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STRUCTURAL ORGANISATION OF THE INTERSTITIAL CELLS OF THE BLADDER IN DIFFERENT SPECIES: COMPARATIVE DATA FROM HUMAN, RAT AND GUINEA PIG BLADDERS

Hypothesis / aims of study

The interstitial cells of the bladder (ICB) have been described for the first time as target cells for neuronally released NO in the bladder. (1) At present, it seems that in humans, two networks of ICB are present: a suburothelial network and a network in the fibromuscular axes of the detrusor muscle. (2)
The ICB are thought of as pacemaker cells, as an integrative or conductive network, as neuromodulating cells or as stretch receptors in the bladder, but convincing evidence for these hypotheses is lacking.
Different studies examined the ICB from different species, rendering the comprehension of the exact role of the ICB in bladder physiology and pathophysiology more difficult. When immunohistochemistry is performed in these previous studies, different types of antibodies have been used for the characterisation of the ICB, which contributed to the confusion.
In the present study, we collected bladders from 3 different species and compared the structural organisation of the interstitial cells of the bladder using the same commercially available antibodies.

Study design, materials and methods

All bladder samples have been obtained according to local ethical regulations.
Full thickness human bladder pieces were obtained from macroscopically and histologically normal areas of patients undergoing cystectomy for invasive bladder cancer.
Entire animal bladders were removed from adult Whistar rats and from adult guinea pigs.
All tissue was immediately frozen in nitrogen cooled isopentane and processed to 5 µm slides. Commercial rabbit antibodies used in this study were directed against the kit receptor, TRPV1, connexin 43, synaptofysin and nNOS.

Results

In all species, 2 networks of interstitial cells were observed: a dense suburothelial network and a less prominent network in the fibromuscular axes of the detrusor. The interstitial cells of both networks in all three species are immunoreactive to kit, the vanilloid receptor TRPV1, the gap junction protein connexin 43, synaptofysin (a protein involved in exocytosis of granules) and nNOS. In the guinea pig, the basal layers of the urothelium seem to contain kit and TRPV1 immunoreactive cells.

Interpretation of results

For the first time, this immunohistochemical study systematically compares the two networks of interstitial cells of the bladder of 2 different species to the networks of ICB in the human bladder. The structural organisation of human and rat bladders seems almost identical containing two distinct networks of interstitial cells. The immunohistochelical characterisation of these networks suggests a role in normal bladder physiology.
In guinea pig bladders, there is an additional cell population in the basal layer of the urothelium. It could be that in guinea pig, this cell layer is a source of renewal of the urothelium.

Concluding message

There is a remarkable similarity in the organisation of the networks of interstitial cells in human, rat and guinea pig bladders.

References

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