Letter to the Editor

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Adenosine, inosine, hypoxanthine, xanthine and uric acid concentrations in the cerebrospinal fluid of unanaesthetized rats

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Cerebrospinal (CSF) fluid levels of adenosine and its metabolites in anaesthetized rats have recently been reported (Walter et al 1988). The values are of interest in that CSF provides a convenient source of brain perfusate samples which have equilibrated with cerebral interstitial fluid. Concern over the possibility that the induction and maintenance of anaesthesia could have affected brain metabolism, and thus of purine levels in the CSF, has prompted us to develop a model for the withdrawal of CSF from unanaesthetized rats.

The CSF samples were obtained from 16 male Sprague-Dawley rats, 350–400 g, with chronically implanted cannulae in their cisternae magna. A polyethylene tube (PE-160, 2·5 cm), the end of which had been enlarged (flanged slightly after heating over a gas burner, was inserted into the cisterna magna through a small hole in the atlanto-occipital membrane of sodium pentobarbital (60 mg kg^{-1}) anesthetized rats. The tube was held in place with a fine wire attached to a screw inserted into the midline of the skull at the line of fusion between the interparietal and supraoccipital bones. Further fixation was obtained by bonding the tube to the screw and skull with dental cement, leaving a 5 mm segment of the polyethylene tubing protruding above the dental cement retainer. A cap, consisting of an obturator (PE-50 tubing) cemented to a short piece of PE-205 tubing was inserted into the cisternal cannula so that the tip of the obturator was located exactly in the flanged end of the cannula to prevent plugging.

The animals were allowed to recover for 24–48 h and then CSF was sampled with a blunt tipped 20 SWG hypodermic needle connected to a 1 mL syringe. After sufficient CSF had been withdrawn, the cap and obturator were replaced on the cisternal cannula. CSF samples of 150–200 μL were obtained from each animal. Adenosine and metabolite levels were identified and measured with the HPLC techniques described in our previous communication (Walter et al 1988).

The mean CSF purine concentrations recorded are shown in Table 1. It was interesting to find that the levels of adenosine and its metabolites, other than uric acid, in the CSF of unanaesthetized rats were not significantly different from those that we have previously reported in methoxyflurane-anaesthetized animals (Walter et al 1988). This observation alleviates concerns that data on the basal levels of purine release obtained from anaesthetized animals may be misleading. The levels of uric acid (mean of 12 130 nM) in CSF samples from unanaesthetized animals were, however, significantly higher than those (6130 nM) observed in anaesthetized rats. Intracranial dialysis techniques have demonstrated comparable levels of uric acid (7300 nM) in the striatum (Ungerstedt 1984). Even higher levels of striatal uric acid (20 000 nM) have been measured by in-vivo voltametric techniques (Marsden et al 1988).

Table 1. Adenosine, inosine, hypoxanthine, xanthine and uric acid concentrations collected from the cisterna magna of unanaesthetized and anaesthetized rats.

Purine	Range (nM)	Unanaesthetized Mean ± s.e.m. (nM)	Anaesthetized[2] Mean ± s.e.m. (nM)
Adenosine	30–240	59·9 ± 12·9	35 ± 9
Inosine[1]	120–680	284·0 ± 100·0	359 ± 85
Hypoxanthine	80–310	129·3 ± 15·8	243 ± 77
Xanthine	210–2900	834·0 ± 333·4	1340 ± 423
Uric acid	3550–19 000	12 130·1 ± 1100·0***	6130 ± 678

*** Significantly different from CSF concentration in anaesthetized rats; $P < 0.001$.
[1] Due to an interfering peak, data was obtained from 5 animals only.
[2] Data from Walter et al 1988.

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References

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