

Can Mitochondrial Crowding within Thymic Epithelial Cells Trigger Thymocyte Maturation in Fish?

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Channa gachua (Hamilton 1822) is a dwarf snakehead fish from order Perciformes and Least Concern (LC) in Red Data book (IUCN Ver. 3.1). The thymus gland comprises of different type of epithelial cells, thymocytes, blood capillary thymic stromal components, etc. [2]. The thymocyte shows distinct functional interaction with different epithelial components within the thymic tissue of vertebrates [3]. The question that we address here is 'How thymic pharyngeal epithelial cells trigger the thymocyte maturation process within the thymic tissues of the said species concerned?

The thymus gland of adult, sex-independent *C. gachua* were dissected out and immediately fixed in 2.5% glutaraldehyde in 0.1 (M) phosphate buffer (pH. 7.2) for 2 hours at 4°C (primary fixation) and 1% osmium tetroxide in the same buffer for 1 hour (secondary fixation) followed by dehydration through chilled graded acetone. The ultrathin sections (60-90nm.) were stained with uranyl acetate and lead citrate, examined under transmission electron microscope [TEM: JEM-2100 JEOL] operated at 40kV [SAIF, North Eastern Hill University (NEHU), Shillong, India].

Thymic tissue is an integrated cell mass of lymphoid and non-lymphoid elements with blood-trabecular cascade. Within the thymus gland, the corticomedullary region is not well demarcated (Figs. 1, 2 and 5). The morphs of epithelial elements are usually scattered within the thymus gland and they are well connected with different type of cellular extension supported with sub-cellular elements like distinct mitochondria, mature golgi complexes, endoplasmic reticulum, secretory vesicles, different stages of lysosomal elements and with distinct ribosomal units (Figs. 2, 3 and 4). The thymopharyngeal epithelial cells are well characterized with mitochondrial association, the morphs of secretory vesicles with microtubular connections and cellular junctions (Figs. 1, 2 and 6). Microscopically the cellular associations between lymphoid and non-lymphoid elements with distinct communication are also observed within the sub-capsular region of thymic tissue (Figs. 1 and 6). Few distinct secretory vesicular cargo/structures within the lymphoid and non-lymphoid elements are the common microscopical phenomenon in thymic environment (Figs. 3 and 6).

Thymus is a primary lymphoid organ in vertebrates. The true nature of thymic function is not well articulated in thymic immune biology of fish. The crowding of mitochondria in thymopharyngeal epithelial cell may provoke lymphoid cell differentiation (?) or may be mitochondria specific immunological response. This mitochondrial accumulation may produce mROS that trigger the activation of nuclear factor of activated T cell [1]. Our understanding also indicates that T cell proliferation may trigger the function of accessory immune cellular components (*i.e.*, macrophage,

plasma cell, mast cell, rodlet cell, granulated secretory cell, etc.) that rejuvenate the immune system at the time of cellular dysfunctions and ageing.

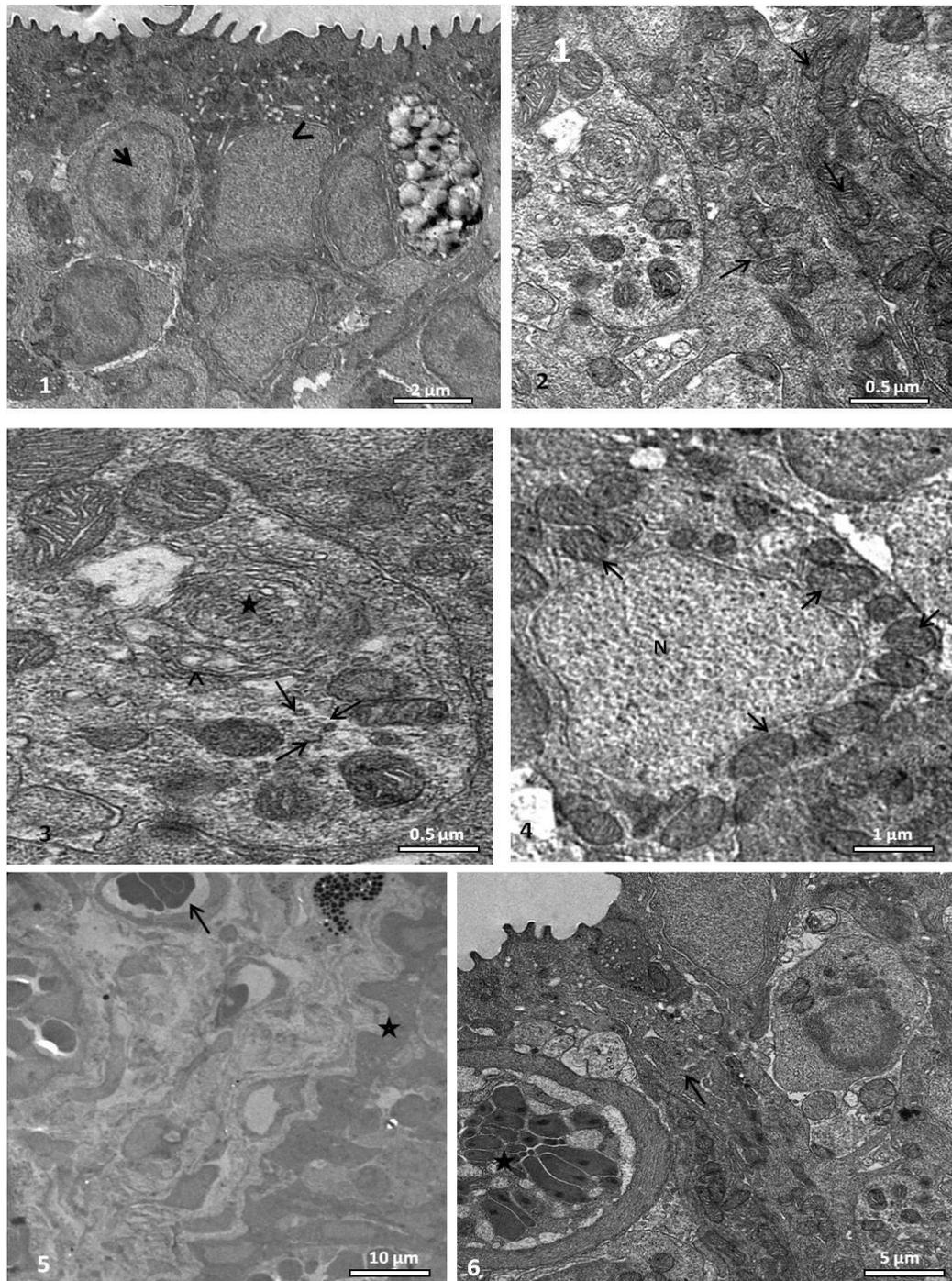


Fig.1: The electron micrograph shows the lymphoid (arrow) and non-lymphoid (arrow head) elements within thymic tissue of *Channa gachua*. **Fig.2:** The photomicrograph shows mitochondrial crowding (arrows) within the thymopharyngeal epithelial cells. **Fig.3:** Thymic non-lymphoid epithelial

components containing dense Golgi complexes (*), Rough Endoplasmic Reticulum (arrow head) with distinct secretory vesicles (arrows). **Fig.4:** Thymic lymphoid cell with euchromatic nucleus (N) having peri cytoplasmic accumulation of mitochondria (arrows). **Fig.5:** EM picture indicates the association (*) of thymic cells at the close proximal area of thymic trabeculae (arrow). **Fig.6:** The photo micrograph shows rodlet cell (*) with distinct secretory granulated sacs, cytoskeletal structures of epithelial cell (arrow) within the thymic tissue of *C. gachua*.

References:

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