

neurons in the goldfish optic tectum and vagal lobes<sup>(3)</sup> and in the embryonic rat hippocampus<sup>(6)</sup>.

Following subcellular fractionation, large amounts of ependymins  $\beta$  and  $\gamma$  were recovered in the cytoplasmic compartment and also in a fraction collected from the extracellular fluid of goldfish brain (ECF). The synaptosomal fraction contained small amounts of ependymins, mainly ependymin  $\gamma$ <sup>(4)</sup>. Ependymin  $\gamma$  exhibits sequence homologies to ependymin  $\beta$  and is presumably derived from the  $\beta$ -subunit by the hydrolytic action of an extracellular metallo-protease<sup>(5)</sup>. Subcellular organelles recovered in the synaptosomal fraction incorporate 125-I-labeled ependymin  $\gamma$  that was injected into the ventricular cerebrospinal fluid<sup>(4)</sup>.

RIA measurements revealed that ependymin concentrations in the ECF decreased temporarily (-12%) in fish that had learned a vestibulo-motoric task, before they increased above control levels (+38%). Ependymin concentrations in the cytoplasm increased immediately after learning (+39%)<sup>(2)</sup>. Intraventricularly injected anti-ependymin antisera not only prevent recall of this task, but also of classical, active avoidance-conditioning in a shuttle-box, when injected between 0.2 and 24 hours after acquisition of the new behaviour. Goldfish fleeing spontaneously the light stimulus, which was used for conditioning, were not affected (active control)<sup>(1)</sup>.

It is suggested that a decrease in extracellular calcium in the synaptic cleft after learning might induce a conformational change or prevent proteolysis of secreted ependymin molecules, thereby triggering their interaction with synaptic membranes.

- 1) Piront, M.-L. and Schmidt, R. (1987) Brain Res., in press.
- 2) Schmidt, R. (1987) J. Neurochem. **48**, 1870-1878.
- 3) Schmidt, R. and Lapp, H. (1987) Neurochem. Int. **10**, 383-390.
- 4) Schmidt, R. and Lapp, H. (1987) J. Neurochem. **48**, 1862-1869.
- 5) Schmidt, R. and Shashoua, V.E. (1983) J. Neurochem. **40**, 652-660.
- 6) Schmidt, R., Löffler, F., Müller, H.W. and Seifert, W. (1986) Brain Res. **386**, 245-257.

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#### Involvement of Extracellular Glycoproteins in Neuronal Plasticity

Ependymins are dimeric brain-specific<sup>(3)</sup> glycoproteins sharing several properties with other calcium-binding proteins. By radioimmunoassay (RIA) and immunofluorescence they were localized to pyramidal