

upon the gill cells, and (2) only when the brownish color of the methemoglobin remains after mixing with cyanide is the inhibition removed; when an excess of the cyanide converts all the pigment to the bright red cyanmethemoglobin, inhibition remains.

Under the conditions of these experiments, therefore, it appears that methylene blue antagonizes cyanide inhibition by substituting for the cyanide poisoned respiratory enzyme; methemoglobin by chemically removing the active cyanide and freeing the poisoned enzyme. In the intact vertebrate, methylene blue may well act indirectly via the formation of methemoglobin.

7207 C

Electrical Stimulation of the Hypothalamus.

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Evidence has been presented that stimulation of the hypothalamus causes pupillary dilatation,^{1, 2} increase in blood pressure,^{3, 4} cardiac arrhythmia and ventricular extrasystoles,⁴ and contraction of the bladder.⁵ The suggestion has been made that the parasympathetic and sympathetic divisions of the autonomic system are separately represented in the hypothalamus.^{6, 7} We have shown that the mechanism yielding pupillary dilatation is not sharply localized at one point but is widespread throughout the hypothalamus and that the most marked reactions are obtained from the lateral part in the region occupied by the medial forebrain bundle.²

¹ Karplus, J. P., and Kreidl, A., *Pflüger's Arch. f. d. ges. Physiol.*, 1928, **219**, 613.

² Ranson, S. W., and Magoun, H. W., *Arch. Neurol. and Psychiat.*, 1933, **29**, 1179.

³ Karplus, J. P., and Kreidl, A., *Pflüger's Arch. f. d. ges. Physiol.*, 1927, **215**, 667.

⁴ Beattie, J., Brow, G. R., and Long, C. N. H., *The Vegetative Nervous System*, Vol. XI. Association for Research in Nervous and Mental Disease. Williams and Wilkins, Baltimore, Md. 1930.

⁵ Karplus, J. P., and Kreidl, A., *Pflüger's Arch. f. d. ges. Physiol.*, 1909, **129**, 138.

⁶ Cushing, H., *Papers Relating to the Pituitary Body, Hypothalamus and Parasympathetic System*. Thomas, Baltimore, Md. 1932.

⁷ Beattie, J., *Canadian Med. Assn. J.*, 1932, **26**, 400.

Directing our attention to this problem again, we have explored the hypothalamus millimeter by millimeter in 44 cats using a faradic current delivered through a bipolar needle electrode accurately placed with the Horsley-Clarke stereotaxic instrument. The technique was the same as that employed in our previous experiments² except that changes in respiration, blood pressure, and bladder tonus were recorded on a kymograph. The results of this new series of experiments confirm our previous observation on the pupil and respiration. Pupillary dilatation and increases in rate and depth of respiration were elicited along with a rise in blood pressure and contraction of the bladder as a result of the stimulation. Better reactions were obtained from the lateral part of the hypothalamus containing the medial forebrain bundle than from the medial part forming the wall of the third ventricle.

Stimulation farther rostrally in the region of the anterior commissure and adjacent part of the septum also yielded contraction of the bladder. It would appear that the cell masses concerned with this reaction are located here, that from these a descending pathway runs caudalward and that bladder reactions elicited from the hypothalamus are due to a stimulation of this descending path. No other parasympathetic responses were elicited by us from the hypothalamus. But often a drop in blood pressure, sometimes associated with a decrease in the heart rate, was obtained from the region of the anterior commissure and adjacent portion of the septum. Stimulation of this same region also caused a decrease in the rate and depth of respiration.

There can be no doubt that the hypothalamus is concerned with the activity of the sympathetic system but we have not been able to show that it has any parasympathetic functions. Perhaps these functions may have their forebrain center farther rostrally in close relation to the anterior commissure.