

일측 신절제 유도 염분 민감성 고혈압 백서에서 potassium 투여가 sodium 운반체 발현에 미치는 영향

서울대학교병원 신장내과¹, 분당서울대학교병원 신장내과², 보라매병원 신장내과³
가천의과학대학교 신장내과⁴, 국군수도병원 신장내과⁵

정지용¹ · 정은숙¹ · 손민정⁵ · 김세중⁴ · 오윤규³ · 나기영² · 한진석¹ · 주권욱¹

Effect of Potassium Repletion on the Expression of Sodium Transporter in Salt-sensitive Hypertensive Rats Induced by Uninephrectomy

Ji Yong Jung¹, Eun Sook Jung¹, Min-Jeong Son⁵, Sejoong Kim⁴
Yun Gyu Oh³, Ki Young Na², Jin Suk Han¹, Kwon Wook Joo¹

Division of Nephrology¹ Department of Internal Medicine Seoul National University Hospital
Division of Nephrology² Department of Internal Medicine Seoul National University Bundang Hospital
Division of Nephrology³ Department of Internal Medicine Boramae Hospital
Division of Nephrology⁴ Department of Internal Medicine Gachon University of Medicine and Science
Division of Nephrology⁵ Department of Internal Medicine Armed Forces Capital Hospital

Background : Dietary potassium is considered to be an important modulator of systemic blood pressure. The purpose of this study was to examine whether dietary potassium is associated with altered abundance of major renal sodium transporters that may contribute to the modulation of systemic blood pressure. The experiment were performed by potassium repletion (KR) in salt-sensitive hypertensive rats induced by uninephrectomy (uNx.-SSH rats).

Methods : Unilateral nephrectomy (uNx.) was performed in male Sprague-Dawley rats, and normal-salt diet (0.3% NaCl) was fed for 4 weeks. Thereafter high-salt diet (3% NaCl) was fed for whole experimental period. KR group was given mixed solution of 1% KCl substituted for drinking water. Expressions of major renal sodium transporters were determined sequentially at 1 wk and 3 wk by semi-quantitative immunoblotting. Physiologic parameters and daily sodium and chloride balance were also measured on the day of sacrifice.

Results : In KR group, urine flow rate was increased (1.52 ± 0.16 vs 1.22 ± 0.10 ml/hr/100gBwt at 1 wk; 1.63 ± 0.23 vs 1.18 ± 0.09 ml/hr/100gBwt at 3 wk, respectively), urine osmolality did not show any differences (603.9 ± 23.07 vs 634.2 ± 19.55 mOsm/Kg at 1 wk; 838.7 ± 57.87 vs 810.5 ± 90.70 mOsm/Kg at 3 wk, respectively) compared with control group and daily sodium and chloride balances were negative (-1.99 ± 0.48 and -2.61 ± 0.44 mmol/24hr/100gBwt at 1 wk; -0.79 ± 0.65 and 2.56 ± 0.86 mmol/24hr/100gBwt at 3 wk, respectively). Systolic BP of KR group was decreased compared with that of control group (140.3 ± 2.97 vs 150.9 ± 4.04 mmHg at 1 wk; 180.3 ± 1.76 vs 207.7 ± 6.21 mmHg at 3 wk, respectively). Protein abundances of NCC, ENaC- γ and NHE3 in KR group significantly decreased (49%, 33%, 21 % of control group at 1 wk; 16%, 10%, 7% of control group at 3 wk, respectively). Expression of AQP-2 was significantly reduced in response to KR (1% of control) at 3 wk. In contrast, expressions of NKCC2 and ROMK in KR groups did not show any significant alterations comparing with those in control group.

Conclusion : We demonstrated a blood pressure-lowering effect of dietary potassium supplementation in uNx.-SSH rats, associated with increased sodium and chloride excretion. Adaptive alterations of NCC, ENaC- γ , NHE3 may partly play a role in antihypertensive effect of dietary potassium. Further studies are needed to elucidate the precise mechanism.

Key Words : 포타시움, 염분민감성 고혈압, 신 소듐 운반체

Potassium, Salt sensitive hypertension, Renal sodium transport