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Acid-Base Balance-Electrolyte Quiz – Case 71

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All of the above mechanisms contribute to the decreased potassium excretion in cases of potassium depletion, except of:

(a) Reduced aldosterone production

(b) Reduced abundance of the renal outer medullary K^+ channels (ROMK) in the luminal membrane

(c) Reduced NaCl reabsorption in the early distal tubular cells

(d) Increased NaCl reabsorption in the early distal tubular cells

Comment

In response to potassium depletion, a reduced aldosterone production is associated with a decreased number of open epithelial sodium channels (ENaC) in the luminal membrane of principal cells in the distal tubules. Decreased sodium reabsorption is associated with a reduced potassium secretion through decreased lumen-negative transepithelial electrical potential. Potassium depletion is also associated with a reduced abundance of ROMK channels in the luminal membrane of principal cells (due to both hypokalemia and angiotensin II, which inhibits ROMK activity). Furthermore, increased reabsorption of sodium chloride in the early distal convoluted tubule (DCT1) is observed leading to decreased flow rate in the distal tubules and subsequently to reduced potassium excretion. This increased sodium reabsorption is related with increased phosphorylation and activation of sodium chloride cotransport (NCC) in the early DCT1 due to a cascade of mechanisms, which involve the K_{ir} 4.1/K_{ir} 5.1 channels in the basolateral membrane, the intracellular Cl^- concentration, the with no lysine kinases (WNK), as well as the angiotensin II.

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Answer: c (reduced NaCl reabsorption in the early distal tubular cells)