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Acid-Base Balance-Electrolyte Quiz – Case 72

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All of the above mechanisms contribute to the increased flow rate in the distal tubules associated kaliuresis, except for:

(a) Increased activity of the big potassium (BK) channels

(b) Increased sodium reabsorption in the distal nephron

(c) Increased intrarenal recycling of urea

(d) Increased activity of the renal outer medullary potassium channels (ROMK)

Comment

Increased tubular flow is associated with kaliuresis through the flow-activated BK channels mainly in the intercalated cells mediated by an increase in intracellular cytoplasmic concentration of calcium anions. However, an increased flow rate is associated with increased sodium flux and subsequently sodium reabsorption through the epithelial sodium channel (ENaC) in the distal nephron resulting in elevated potassium secretion due to increased lumen negative transepithelial electrical potential. Flow rate is determined by the numbers of effective osmoles in the luminal fluid, that is Na^+ (and Cl^-), and urea. Increased intrarenal recycling of urea provides adequate number of osmoles to be excreted and adequate flow rate. Interestingly, hypokalemia is associated with increased sodium reabsorption in the both proximal and distal tubular cells, as well as with a reduced intrarenal recycling of urea resulting in a reduction of the tubular flow rate in the distal nephron and a decrease in potassium excretion.

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Answer: d (increased activity of ROMK potassium channels)