclusion is predicated on the assumptions, first, that these experiments were not complicated by as yet unrecognized factors, and, second, that a continuous elaboration of the antidiuretic substance is invariably essential for the maintenance of a normal fluid exchange.

If the adenohypophysis is concerned the pars tuberalis as well as the pars intermedia possess antidiuretic secretory powers since: (1) total hypophysectomy except for remnant of tuberalis,<sup>9</sup> and (2) removal of the entire tuberalis and most of the pars anterior, leaving the isolated posterior lobe, can be accomplished without precipitating d. i.

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‡ Such factors might be (1) devitalization of cells distal to the tissue defect when electrolytic lesions are made, (2) pulling upon the cell bodies by tension exerted through the axis cylinders during stalk sectioning procedures, and (3) vascular disturbances sufficient to cause death of the nerve cells without regional gliosis and demyelination.

<sup>9</sup> (a) Keller, A. D., *PROC. SOC. EXP. BIOL. AND MED.*, 1938, **38**, 31; (b) Keller, A. D., *Am. J. Physiol.*, 1938, **123**, 116; (c) Keller, A. D., *PROC. SOC. EXP. BIOL. AND MED.*, 1938, **39**, 555.