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Vesicular Diversity and Crowding within the Olfactory Sensory Receptor Neuron

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The olfactory sensory receptor neuron (OSRN) is an important cellular component of the vertebrate olfactory system that are responsible for detection and discrimination of different type of chemical cues from the external environment [1]. The neural communication between the sensory receptor cells is generally mediated through vesicles [2]. The fine structural details of OSRN aim to unfold the vesicular morphometry, trafficking and crowding in relation to olfactory signal transduction in a mudskipper [*Pseudapocryptes lanceolatus*] of South East Asia.

The unilamellar olfactory apparatus of adult, sex-independent *P. lanceolatus* was fixed in 2.5% glutaraldehyde in 0.1 (M) phosphate buffer (pH. 7.2) at 4°C and secondary fixation by 1% osmium tetraoxide in the same buffer for 1 hour. The ultrathin sections (70 - 90) nm. were stained with uranyl acetate and lead citrate, examined under transmission electron microscope [TEM: MORGAGNI -268D] operated at 40kV [SAIF, All India Institute of Medical Sciences (AIIMS), New Delhi].

The OSRN is bipolar in nature and is divided into three regions *viz.,* dendron, perikaryon and axon (Figs. A, C and E). The terminal parts of the dendron and axon are bulges to form olfactory and synaptic knob respectively (Figs. C and E). The olfactory knob possesses 4 to 6 number of kinocilia (Fig. C). The perikaryon of OSRN is integrated with chromatinized nucleus, mitochondria, rough endoplasmic reticulums (rER), free and polyribosomes, vesicles with different morpho anatomy *(i.e.,* small vesicles, small dense core vesicles, pleomorphic vesicles, coated vesicles and synaptic vesicles), Golgi complex, lysosomes, *etc.* (Figs. A and B). The granulated cytoplasm of the perikaryon also possesses glycogen droplets. The different phases of the vesicles are space specific and the polarity of the said vesicles within the perikaryon is also distinct. The small vesicles (10 - 20) nm. are mostly distributed at the proximal region of the perikaryon, cytoplasm of the dendron along with microtubules (20 - 25) nm. and neurofilaments (7 - 10) nm., axonemal region of each kinocilium respectively. These vesicles are subsequently crowded near the centriole of the basal body of each kinocilium. The frequency of small dense core vesicles (30 - 40) nm., coated vesicles (60 - 70) nm. and synaptic vesicles (70 - 90) nm. are higher within the axoplasm of OSRN. These vesicles are characteristically docked and fused with the synaptic cleft (20 - 25) nm. of the synaptic knob of OSRN.

The accumulation of different vesicles at the olfactory knob and synaptic knob of OSRN may not only indicate the unique bidirectional vesicle mediated trafficking through cytoskeletal structures [3] but also denotes as crowding of specific peptides (?) during the olfactory signal transduction in *P. lanceolatus.*

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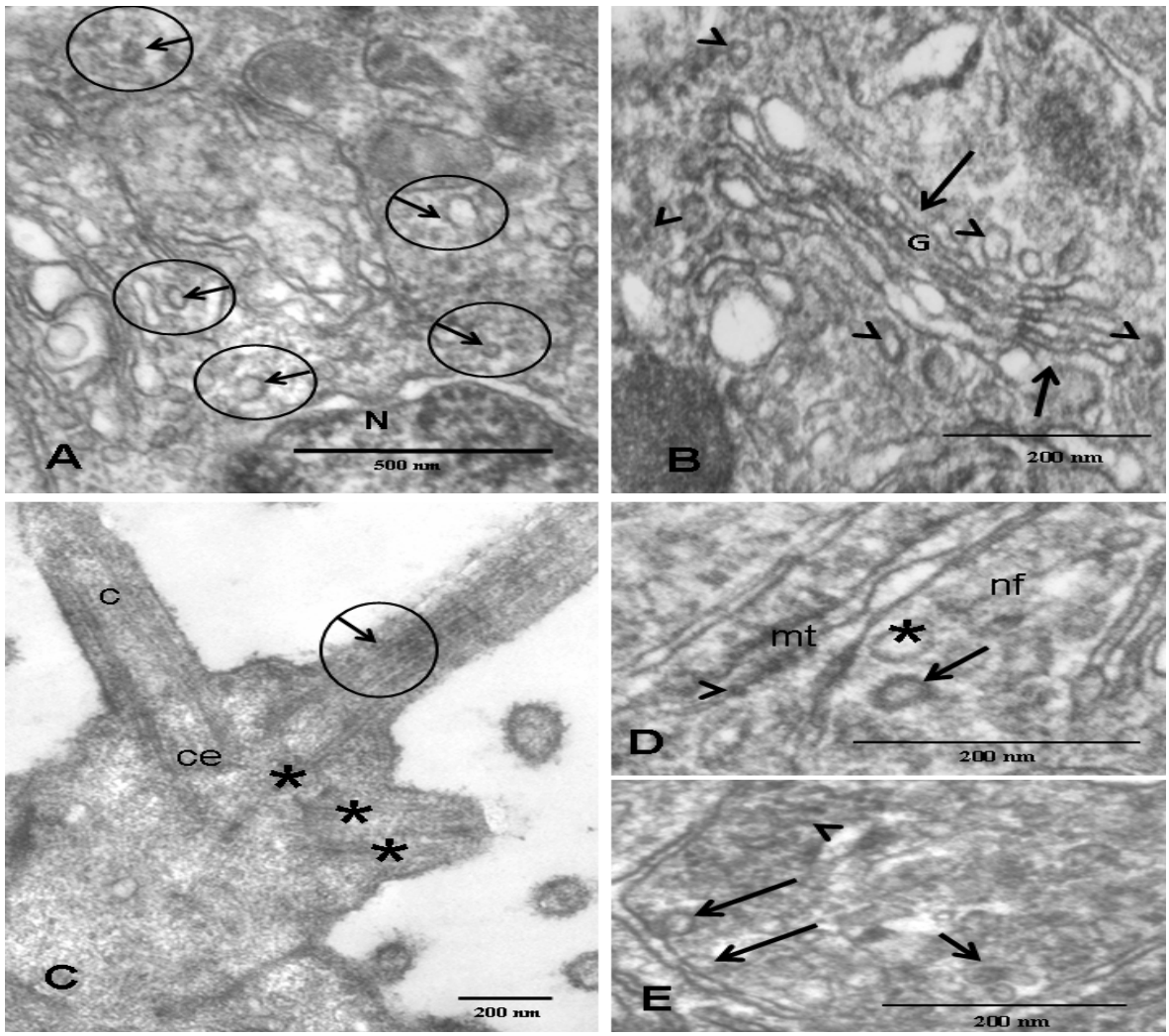

Figure 1. The electron micrograph shows the perikaryon of olfactory sensory receptor cell (OSRN) with vesicular diversity (arrows) within the perinuclear cytoplasm. Nucleus (N).
Figure 2. The phases of secretory vesicles (arrow heads) and prominent cis-trans Golgi axis (arrows) are demonstrated by transmission electron micrograph.
Figure 3. The olfactory knob is associated with kinocilia (c). Small vesicles are docked (stars) near the centriole (ce) of the basal body of the kinocilium (c). The association of small vesicles and microtubules (arrow) are also marked.
Figure 4. Morphometrically distinct vesicles [*i.e.,* small dense core vesicle (arrow head), coated vesicle (arrow) and synaptic vesicle (star)], microtubule (mt) and neurofilament (nf) - are also noted within the axoplasm of OSRN
Figure 5. Synaptic vesicles (arrows) and small dense core vesicle (arrow head) are largely accumulated at the synaptic knob of OSRN.

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