LETTER TO THE EDITOR

ENERGY RESERVES OF THE BRAIN DURING POTASSIUM EMBELATE-INDUCED ANTINOCICEPTION IN RAT

(Received on July 27, 1987)

Certain analgesics are known to affect the metabolic status of the brain and other parts of the CNS, and in this respect most profound effects have been noticed in the intermediary metabolism of carbohydrates. A potassium salt of embelin (Ex: Embelia ribes) was reported to produce time dependent antinociception which begins at 0-15 min, reaches maximum at 30-60 min and diminishes by 90 min (1). The purpose of present investigation has been to find out the effect of potassium embelate on the energy status of the brain during these time periods, viz, 0,15, 30, 60 and 90 min after the drug administration.

Groups of adult albino rats (120-160 g) were fasted overnight and then a single oral administration of (30 *mg/kg*) of potassium embelate was given. At various times thereafter, animals were sacrificed and whole brain dissected out: one portion of it was immediately precipitated for glycogen estimation (4) and remaining part was utilised for colorimetric estimations of lactate (2), pyruvate (7) and inorganic phosphate (Pi, 5). Peripheral blood was collected for the determination of glucose (6).

The changes observed at 15-90 min, after drug treatment were compared for significance of difference (t-test) with O time (control) and are summarised in Table I. It was observed that lactate content showed increasing pattern whereas pyruvate levels remained fairly constant. This would suggest that glycolysis exists as major pathway of glucose metabolism during peak antinociception (60-90 min). However, an increased glycogen content was also observed, although there was no corresponding rise in the blood glucose concentrations The high glycogen content is in accordance with the low inorganic phosphate as observed, since decreased Pi favours glycogen synthesis. Under normal physiological conditions, blood glucose is known to provide adequate supply of energy to the CNS and in this respect the role of glycogen as an energy reservoir in the brain is not clear. However, the depletion of glycogen has also been associated with failure of neuronal transmission in the superior cervical ganglion of the rat (8). Alterations in the glycogen levels have also been attributed to changes in the turnover of cerebral noradrenaline (9) and in an earlier study, the levels of this neurotransmitter were found to rise in the cerebrospinal fluid of potassium

TABLE I : Levels of carbohydrate intermediates in brain of control and potassium embelate-treated rats and blood glucose.

	Time (min.)				
Parameter	0	15	30	60	90
Glycogen[a]	4.0±0.33	6.2±0.30	9.2±0.33	10.5±0.32	7.5±0.29
Pyruvate[a]	0.15±0.09	0.17±0.07	0.18±0.09	0.15±0.07	0.16±0.08
Lactate[a]	2.0±0.17	3.1±0.15	6.4±0.17	8.8±0.15	4.8±0.17
Pi[a]	1.11±0.03	0.92±0.03	0.62±0.04	0.55±0.03	0.41±0.05
Blood Glucose[b]	45.0±3.0	48.0±3.0	52.0±5.0	49.0±4.0	51.0±3.0

Values are mean ±S.E.M. (n=15); a=*μmol/g* tissue (wet wt.) b=*mg*/100 *ml*, blood.

embelate-treated dogs (3). Further studies would clarify the precise regulation of glycogenesis and glycogenolysis in the pain syndrome with special reference to the mechanism of potassium embelate-induced antinociception.

S. K. DHAR, R. K. JOHRI, U. ZUTSHI AND C. K. ATAL

Regional Research Laboratory,
Jammu-Tawi - 180 001

REFERENCES

1. Atal, C. K., M. A. Siddiqui, U. Zutshi, V. Amla, R. K. Johri, P. G. Rao and S. Kour. Non-Narcotic orally effective centrally acting analgesic from an Ayurvedic drug. *J. Ethnopharmacol.*, **11** : 309-317, 1984.
2. Barker, S. B. and W. H. Summerson. The colorimetric determination of lactic acid in biological materials. *J. biol. Chem.*, **138** : 535-554, 1941.
3. Dhar, S. K., R. K. Johri, U. Zutshi and C. K. Atal. Effect of potassium embelate, a novel analgesic compound on the neurotransmitter content of the cerebrospinal fluid of dog. *Curr. Sci.*, **10** : 511-512, 1986.
4. Dubois, M., K.A. Gilles, J.K. Hamilton, P.A. Rebers and F. Smith. Quantitative estimation of glycogen. *Anal. Chem.*, **28** : 351-357, 1956.
5. Fiske, C.H. and Y.Subbarow. The colorimetric determination of phosphorus. *J. biol. Chem.*, **66** : 375-400, 1925.
6. Folin, O. and H. Wu. Colorimetric determination of glucose in the blood and urine. *J. biol. Chem.*, **60** : 2583-2594, 1920.
7. Friedemann, T. E. and H. E. Haugen. Pyruvic Acid. II. Determination of keto acids in blood and urine. *J. biol Chem.*, **147** : 415-434, 1943.
8. Harkonen, M. H. A., J. V. Passonneau and O. H. Lowry. Relations between energy reserves and function in rat superior cervical ganglion. *J. Neurochem.*, **16** : 1439-1450, 1969.
9. Hutchins, D. A. and K. J. Rogers, Physiological and drug induced changes in the glycogen content of mouse brain. *Br. J. Pharmac.*, **39** : 9-25, 1970.