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Role of the Urinary Bladder in Water Metabolism — How Does the Bladder Absorb Urine?

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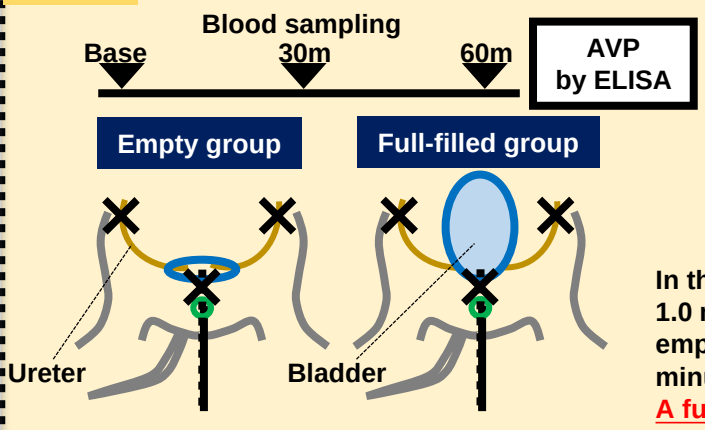
Introduction

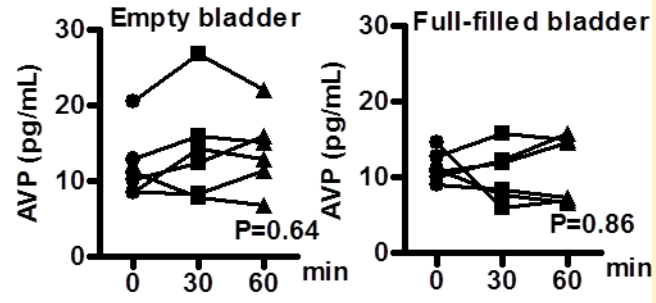
Previous clinical reports suggested that the human bladder affects the secretion of arginine vasopressin (AVP) and the rat bladder absorbs urine and small solutes. We hypothesized that: [1] filling of the bladder induces AVP secretion; [2] AVP induces water absorption in the bladder; and [3] water absorption in the bladder is associated with solutes. The aim of the study was to investigate these hypotheses by performing rat experiments.

Material methods and Results

Exp.1

SD Rat, Female, 300 g, N=12



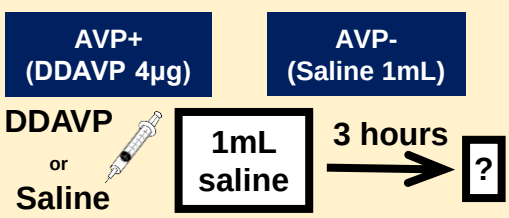


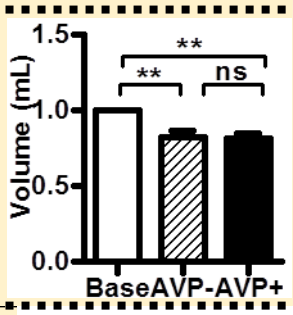
In the full-filled bladder group, the bladder was filled with 1.0 mL of saline. In the control group, the bladder was empty. Serum AVP was measured over time (0, 30, 60 minutes), using an ELISA kit.

A full-filled bladder did not modify the serum AVP level.

Exp.2

SD Rat, Female, 300 g, N=10



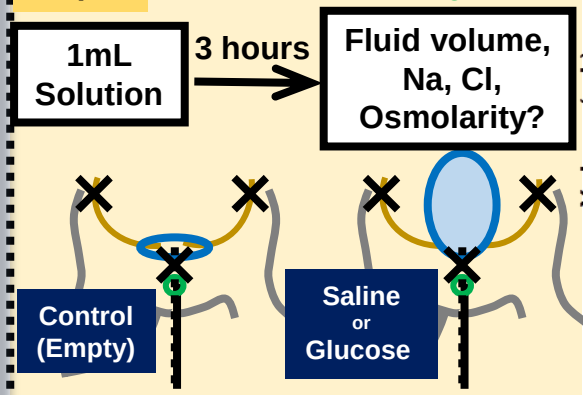


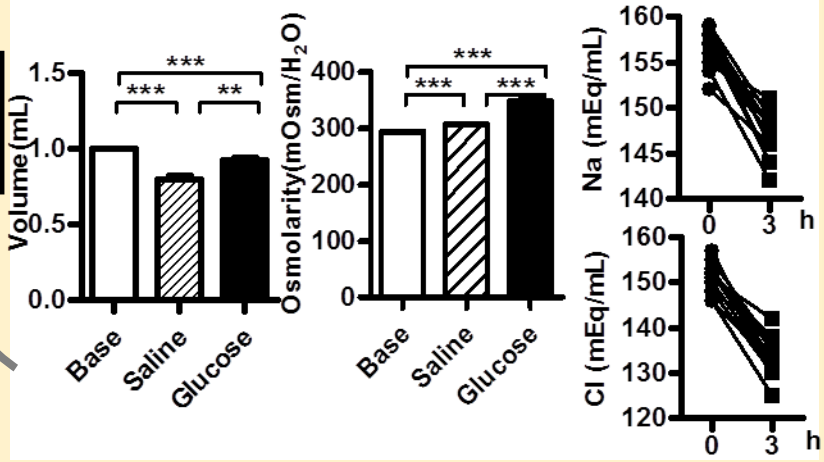
In the AVP+ group, 4 μg/rat of DDAVP was intravenously administered. In the AVP- group, saline was administered.

Although the intravesical fluid volume significantly decreased over time, DDAVP administration did not affect the extent of the decrease.

Exp.3

SD Rat, Female, 300 g, N=36





The bladder was filled with 1.0 mL of saline or a 5% glucose solution for 3 hours. The intravesical fluid volume as well as the concentration and osmolarity of sodium and chloride were all measured.

The intravesical volume of saline significantly decreased more than that of the 5% glucose solution.

In the saline group, the levels of sodium and chloride decreased.

The osmolarity was significantly higher in the glucose group compared with the saline group.

Summary and Conclutions

The urinary bladder absorbed water or solutions when it was fully filled. The extension of the bladder wall and absorption of the intravesical solution was not associated with serum AVP levels. Water effectively permeated the urothelium in the presence of small molecules.

The urinary bladder has an AVP-independent absorptive function associated with smaller solutes such as electrolytes.

The authors declare no conflicts of interest.