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Effect of Cadmium on Golgi Complex of Freshwater Teleost (*Pimelodus maculatus*) Hepatocytes

Brief Report

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Summary

Freshwater teleost hepatocytes show hypertrophied Golgi complexes 3 days after a single intraperitoneal injection of cadmium chloride (10 mg/Kg).

Keywords: Cadmium; Golgi complex; Hepatocyte; Teleost.

1. Introduction

It is known that mammals and fish submitted to acute or chronic cadmium (Cd) exposure accumulate the metal especially in the liver with concomitant hepatic alterations (FLICK *et al.* 1971, NOËL-LAMBOT and BOUQUEGNEAU 1977). Considering that Cd salts are very common in industrial discharges and that ultrastructural alterations produced by this heavy metal in fish hepatic cells are not well investigated, the present study was carried out.

2. Material and Methods

Six male adult specimens of *Pimelodus maculatus*, weighing about 130 g, were kept in freshwater aquaria. Three animals were intraperitoneally injected with a solution of $CdCl_2 \cdot 2\frac{1}{2}\ H_2O$ in a single dose of 10 mg/Kg and sacrificed after 3 days. The remaining three were used as control. Fish were not fed during the experiment. The liver of all animals was excised under anesthesia induced by placing them in crushed ice. For thin sectioning, small pieces of liver were fixed for 2 hours in cold solution of 3% glutaraldehyde buffered at pH 7.2 with 0.1 M phosphate. Specimens were postfixed for 2 hours in 1% cold OsO_4, treated *en bloc* with 0.5% uranyl acetate, dehydrated and embedded in araldite. Sections were sucessively stained with uranyl acetate and lead citrate and examined in a Philips EM 301 electron microscope at 60 kV.

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3. Results

In control fish the Golgi complexes are frequently observed near the bile canaliculi and in the perinuclear area. They consist usually of some smooth parallel cisternae with dilated ends, vacuoles and vesicles (Fig. 1) rarely filled with material of moderate electron density. After Cd injection the appearance of the Golgi complex has changed. The cell becomes occupied by numerous Golgi complexes formed by a great number of smooth parallel cisternae,

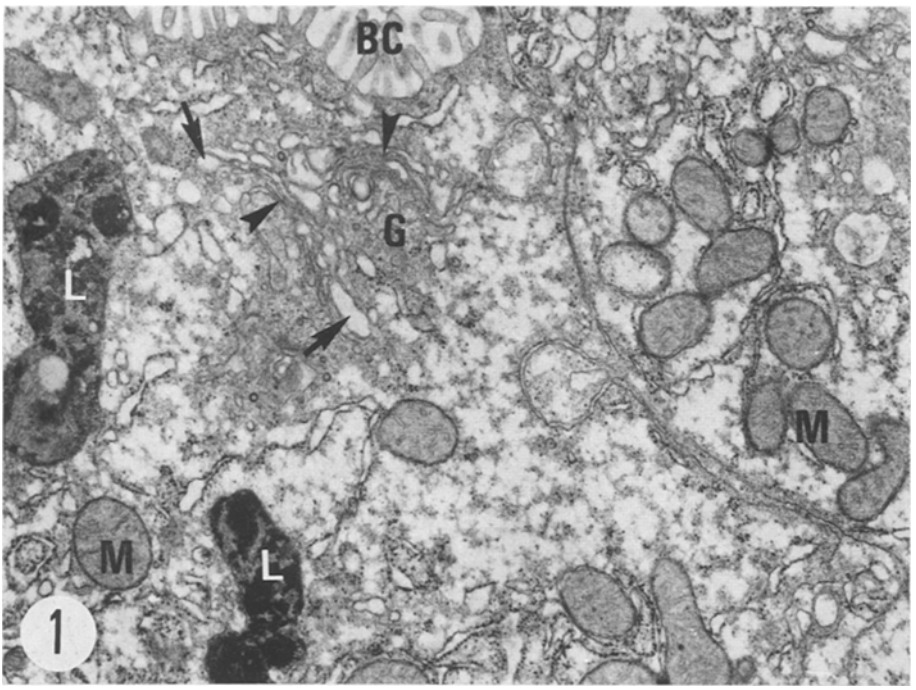

Fig. 1. Hepatocyte of a control fish. The Golgi complex (*G*), located near to the bile canaliculus (*BC*), is formed by a few amount of small parallel cisternae (arrowheads), vacuoles and vesicles (arrows). *L* lysosome, *M* mitochondria. ×13,000

vacuoles and vesicles (Fig. 2). The material that sometimes fills the vesicles is also found in the cisternae (Fig. 3). Although these alterations have no conclusive explanations, they may be related to some functions performed by the Golgi system.

4. Discussion

As female teleost hepatocytes undergo several changes during the reproductive cycle (Peute *et al.* 1978), in the present study only male fishes were used. It is known that low molecular weight proteins implicated in the process of Cd detoxification (metallothioneins) are commonly found in the liver of

untreated fish and that Cd exposure drastically increases their concentration (NOËL-LAMBOT *et al.* 1978). Induction of metallothionein synthesis occurs in other animals and also in cultured cells in response to cadmium exposure (HILDEBRAND *et al.* 1979). Since Golgi complexes play an important role in

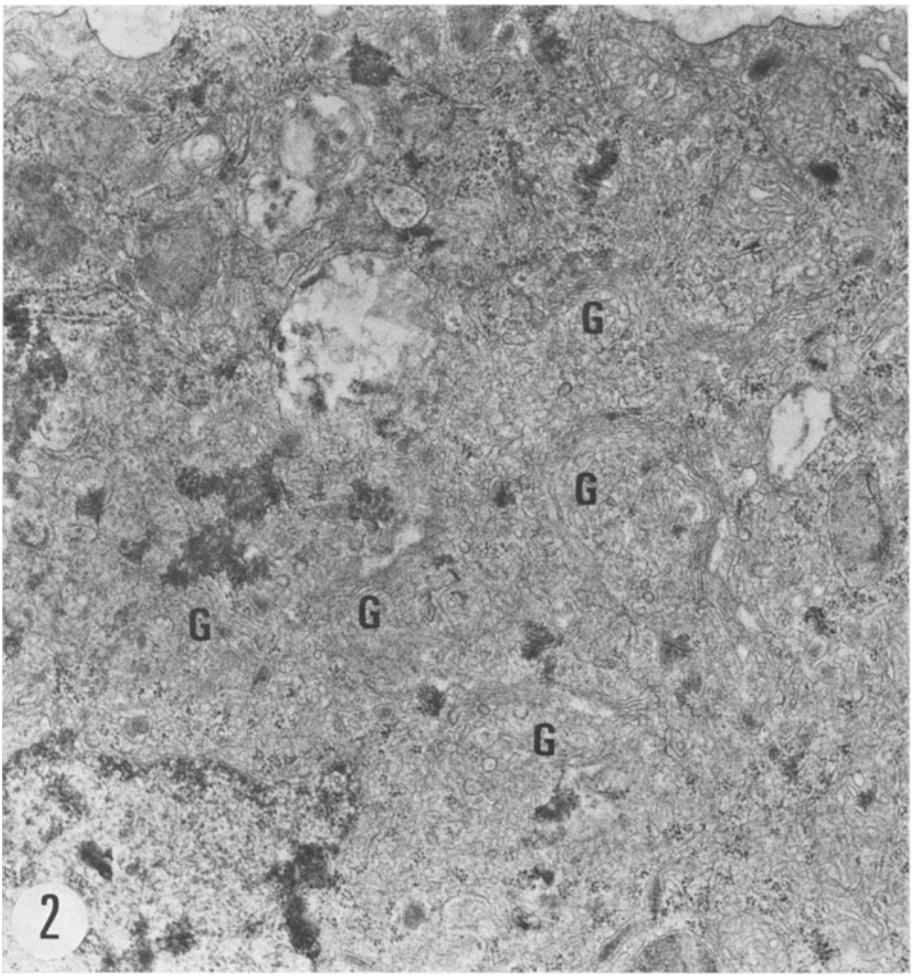

Fig. 2. Hepatocyte of a treated fish. Observe that the Golgi complexes (*G*) become highly developed. ×27,000

packaging and concentrating the products, especially proteins, which come from the rough endoplasmic reticulum, it is reasonable to suggest that the Golgi modifications induced by Cd are related to an increase in the synthesis of such proteins. Another plausible explanation for the development observed in Golgi systems is related to the lysosomal enhancement after Cd injection (personal observation) since the Golgi complex is envolved in the formation of the primary lysosomes (DE ROBERTIS *et al.* 1975).

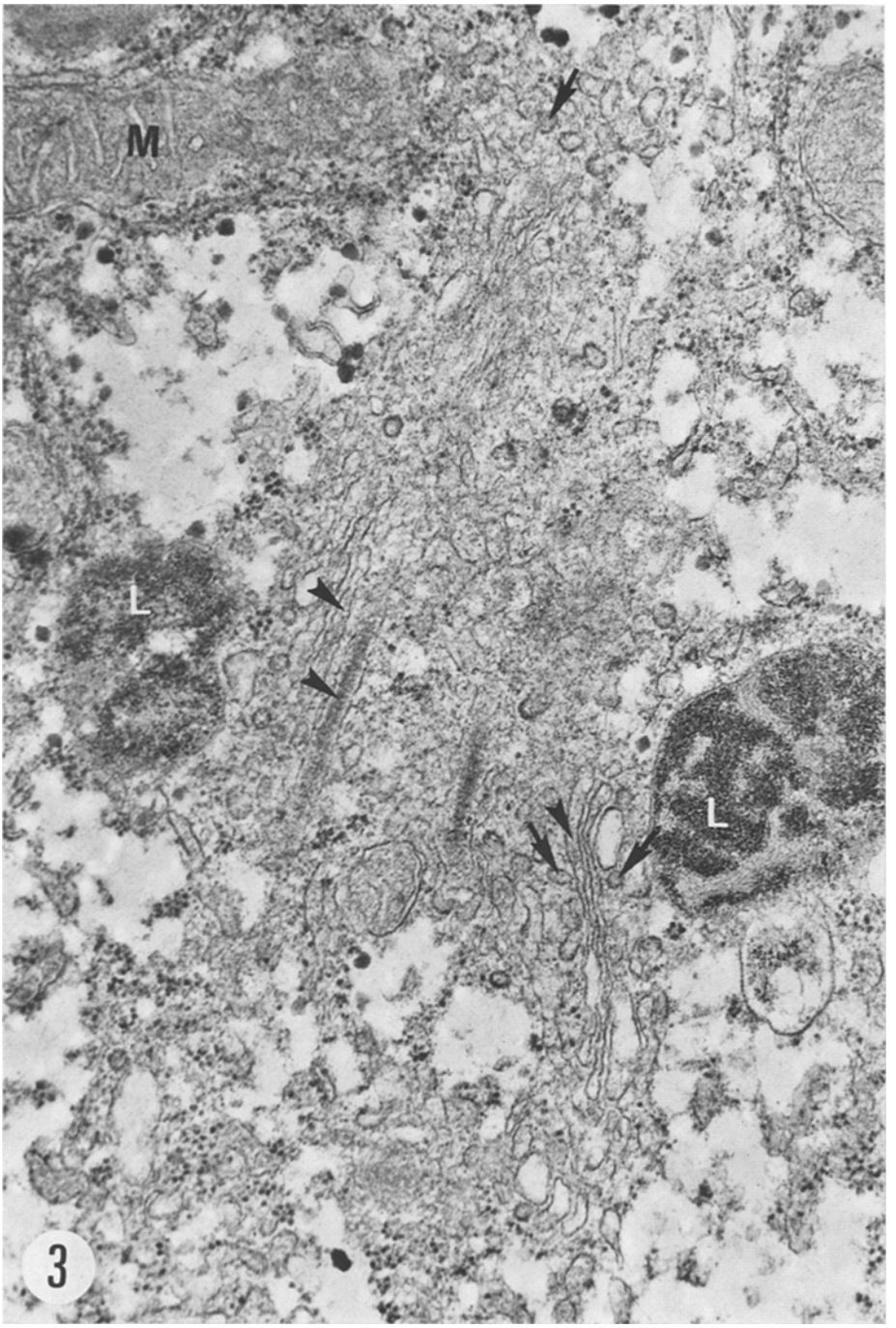

Fig. 3. Hepatocyte of a treated fish showing material of moderate electron density inside the vesicles (arrows) and cisternae (arrowheads). *L* lysosome, *M* mitochondria. ×40,000

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