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The effect of reducing the calcium concentration at the site of nerve injury on motoneurones and muscles of neonatal rats

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Sciatic nerve crush in newborn rats results in the death of up to 70% of motoneurones and reduction of muscle force (Lowrie *et al.* 1987). Several studies have suggested that growth cones require an optimal level of Ca^{2+} to continue to grow (Kater *et al.* 1988). It is possible that regeneration after axonal injury could be influenced by altering the Ca^{2+} concentration around the growing axons. The experiments described here explore this possibility. In newborn rats localized reduction in Ca^{2+} concentration was achieved by placing a 1,2bis(2-aminophenoxy)ethane *N,N,N'N'*-tetraacetic acid (BAPTA)-containing silicone strip alongside the sciatic nerve, close to the place of injury. The effect of this procedure on motoneurone survival and muscle recovery was examined.

Experiments were performed on newborn Wistar rats. Using ether anaesthesia and sterile conditions the sciatic nerve was crushed. Three to four days later under similar conditions a 1 mg silicone rubber strip containing either 238 μg of BAPTA or NaCl was placed alongside the sciatic nerve at or slightly distal to the place of injury.

Six to eight weeks later the animals were anaesthetized by chloral hydrate (4%, 1 mg/100 g of body weight) and prepared either for labelling of motoneurones or for tension recording of soleus muscle (see Lowrie *et al.* 1987 for details). Only 30% of motoneurones survived after nerve injury ($n = 9$), and treatment with BAPTA increased this survival to 42·2% ($n = 10$). However, this difference was not significant ($P < 0{\cdot}01$). The tension developed by soleus muscles after nerve injury was 20% of control, and 40% after treatment with BAPTA ($n = 10$ to 14). This difference was highly significant ($P < 0{\cdot}001$).

We conclude that lowering the calcium concentration around the regenerating nerve terminals may enhance regeneration, and this allows a better recovery of muscles by reducing the period of denervation.

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