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Renal dopaminergic mechanisms and hypertension

M. Pestana, A. Ferreira, J. Santos and P. Soares-da-Silva
Department of Nephrology and Institute of Pharmacology and Therapeutics, Faculty of Medicine, 4200, Porto, Portugal.

Several studies have shown that the kidney has both prohypertensive and antihypertensive functions. Because dopamine (DA) which is synthesised in renal proximal tubules from filtered L-3,4-dihydroxyphenylalanine (L-DOPA) is both vasodilatory and natriuretic, it plays an important paracrine/autocrine role in the regulation of renal function. The relative importance of this system in controlling natriuresis assumes particular relevance in view of the findings that salt sensitive (SS) hypertensives (HT) may have a fault in renal dopamine production and this may be associated with salt sensitivity of their blood pressure (BP). In the renal proximal tubules, dopamine may be metabolised by intracellular monoamine oxidase (MAO) to dihydroxyphenylacetic acid (DOPAC), before having access to the urine. Thus, the functional activity of dopamine released by the epithelial cells might depend in part on the MAO activity. The recovery of renal function in renal transplant recipients is accompanied by an enhanced ability to synthesise dopamine and deaminate it to DOPAC, which may contribute to maintain sodium homeostasis. Patients suffering from chronic renal parenchymal disease, a well recognised form of SS hypertension, have a reduced ability to produce dopamine and deaminate it to DOPAC, which correlates well with deterioration of renal function. In patients with IgA nephropathy, but normal renal function, urinary excretion of dopamine correlates positively with BP responses to changes from 20 to 350 mmol/day sodium intake. Patients afflicted with minimal change nephrotic syndrome and heart failure present with an increase in DA/L-DOPA urinary ratios. This suggests that these edema formation conditions are accompanied with an increased ability to take up or decarboxylate L-DOPA in renal tubules. It is concluded that activity of renal dopaminergic system is altered in subjects with renal parenchymal diseases and this may contribute to salt sensitibity of their BP. An enhanced delivery of L-DOPA to the kidney may be beneficial in edema formation states. The urinary levels of DOPAC may represent a good marker of renal production of dopamine as well as a good index of cell integrity and viability.

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