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Salt intake influences the interaction between the renin-angiotensin and renal dopaminergic systems in normotensive humans

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The renin-angiotensin and renal dopaminergic systems interact to maintain sodium balance. Dopamine, whose synthesis and activity is increased by sodium excess, decreases sodium transport, while the renin-angiotensin system, which is activated by sodium deficit, increases sodium transport. The effects of sodium intake on interactions between these two systems were studied in seven salt-resistant normotensive adults in a double blind placebo-controlled balanced crossover design. All subjects attained sodium balance on low (50 mmol/day) and high (300 mmol/day) salt diets, administered four weeks apart. Sodium, potassium, lithium, para-aminohippurate, and creatinine clearances were measured before, during, and after a three-hour infusion with fenoldopam, a dopamine D1-like receptor agonist, in all subjects with and without pretreatment with enalapril, an angiotensin converting enzyme inhibitor. On high salt, fenoldopam induced natriuresis, associated with inhibition of proximal and distal tubular sodium transport. On low salt, fenoldopam-mediated natriuresis, (which was less than that observed on high salt), was associated with inhibition of distal, but not proximal, tubular sodium transport. The addition of enalapril to fenoldopam on low salt diet restored fenoldopam's inhibitory effect on proximal tubular sodium transport. In contrast, on high salt diet, enalapril blunted fenoldopam's inhibitory effect on distal tubular sodium transport. We conclude that increased activity of the renin-angiotensin system during low salt diet accounts for the attenuated natriuretic response to D1-like receptor stimulation, reported previously in humans. This is the first demonstration of an interaction between the renin-angiotensin and renal dopaminergic systems in humans, and highlights the influence of dietary salt on these interactions.

Biography

Aruna Natarajan graduated from Armed Forces Medical College, Pune, completed residency training in London, and Dartmouth Medical School, and fellowship at University of Texas Southwestern Medical Center at Dallas. She holds a PhD in Physiology and Biophysics from Georgetown University. She is a pediatric intensivist and Associate Professor of Pediatrics, Pharmacology and Physiology at Georgetown University Hospital and School of Medicine. Her research focuses on molecular mechanisms underlying cardiovascular disease and their translational pharmacological applications. The above study was performed under the mentorship of Dr. Pedro A. Jose, currently Professor of Medicine at the University of Maryland, Baltimore, USA.

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