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Sympathetic Regulation of Aquaporin Water Channels in Rat Kidney

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Background: The expression of aquaporin (AQP)-2 water channels is increased in response to arginine vasopressin (AVP) and water deprivation. The present study was designed to determine whether there exist neural mechanisms regulating AQP channels.

Methods: Male Sprague-Dawley rats (~250g) were used. They were unilaterally renal nerve denervated by stripping the renal nerves and painting 10% phenol red around the renal artery under ketamine anesthesia. They were then subjected to water deprivation for three days, during which V2 receptor antagonists (arginine-vasopressin fragment 4-9) were subcutaneously infused at 0.5 μg/100g/day through osmotic pump. Protein expression of AQP1-4 in the homogenates of kidney inner medulla was determined by Western blot analysis.

Results: Following the water deprivation and V2 antagonism, the expression of AQP2-4 proteins was significantly increased in the innervated kidney, while not significantly altered in the denervated kidney. The expression of AQP1 channels was not significantly altered either in the denervated or in the innervated kidney.

Conclusions: These results indicate that AQP water channels are regulated by renal sympathetic nervous system in the kidney, independently of AVP system.