

DIFFERENT TYPES AND LOCATIONS OF SEROTONIN POSITIVE CELLS IN THE EPITHELIUM OF THE FEMALE RAT URETHRA

Hypothesis / aims of study

The urethral epithelium is one of the many epithelia where neuroendocrine (NE) cells or paraneurons can be identified. Epithelial paraneurons are morphologically subdivided into the closed or open type, where the open NE cells extend a narrow apical cytoplasm to the luminal space. Microvilli have been identified on the apical region of the open type NE cells, thus potentially acting as sensory cells for stimuli from the lumen. Open type NE cells have been predominantly identified in the urethra. The present study investigated the different types and locations of serotonin positive NE cells in the urethral epithelium of the female rat.

Study design, materials and methods

Twelve urethras were dissected from Sprague-Dawley female rats (200-250 grams) and anesthetized with Pentobarbital (60mg/kg, intraperitoneal). The urethras were fixed with 4% paraformaldehyde, frozen and sections (8µm) were prepared for immunohistochemistry. Antibodies (Abs) were used to detect immunoreactivity (IR) to serotonin (5HT-IR), nitric oxide synthase (nos-IR) and visualized with appropriate fluorescent secondary Abs.

Results

Two different types of serotonin positive cells morphologies could be identified in the urethral epithelium, i.e. round and "nematode" like type cell. The round type may represent the closed type paraneurons, whereas the "nematode" like cell may represent the open type paraneuron with frequently sending a cytoplasmic process to the luminal area. Though, some "nematode" like cells sent processes toward the epithelial base or both. The round type was typically found in the bladder neck, whereas the "nematode" like cell was abundantly found in the proximal/mid urethra and to a lesser extend more distal (Figure 1). A close relationship of "nematode" like cells and nos-IR fibers could be occasionally seen in the subepithelium of the urethra (Figure 1).

Interpretation of results

These results demonstrate different types and locations of serotonin positive cells in the female rat urethra. The abundance of respectively the round type of serotonin positive cells in the bladder neck and the "nematode" like serotonin positive cells in the proximal and mid urethra raises the possibility of two different functions of serotonin positive cells in the urethral epithelium. The presence of microvilli on open type paraneurons hypothesizes the possibility to conduct luminal stimuli. Moreover, the close relationship of serotonin positive cells and nos-IR fibers in the subepithelium suggests the possibility of communication between the serotonin positive cells and the nervous system.

Concluding message

The current study identified and located two main types of serotonin positive cells in the female rat epithelium. The different location and morphology (open or closed type cell) of these serotonin positive cells suggests separate functions in the urethra. Based on the current results, these functions could be the sensation of luminal stimuli and the communication between the urethral lumen and the nervous system.

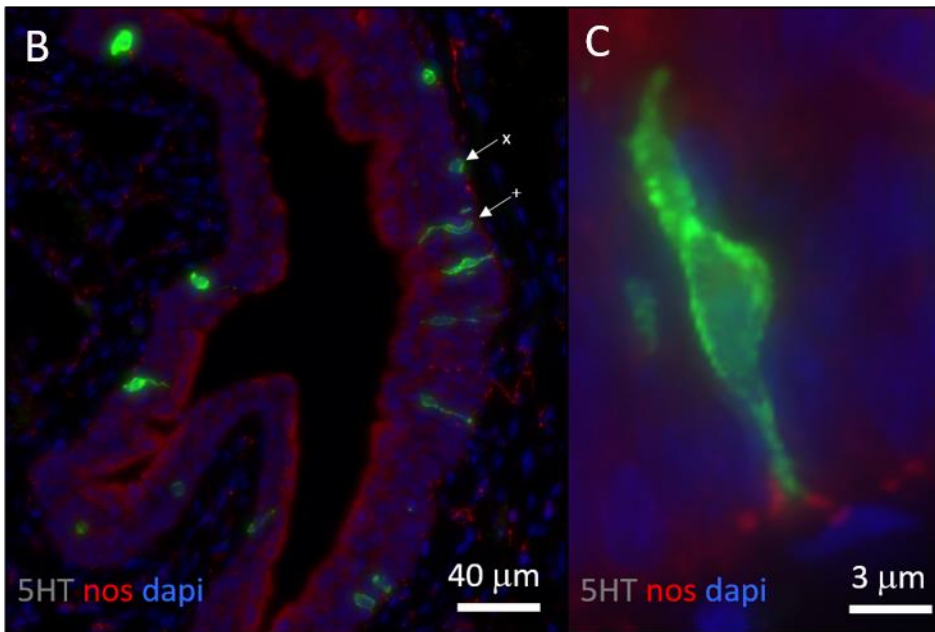
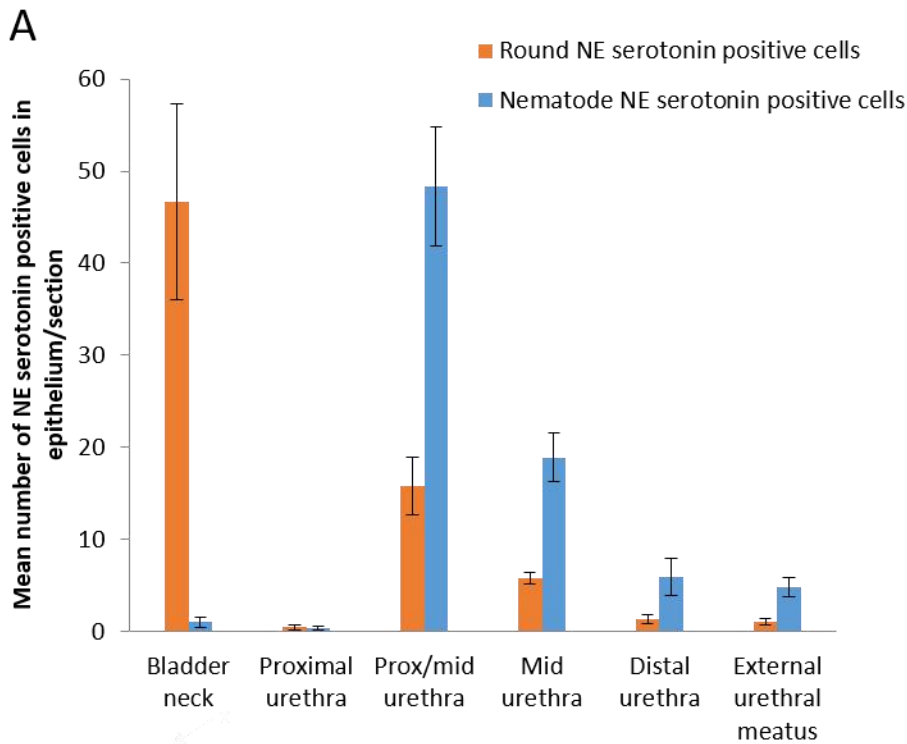


Figure 1. A) Bar chart shows mean number of serotonin positive cells in the urethral epithelium of two identified types. B) Shows a section of the mid urethra illustrating immunoreactivity to serotonin (5HT-IR: green) and nos (nos-IR: red). Cell nuclei are stained with dapi (blue). Arrows show the types of identified serotonin positive cells; (x) round type, (+) "nematode" like type. C) Showing a serotonin positive cell (nematode like type) sending cytoplasmic processes to the luminal area and towards the epithelial base. Note the close relationship of the cell with the nos-IR fiber in the subepithelium.

Disclosures

Funding: NONE **Clinical Trial:** No **Subjects:** ANIMAL **Species:** RAT **Ethics Committee:** The protocol was approved by the animal ethics committee of the Faculty of Medicine and Health Sciences, University of Antwerp (EC2014-89).