Cholinesterase activity of Mechanoreceptors

Chizuka IDE, Reiko YOKOTA and Tohru NITADORI

Department of Anatomy, Iwate Medical College School of Medicine, Morioka

It has been generally accepted that mechanoreceptors such as Meissner and Pacini corpuscles have an intense ChE activity in the perineural and interlamellar spaces. The present study was carried out to see whether other types of mechanoreceptors also have ChE activity. Mechanoreceptors examined were pressoreceptors in the atrium and in the carotid sinus of cat and rat, nerve endings around non-sinus and sinus hair roots of mouse and lamellated corpuscles in the cat nostril dermal parts. Tissues were fixed and frozen sections were incubated in the Karnovsky and Roots' medium.
In the pressoreceptors ChE activity was found in the spaces beween axon terminal and surrounding Schwann cells. Palisade endings of hair roots did not exhibit a definite activity, while the nerve endings around sinus hair showed an intense ChE activity in the periaxonal spaces. The lamellated corpuscles had ChE activity in the perineural and interlamellar spaces. These findings indicate that mechanoreceptors except palisade endings would generally have ChE activity. The functional significance of this enzyme in mechanoreceptors is unkown.

Histochemical study of the Mauthner cell

Nagayasu OTSUKA, Takako ENDO, Kiminao MIZUKAWA, Shigeto KANDA, Junzo SASAKI

Department of Anatomy, Okayama University Medical School, Okayama

The Mauthner cell can be identified in goldfish, carp and trout by four primary criteria:(a) a large size and position at the level the eighth nerve, (b) the presence of a principal lateral and ventral dendrite, (c) a large myelinated axon that decussates, and (d) a characteristic axon cap. PAS-positive substance were demonstrated on Mauthner neurons of goldfish, carp and trout. The PAS-positive substances are visible as intracytoplasmic and as surface-covering of the Mauthner neuron.
The activities of acetylcholinesterase was studied on Mauthner cells of goldfish, carp and trout. With respect to the transmitter enzymes studied, acetylcholinesterase only is demonstrable being strikingly localized to synaptic endings on main dendrites. The results are interpreted in a functional sense, and the existence of a chemically mediated preferential cholinergic transmission on Mauthner cells is discussed.

Electron Cytochemical Study on Neuroglial NDPase and TPPase after Needle Injury of Rat Brain

Tetsuzo KUMAMOTO, Tajimi HIROHATA and Chiharu SUEMATSU

Department of Anatomy, Wakayama Medical College, Wakayama

Ultrastructural enzyme localization of NDPase was studied in control and experimental rat cerebrum after needle injury on 4th, 6th and 9th days. Rat brain was fixed by perfusion (1.5% glutaraldehyde, 4% paraformaldehyde, 0.1M cacodylate buffer, pH 7.4) and specimens were fixed in cold buffered 4% paraformaldehyde for 12 hrs. Free-floating sections were incubated with IDP and TPP (Novikoff & Goldfisher, 1961). After incubation, sections were mounted with resin.
Results showed strong positive NDPase and TPPase reaction in cerebral cortex in the plasma membrane of microglia cell and endothelial basement membrane of blood capillary. In injured cerebral cortex of experimental animals, increased NDPase activity was demonstrated in plasma membrane of microglia, especially in outer space of individual nerve fibers surrounding the reactive microglia cell. The reactive microglia often showed hypertrophy and arborization of glial processes.

Ultracytochemical localization of ouabain-sensitive, K^+-dependent p-nitrophenylphosphatase activity in the rat hippocampus.

Fumio NASU and Kenichirou INOMATA*

Electron Microscopy Research Laboratory and Department of Anatomy*, Shimane Medical University, Izumo

Very few electron microscopic studies on localization of ouabain-sensitive, K^+-dependent p-nitrophenylphosphatase(K^+-NPPase) activity in central nervous system have been reported. In the present study, the localization of K^+-NPPase activity was ultracytochemically investigated in the rat hippocampus called substantia gelatinosa cerebri. Microslicer sections of materials fixed with a mixture of 0.25 % glutaraldehyde and 1 % paraformaldehyde were incubated in medium by Mayahar et al.(1980). In the light microscopic investigation, the K^+-NPPase activity of the molecular layer was higher than that of other region in the hippocampus. Electron microscopically, the activity was demonstrated on the axolemma, neurofilamentous structure in the axoplasma, presynaptic membrane and synaptic vesicle. Theses activities were decreased with addition of ouabain or substitution of Na^+ for K^+. These activities in the hippocampus indicated the existence of Na^+-K^+-ATPase, since K^+-NPPase is a part reaction of the Na^+-K^+-ATPase complex. In addition, Mg^{++}-ATPase activity, Ca^{++}-ATPase activity, Alkaline phosphatase activity and Thiamine pyrophosphatase activity were demonstrated and compared with that of K^+-NPPase.