Counter Current Mechanism

The concentrating mechanism depends upon the maintenance of a gradient of increasing osmolality along the medullary pyramids. This gradient is produced by the operation of the **loops of Henle** as **countercurrent multipliers** and maintained by the operation of the vasa recta as countercurrent exchangers. A countercurrent system is a system in which the inflow runs parallel to, counter to, and in close proximity to the outflow for some distance. This occurs for both the loops of Henle and the vasa recta in the renal medulla

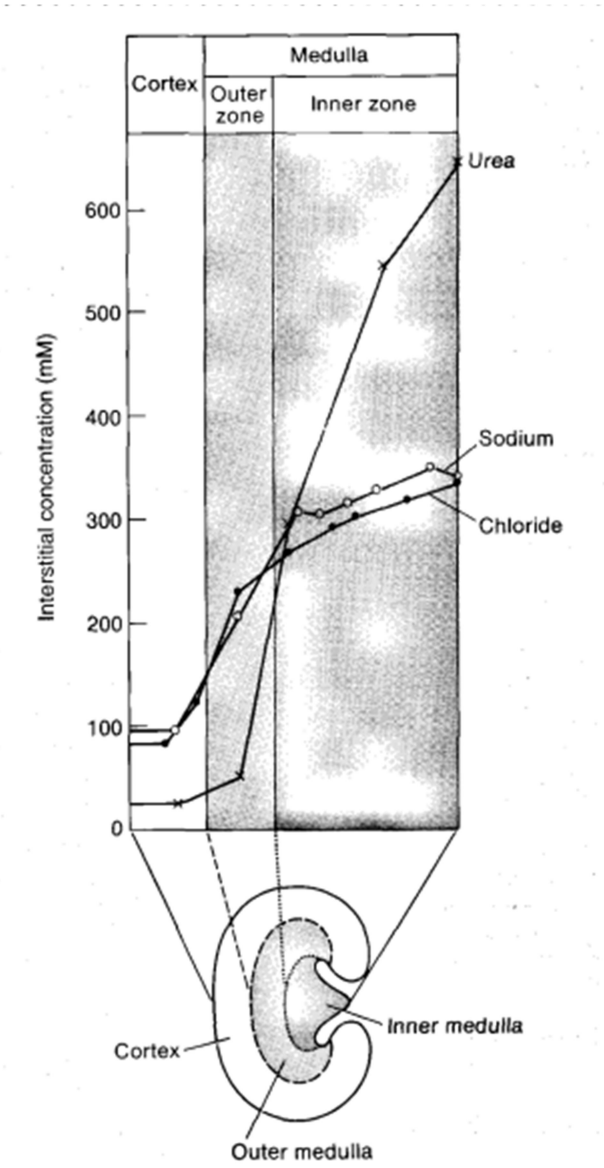

Figure1: Solute concentrations in the interstitium of the mammalian kidney progressively increase from the cortex into the depths of the medulla. Shown here are the interstitial concentrations (in millimoles per liter) of urea, sodium, and chloride at different depths. Note that *most of the increase in urea concentration occurs across the inner medulla, whereas most of the increase in NaCl concentration occurs across the outer medulla*. Since the osmotic contributions of Na^+ and Cl^- sum, the total osmotic contributions of NaCl and urea are about equal deep within the medulla.

The operation of each loop of Henle as a counter current multiplier depends on the high permeability of the thin descending limb to water (via aquaporin-1), the active transport of Na^+ and Cl^- out of the thick ascending limb, and the inflow of tubular fluid from the proximal tubule, with outflow into the distal tubule.