This indicates that less than 50 mg substantia nigra contain enough substance *P* to produce quite a pronounced increase in capillary permeability.

It is possible, therefore, that substance *P* enables those parts of the brain which are rich in it to have particularly high rates of exchange, either potential or permanent, between the capillaries and the surrounding tissue.

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[1] Franz, I., Boissonnas, R. A., and Stürmer, E., *Helv. Chim. Acta*, **44**, 881 (1961).
[2] Jaques, R., *Arch. Exp. Path. Pharmakol.*, **245**, 276 (1963).
[3] Lembeck, F., and Zetler, G., *Intern. Rev. Neurobiol.*, **4**, 159 (1962).
[4] Frimmer, M., and Müller, F. W., *Med. Exp.*, **6**, 327 (1962).

Reduction by Chlorpromazine of Pylorus-ligation Ulcers in the Rat

RECENT research indicates that chlorpromazine is an effective inhibitor of gastric secretion[1–3] and reduces starvation ulcers in mice[4]. This investigation was undertaken to determine quantitatively the extent of ulceration in the fore-stomach and glandular stomach of the pylorus-ligated rat after treatment with chlorpromazine.

Twenty-eight adult, male and female albino rats (Holtzman strain) were involved in the investigation. Each rat was separately caged and water was accessible *ad libitum* to all rats for a 24-h pre-operative fasting period. The Shay rat procedure[5] of duodenal ligation was performed under ether anæsthesia. Three subcutaneous injections (inguinal region) were given post-operatively at 8-h intervals to all rats. Treatments consisted of the following injections: 5·0 mg chlorpromazine/kg bodyweight (Thorazine, Smith, Kline, and French Lab., about 0·06 c.c.); 2·5 mg chlorpromazine/kg (approx. 0·03 c.c.); or 0·06 c.c. water (control animals). The number of rats per treatment is indicated in Table 1. Drinking water was removed subsequent to the surgical procedures. Twenty-four h after pyloric ligation the stomachs were removed, opened along the lesser curvature, and both the fore-stomach and glandular region of each stomach were evaluated for gastric pathology by the ulcer index developed by Pfeiffer and Gass[6], which has a minimum rating of 1 (normal stomach) and a maximum rating of 15 (highly ulcerated stomach).

Table 1. ULCER REDUCTION BY CHLORPROMAZINE IN THE PYLORUS-LIGATED RAT

Treatment*	No. of animals	Mean weight at surgery (g)	Mean ulcer index ± *S.E.* (fore-stomach)	Mean ulcer index ± *S.E.* (glandular region)
Water (control) 0·06 c.c.	10 (5 ♂, 5 ♀)	337	10·8 ± 1·5	7·2 ± 0·2
Chlorpromazine 2·5 mg/kg 0·03 c.c.	8 (6 ♂, 2 ♀)	362	4·2 ± 2·0	3·2 ± 1·0
Chlorpromazine 5·0 mg/kg 0·06 c.c.	10 (4 ♂, 6 ♀)	336	2·9 ± 1·4	2·9 ± 1·0

* All injections subcutaneous (inguinal region) t.i.d. at 8-h intervals for 24 h.

The results of the investigation are illustrated in Table 1. The mean fore-stomach ulcer index was higher than the mean glandular stomach ulcer index except in the 5·0 mg/kg group where the indices were equal. Greater ulceration of the fore-stomach of pylorus-ligated rats is a phenomenon commonly reported by earlier investigators[5]. Ulceration of both regions of the stomach was graded from severe ulceration in the control group to greatly minimized ulceration in the 5·0 mg/kg group. The protective action of the higher dose of chlorpromazine was only slightly greater than that of the lower dose.

It can be concluded that chlorpromazine minimizes ulceration in the Shay rat. This reduction of ulceration is similar to the protective action afforded by bilateral vagotomy in the pylorus-ligated rat[7]. The present investigation quantitatively confirms past findings that chlorpromazine reduces ulcers in the Shay rat[8,9], supposedly by inhibition of gastric secretion[1–3]. By means of an ulcer index, the protective effect of chlorpromazine on both the fore-stomach and the glandular stomach has been evaluated.

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[1] Sun, D. C. H., and Shay, H., *Amer. J. Physiol.*, **187**, 635 (1956).
[2] Sun, D. C. H., and Shay, H., *Gastroenterol.*, **36**, 245 (1959).
[3] Sun, D. C. H., and Shay, H., *J. Pharmacol. and Exp. Therap.*, **126**, 155 (1959).
[4] Pfeiffer, C. J., Gass, G. H., and Schwartz, C. S., *Nature*, **197**, 1014 (1963).
[5] Shay, H., Komarov, S. A., Fels, S. S., Meranze, D., Gruenstein, M., and Siplet, H., *Gastroenterol.*, **5**, 43 (1945).
[6] Pfeiffer, C. J., and Gass, G. H., *Canad. J. Biochem. and Physiol.*, **40**, 1473 (1962).
[7] Shay, H., Komarov, S. A., and Gruenstein, M., *Arch. Surg.*, **59**, 210 (1949).
[8] Bornmann, G., *Arzneimittel-Forsch.*, **11**, 89 (1961).
[9] Aron, E., Nezelof, C., and Guesle, J., *Arch. Mal. App. Digest.*, **43**, 496 (1954).

ANATOMY

Centrifugal Fibres in the Lateral Olfactory Tract

FOR the interpretation of results of electrophysiological studies of the responses in the olfactory bulb to stimulation of the lateral olfactory tract it is a matter of some importance to know whether this tract consists solely of efferent fibres from the bulb or whether it also contains centrifugal fibres to the bulb[1–3]. Such centrifugal fibres were described by Cajal[4], who, although uncertain of their origin, clearly distinguished them from those in the anterior commissure (which, coming from the opposite olfactory bulb, should be considered as commissural). The commissural fibres have been demonstrated experimentally by several workers; but with one exception[5] the presence of centrifugal fibres in the lateral olfactory tract has been either denied or overlooked. However, as all reports agree that after interruption of both the anterior limb of the anterior commissure and the lateral olfactory tract the degeneration is heavier in the ipsilateral than in the contralateral olfactory bulb[5–7], it is clear that a proportion of the fibres to the bulb must be arising in the ipsilateral hemisphere, but it is not known to what extent these run in the lateral olfactory tract or in the anterior commissure. In order to determine if centrifugal fibres run in the lateral olfactory tract it is necessary to place lesions which are strictly limited to the tract.

Following such lesions in the rat heavy fibre degeneration has been found, in Nauta preparations, passing forwards in and along the deep aspect of the tract to the ipsilateral olfactory bulb. In the main bulb severe fibre fragmentation is seen in the periventricular and granule cell layers; but in addition a considerable number of degenerating fibres pass beyond the mitral cell layer to the external plexiform layer, many reaching as far as the glomeruli. Although no degeneration is seen within the glomeruli themselves, the terminal degeneration on the