Zoological Studies 34, Supplement I (1995)

Mitochondria-rich Cells in Gills of the Euryhaline Teleost, *Oreochromis Mossambicus*

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The gill is considered as one of the most important osmoregulatory organs in teleostean fish. There are four pairs of gill arches. Each of the arches has two rows of filaments and leaf-like lamellae protrudes along both side of each filament. The epithelium of gill filaments has at least four morphologically different cell types, each with different functions : the pavement cells; the mitochondria-rich (MR) cells; the mucus cells and the undifferentiated cells Mitochondria-rich cells are responsibile for ionic exchanges required for teleosts (Pisam and Rambourg 1991).

Ultrastructural features of gill mitochondria-rich (MR) cells in euryhaline tilapia, *Oreochromis mossambicus*, were studied with scanning and transmission electron microscopy. MR cells distribute mostly on the filamental epithelium and very rarely on the lamellar epithelium. SEM studies presented three types of apical surfaces of the MR cells — wavy convex, shallow basin and deep hole — on the afferent side of gill filaments (Fig. 1). TEM observations revealed that all three types of MR cells were characterized in the cytoplasm with numerous mitochondria and the labyrinth-like tubular system. However, other characteristics like leaky junctions and intercellular digitations only occurred between deep holes but not between wavy convexes and shallow basins. Experiments on the adaptation to various milieux proved that the size and density of MR cells altered abruptly within 24 hours following transfer. Hence various types of MR cells were correlated to diverse ion changes in the environments.

Na, K-ATPase, the membrane-bound enzyme responsible for the energy dependent exchange of cytoplasmic Na^+ for extracellular K^+ in most animal cells, plays a critical role in salt secretion of euryhaline teleost. Immunocytochemical studies with a monoclonal antibody demonstrated that the gold particles representing Na, K-ATPase α-subunit were distributed along the membrane-formed tubules in the gill MR cells, but not in other epithelial cells. Na, K-ATPase has also been found to localize in different types of MR cells (Fig. 2).

To sum up, (1) changes in shape and amount of mitochondria-rich cells in gills of euryhaline tilapia with different environmental ions implies the correlations between distinct MR cell types and ions; (2) alteration of MR cells occurred within 24 hours after transfer of the fish to different milieux and (3) exhibition of Na,K-ATPase in the cytoplasm of all types of MR cells indicate that branchial MR cells of euryhaline teleost may transform interchangeably within a short period of time to ensure the survival of the fish.

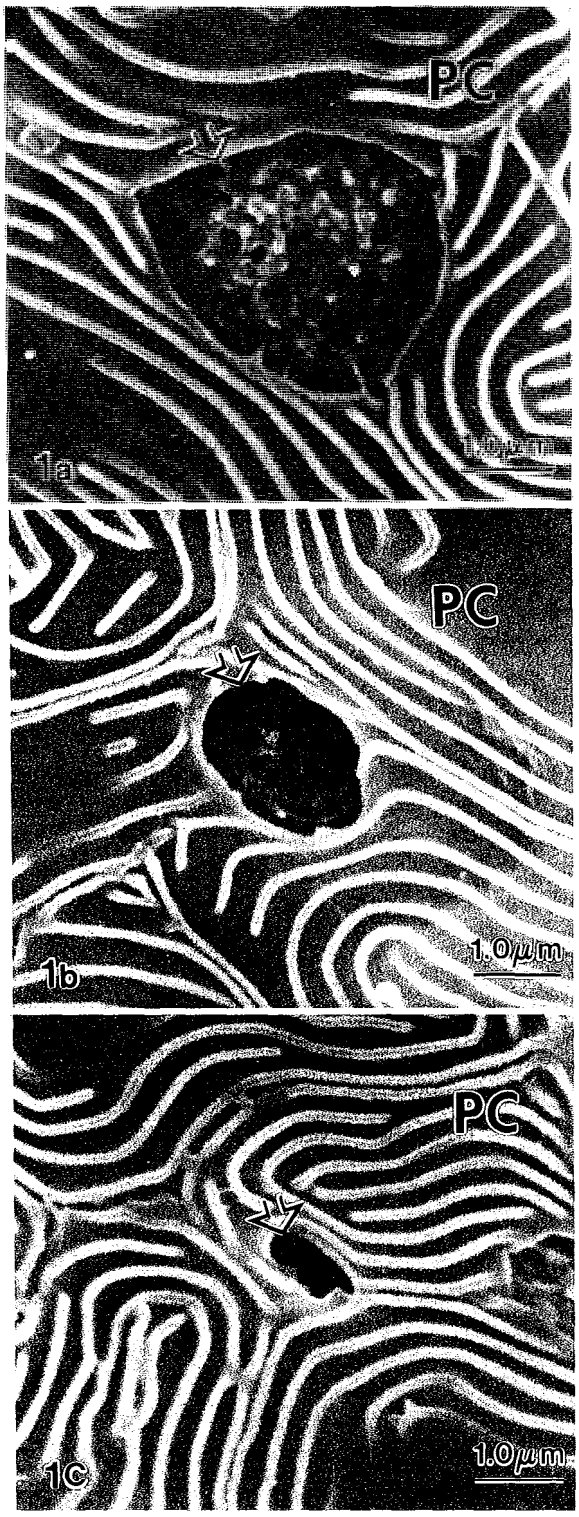

Fig. 1. SEM pictures show three types of apical surfaces (arrows) of mitochondria-rich (MR) cells on gill epithelium of euryhaline teleost, *Oreochromis mossambicus*. a-wavy convex; b-shallow basin; c-deep hole. PC, pavement cells.

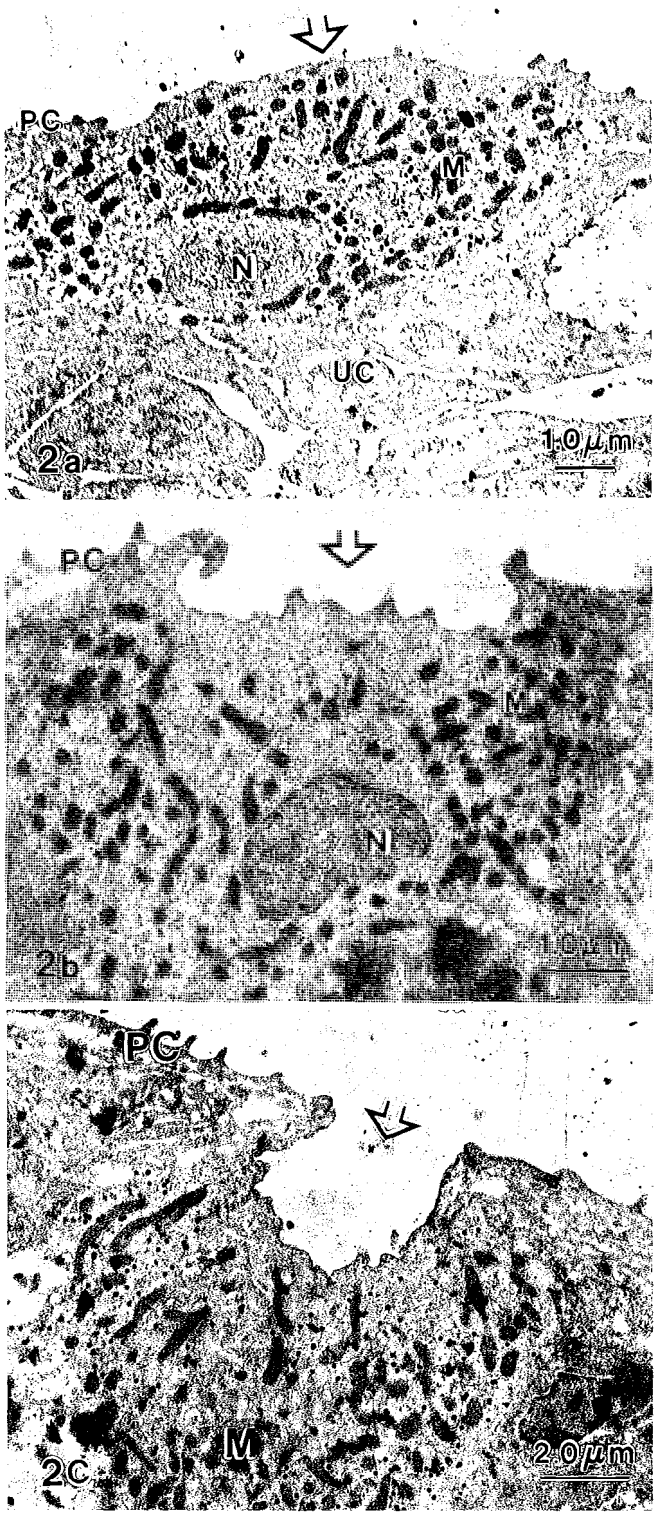

Fig. 2. TEM pictures show immunocytochemical localization of Na, K-ATPase (presented as gold particles) in the cytoplasm of three types of gill MR cells. a-wavy convex; b-shallow basin; c-deep hole. Arrows, apical surface of MR cells; M, mitochondria; N, nucleus; PC, pavement cells; UC, undifferentiated cells.