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COMPUTATION OF RENAL OSMOTIC WORK IN A "PASSIVE" CENTRAL CORE MODEL INCORPORATING MEDULLARY GEOMETRY AND PELVIC UREA REFLUX.

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Medullary countercurrent parameters,i.e.,solute and solvent fluxes and permeabilities in vivo and in vitro,including urea reflux from pelvic urine(1),loop of Henle outer(OM) and inner(IM) medullary architecture, and particularly the dichotomic merging of collecting ducts were incorporated into a differential equation model of the renal counterflow system. The computation(multiple shooting method(2))of renal osmotic work allowed predictions about concentration profiles in all tubular medullary structures.

Results. The results produced by this model agree with the measured values along the nephron and in pelvic urine.

	Cortico-medull.jct.			OM-IM jct.			tip of papilla		
DLH	140	18.0	3.0	498	62	11.0	552	175	13.7
ALH	30	83.0	10.8	456	169	12.6	552	175	13.7
CD	23	121.0	21.0	143	707	131.0	286	587	261.0
IS	140	9.0	-	455	144	-	513	245	-

Numbers indicate:NaCl ($mmol \cdot l^{-1}$); urea ($mmol \cdot l^{-1}$); TP/P inulin. Abbrev.:DLH-desc.loop of Henle;ALH-asc.loop of Henle;CD-collect.duct; IS-interstitium. Pelvic urine was 331, 463, 301, the osmotic activity was 1065 $mosm \cdot l^{-1}$.

Conclusions.Principal characteristics of the model are: (i) Urea recycles through the loop of Henle to OM segments and water abstraction enhances urea concentration in OMCD, as predicted(3). (ii)CD architecture (exponential reduction of tubes) is decisive for maintaining OMCD urea concentration against low IS urea up to CD pelvic entry, even if IMCD urea permeability coefficient is unfavorably high. (iii) Additional entry of urea by diffusion from pelvis into IM IS,thereby enhancing urea trapping in IM. (iv) The properties (ii)and (iii) are more effective in supplying urea to IM than IMCD urea diffusion alone.

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