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Release of $Ca^{2\oplus}$ from postsynaptic mitochondria in the electric organ of Torpedo during nerve activity

The cytoplasmic concentration of $Ca^{2\oplus}$ is essential for the coupling of stimulation and contraction or secretion in a variety of excitable tissues. Based on studies of isotope fluxes, possible extracellular as well as intracellular Ca sources have been taken into consideration. However, little is known on the Ca content of subcellular organelles. The electric organ of *Torpedo* has been frequently used as a model system for the neuromuscular junction, since its electrocytes develop from myoblasts and are innervated by cholinergic electromotor neurons.

Mitochondria are isolated from this tissue by a combination of several homogenization and centrifugation steps and purified on discontinuous sucrose, glycine density gradients. Cytochrome *c* oxidase (EC 1.9.3.1) is used as the marker enzyme for the mitochondria. Ca concentrations are analysed by atomic absorption spectrophotometry.

The Ca concentration of the mitochondrial fraction is much higher than that of any other subcellular fraction (900 nmol/mg protein). When the tissue is stimulated with 5000 pulses via the electromotor nerve[1] before separation, the Ca concentration of the mitochondrial fraction is reduced by 80%. However, the Ca content of the mitochondria is unaffected by the stimulation, when tissue blocks which have been perfused[2] with d-tubucurarine are used, until the response of the electrocytes to single test pulses is almost abolished. Acetylcholine is still released from the presynaptic terminal under these conditions.

It is concluded that postsynaptic mitochondria release their Ca during nerve activity, and this result will be discussed in relation to similar findings in other excitable tissues.

1 Zimmermann, H. & Whittaker, V.P. (1974) *J. Neurochem.* 22, 435 - 450.
2 Zimmermann, H. & Denston, C.R. (1977) *Neuroscience* 2, 695 - 714.

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