

ULTRASTRUCTURAL PROPERTIES OF INTERSTITIAL CELLS OF CAJAL IN THE GUINEA-PIG URINARY BLADDER

Hypothesis / aims of study

Interstitial cells of Cajal (ICC) have been identified in the urinary bladder and can be identified with antibodies to the Kit receptor which is a marker of ICC. Several sub-populations of *Kit*-positive ICC are present in the lamina propria and detrusor muscularis of the guinea-pig bladder (1). Transmission electron microscopy was the standard means of identification of ICC in gastrointestinal tissues (2, 3) before the discovery of specific cell markers.

The aim of the present study was to investigate the ultrastructural characteristics of interstitial cells of Cajal (ICC) in the guinea-pig urinary bladder.

Study design, materials and methods

Bladders were removed from male guinea-pigs (200-600g) and processed for transmission electron microscopy. Some sections were labelled with *c-Kit* antibodies and colloidal gold particles for positive identification of ICC.

Results

Kit-positive cells, identified with 10nm gold particles, were located on the periphery of detrusor smooth muscle bundles and in the interbundle spaces. The ICC had lateral branches which extended towards other ICC, neighbouring smooth muscle cells or nerves. ICC typically contained mitochondria, rough and smooth endoplasmic reticulum, thin and intermediate filaments, caveolae, Golgi apparatus, free ribosomes, cytoplasmic vesicles and had a basal lamina. They were distinct from smooth muscle cells by an absence of dense bodies, membrane attachment bands and thick filaments. While they had abundant rough endoplasmic reticulum, this did not have the dilated form which is typical of fibroblasts. The ultrastructure of ICC in both the lamina propria and the detrusor regions was similar and the myofibroblast characteristic, fibronexus, was not evident in any of the cells examined.

Interpretation of results

Bladder ICC possess typical ultrastructural characteristics of ICC from other tissues and were immunopositive for the ICC marker, *Kit*. They were closely associated with detrusor smooth muscle and often networked with other ICC. Absence of characteristic myofibroblastic and smooth muscle features indicated that these cells more closely match the ICC phenotype.

Concluding message

ICC in the guinea-pig bladder, identified with *Kit* antibodies, possess the ultrastructural profile of typical ICC. The expansion of interest in this cell type in the bladder over the last decade has served to enhance our understanding of the complexity of the interactions of the cells present in the bladder wall.

References

1. Davidson RA and McCloskey KD (2005) *J Urol* 173: 1385-90
2. Rumessen JJ and Thuneberg L. (1996) *Scand J Gastroenterol Suppl.* 216:82-94
3. Komuro et al (1999). *Arch Histol Cytol.* 62: 295-316

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| Specify source of funding or grant | Funding was received from the Wellcome Trust and the European Union FP7. |
| Is this a clinical trial? | No |
| What were the subjects in the study? | ANIMAL |
| Were guidelines for care and use of laboratory animals followed or ethical committee approval obtained? | Yes |
| Name of ethics committee | The animals had been sacrificed by cervical dislocation in accordance with Schedule 1 United Kingdom Animal Scientific Procedures Act (1986) and were approved by local University animal welfare and ethics committee. |