

EXPRESSION OF EPITHELIAL SODIUM CHANNELS IN THE EPITHELIUM OF THE HUMAN URINARY BLADDER

Aims of Study

Functional bladder disorders such as incontinence and overactive bladder affect a large proportion of the population especially with increasing age. Despite the fact that these bladder disorders are common, there are many aspects of bladder function, which are poorly understood. For example the transduction of sensory information relating to bladder filling and emptying cycles at the cellular level of the urothelium.

In rabbit urinary bladders it has been shown that there are epithelial sodium channels (ENaCs) in the urothelium, which comprise three subunits, alpha, beta and gamma. The ENaCs have been shown to be mechanosensitive, having the ability to change their sodium transport properties following small changes in hydrostatic pressure, as might occur in normal bladder filling and emptying (1). This hydrostatic pressure change also results in a release of adenosine triphosphate (ATP) from the urothelium (2), which could act as a signalling molecule to ATP receptors, on the urothelium and underlying sensory nerves, to convey the sensory information of normal filling (3).

However to our knowledge it is unreported whether the three subunits of the ENaC are present in the human urinary bladder urothelium.

Methods

Ethical approval was obtained for this project.

By using bladder urothelium from human subjects who have given informed consent, we have been looking for the presence of all three subunits of ENaC. Reverse transcriptase – polymerase chain reaction (RT-PCR) has been used to look for mRNA coding for the subunits. Western blotting using commercially available antibodies (ADI) has been used to look for the expression of the protein for all of the three subunits.

Results

Using RT-PCR we have shown mRNA expression for the alpha, beta and gamma subunits of ENaC. With Western blotting we have also shown expression of all three subunits at the protein level within human bladder urothelium.

Conclusions

It is a novel finding that all three subunits of the epithelial sodium channel are present in the human bladder urothelium. If they behave in a similar manner to those in the rabbit and are mechanosensitive then they may an important role in bladder filling and emptying. They may also play a part in pathological conditions such as incontinence.

- 1 Urothelial function.
BJU Int. 1999 ;84(3):235-42
- 2 ATP is released from rabbit urinary bladder epithelial cells by hydrostatic pressure changes--a possible sensory mechanism?
J.Physiol. 1997 ;505 (2):503-11.
- 3 Distribution of P2X1 and P2X3 receptors in the rat and human urinary bladder
Pharmacology 2001;63:120-128