No. 1236

Usefulness of Urinary and Plasma Aminograms in Predicting Salt Sensitivity and Hypertension

Junichi Yatabe

Fukushima Medical University

Summary

1) Characteristic alterations of plasma and urine amino acids in Dahl salt-sensitive rats

Background: We have previously reported that urine and plasma amino acid patterns differ by hypertensive strain (SHR) and salt loading (The Japanese Journal of Nephrology 54(3) 2012: 285). The current study explored if salt sensitivity can be determined by characteristic amino acid patterns.

Methods: Dahl salt-sensitive rats (DSS) and salt-resistant rats (DSR) were fed normal-salt (0.28%) or high-salt (4%) chow for 1 week. Urine and plasma amino acid and metabolite concentrations were measured by LC/MS/MS.

Results: Urine volume was significantly less in DSR on both diets. On normal salt, urinary amino acids did not differ by strain. On high-salt, urine excretions of sarcosine, alanine, hydroxyproline, glycine, 3-methylhistidine and arginine associated with strain. Multiple regression analysis showed that alanine, hydroxyproline and 3-methylhistidine presented significant relationship with the salt-sensitive strain ($R2=0.79$, $P=0.002$). In plasma, glycine and alpha-aminobutyric acid concentrations differed significantly by strain.

Conclusion: Urinary amino acids changed dynamically in salt-sensitive animal model and with dietary NaCl.

2) Effects of salt intake and salt sensitivity on amino acid dynamics in humans

Background: Animal studies suggested that amino acid patterns may be useful in predicting salt intake and salt sensitivity. A clinical study was performed to determine if it is applicable to humans.

Methods: Nine healthy volunteers were examined during their usual diet, low-salt diet (3 g NaCl/day) for 7 days, and high-salt diet (20 g NaCl/day) for 7 days. Blood pressure, urine, and blood samples were taken on the last day of each diet. Subjects with salt sensitivity index (SSI = (mean blood pressure (MBP) during high-salt diet – MBP during low-salt diet)/MBP during low-salt diet) of greater than or equal to 0.05 were considered salt sensitive, and those with SSI below 0.05 were considered salt resistant. Amino acid measurements were by LC/MS/MS.

Results: There were no adverse events. Urinary sodium excretion reflected the salt intake on both diets. Change from low- to high-salt diet significantly increased the plasma hydroxyproline concentration while decreased the concentrations of methionine and phenylalanine. Plasma concentrations of sarcosine and lysine were significantly lower in the 3 salt-sensitivie subjects than the 6 salt-resistant subjects during low-salt diet.

Conclusion: Results of the above studies suggest that amino acid patterns are significantly affected by salt intake and salt sensitivity. Aminograms from plasma and urine may aid our understanding of the pathophysiology of hypertension. Further clinical studies are necessary to explore their diagnostic possibility in the future.