

Title	Immunohistochemical localization of metallothionein in the eye of rats
Sub Title	
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Publisher	共立薬科大学
Publication year	1991
Jtitle	共立薬科大学研究年報 (The annual report of the Kyoritsu College of Pharmacy). No.36 (1991.) ,p.51- 51
JaLC DOI	
Abstract	
Notes	抄録
Genre	Technical Report
URL	https://koara.lib.keio.ac.jp/xoonips/modules/xoonips/detail.php?koara_id=AN00062898-00000036-0051

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Immunohistochemical localization of metallothionein in the eye of rats*

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Metallothionein (MT) is a group of low molecular weight proteins, with a unique amino acid composition such as a large content (approximately 30%) of cysteine residues, which endows MT with a very high affinity for heavy metals such as zinc (Zn), copper (Cu) and cadmium. Another unique property of MT is the inducibility upon exposure to these heavy metals as well as in response to various endogenous factors. MT is present in various biological species, and is always found to contain Zn ions, supporting the idea that MT may be associated with essential physiological roles by storage and supply of Zn ions.

If MT is closely associated with Zn metabolism, the protein is expected to be localized in tissues that are abundant in Zn ion. In fact, MT is localized in Paneth cells of small intestine and in the dorsolateral lobes of prostate, the tissue which are known to be rich in Zn. Furthermore, MT concentrations were found to parallel with Zn concentrations in actively proliferating and differentiating tissues such as those under development stages and partially hepatectomized rat liver. In the eye, the presence of a protein similar in physiochemical properties to MT was found in the extract from the bovine retina in which relatively large amounts of Zn ions are present. Thus, in the present study, using an immunohistochemical technique, we have investigated characteristic localization of MT in various tissues of the eye of rats and also discussed a possible link of MT with physiological processes.

As a result, strong MT immunostaining was observed in the epithelium of the lens and cornea. In the retina, considerably strong MT immunostaining was observed in the pigment cell layer while the nervefiber layer and inner plexiform layer showed weak MT staining. Glial cells in the optic nerve were found to have marked MT staining. The present result is consistent with the hypothesis that MT may be involved not only in activation of Zn enzymes and cell proliferation through supply of Zn ions, but also in a protective mechanism in the blood-retina barrier.

* 本報告は *Histochemistry*, 95, 535—539 (1991) に発表.

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