A light and electron microscopic study of the accumulation of material in sectioned rat dorsal roots and the effect of demecolcine

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Accumulation of vesicular material has been demonstrated in sectioned, crushed and ligated nerves *in vivo* and *in vitro* (Dahlstrom, 1971). The following experiments were carried out in order to examine the effects of sectioning rat dorsal roots as a basis for the study of the nature, formation and transport of axoplasmic material in sensory neurones.

Rats (250 g) were anaesthetized with urethane and dorsal roots L3-5 were sectioned. Twenty hours later the animals were perfused with glutaraldehyde (2.5%) and the sectioned roots were examined by light and electron microscopy.

The nerve on the ganglionic side of the cut showed numerous unmyelinated profiles at the cut tip, many of them packed with vesicles. It was seen from longitudinal sections that some of these unmyelinated 'sprouts' arose from myelinated axons. In both myelinated and non-myelinated axons there was an accumulation of mitochondria and vesicles (60-100 nm in diam., some dense-core) for a distance of 500 μm behind the tip. With increasing distance from the tip, the proportion of mitochondria increased and the accumulation became confined to the periphery of the axoplasm. The nerve on the side of the cut distant from the ganglion showed no unmyelinated profiles at the cut end. In addition, the myelin was degenerate, the Schwann cells were active, and the axoplasm of both myelinated and non-myelinated axons was packed with debris including some vesicles and many lamellated bodies.

When dorsal root ganglia with a length of root attached were cultured *in vitro* by the method of Trowell (1959) for 20 h in Medium 199 (Flow Laboratories), the appearance of the cut-end of the nerve was similar to that of a nerve sectioned *in vivo*. However, when an equivalent segment of dorsal root without the ganglion attached was cultured for 20 h the appearance of the axoplasm some distance from the cut end was normal but there were no unmyelinated profiles at the tip, nor was there any accumulation of mitochondria or vesicles.

When intact ganglion-nerve preparations were cultured for 20 h in the presence of demecolcine (3×10^{-7} M) no axonal sprouting or accumulation of mitochondria and vesicles was seen.

In conclusion it appears that in sectioned dorsal roots axonal sprouting and accumulation of material occur only in the presence of cell bodies. Demecolcine (3×10^{-7} M), which disrupts neurotubules, prevents this accumulation and sprouting. Further work on this preparation is necessary to determine the role of axonal transport in these processes and their importance in neuronal function.

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Proconvulsant action of folic acid

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Folic acid (FA) is convulsant when injected intracerebroventricularly (i.c.v.) in mice (Baxter, Miller & Webster, 1973). It has been suggested that in epilepsy high localized folate concentrations could form epileptic foci (Hommes & Obbens, 1972). Microiontophoretic FA has been shown to either stimulate cortical cells or to enhance the effect of applied glutamate (Hill, Miller, Straughan & Webster, 1973). As increased FA may therefore predispose to convulsions we have studied its proconvulsant action (i.c.v.) in mice and rats and compared it with other convulsants by the same route.

In threshold electroshock studies using mice, the normal clonic response was intensified to hind limb extension (HLE) by FA pre-treatment. The ED_{50} values for HLE for FA alone and with electroshock 15 min later were 20.5 and 1.5 μg