Effect of halothane on microtubule numbers in unmyelinated axons from rat sciatic nerve

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It has been reported (Hinkley, 1976) that halothane exerts effects on repolymerisation of neuronal microtubules in crayfish neurones prewarmed to 40°C and then incubated with halothane (10 mM). In this study we have examined the effects of halothane on microtubules of unmyelinated axons from rat sciatic nerve treated in a similar manner. Adult male Wistar rats were killed by decapitation and the sciatic nerves rapidly dissected out, desheathed and cut in 5 mm lengths. The portions of nerve were then incubated in Ringer solution at 40°C for 1 hour. They were then incubated for a further 1 h at 37°C in the presence of halothane (10 or 20 mM), a control group of nerves were incubated in medium alone at this time.

The nerves were then fixed with glutaraldehyde and osmium tetroxide, dehydrated in ethanol and propylene oxide and embedded in Araldite. Cross sections of the nerves were cut and electron micrographs were taken of random samples of unmyelinated axons at 10,000 × magnification. The numbers of microtubules per axon were counted from enlarged prints and the results expressed as the mean number of microtubules per axon.

Figure 1 shows the results of the experiments and it can be seen that there is a decrease in the number of microtubules seen per axon in the case of the incubation with halothane (20 mM), and this difference was significant at the level $P < 0.001$ when compared to the control axons, and there was a slight but significant increase ($P < 0.05$) in the number after incubation with halothane (10 mM). This would indicate that the halothane interferes in some way with the polymerisation of the neuronal microtubules. Examination of the micrographs indicated that there was no obvious effects visible on any of the other intra-axonal organelles, but some swelling of the myelin sheaths were visible at the higher halothane concentration used. Hinkley (1976) has reported the production of macrotubular structures by halothane in crayfish axons, but none of this type of organelle was found in the unmyelinated axons from the rat.

Reference

HINKLEY, R.E. (1976). Microtubule-macrotubule transformations induced by volatile anesthetics. *J. Ultrastr. Res.* **57**, 237–250.

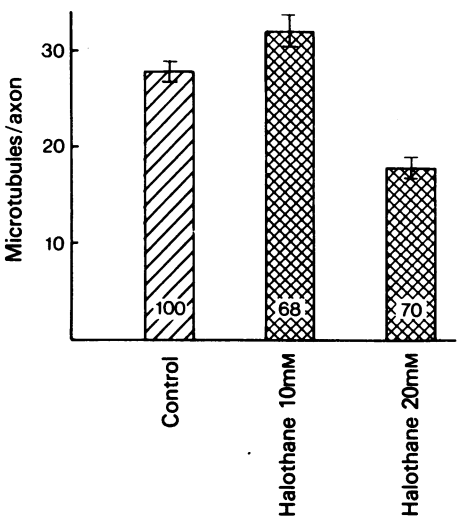

Figure 1 The number of microtubules per unmyelinated axon expressed as the mean ±s.e. mean in control rat sciatic nerve and after incubation with 10 and 20 mM halothane.