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ARTICLES

Determinants of intrarenal oxygenation. I. Effects of diuretics

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To study renal cortical and medullary oxygen tensions, we used sensitive Clark-type O2 microelectrodes, inserted by micromanipulators into the cortex and medulla of kidneys of anesthetized rats. As previously reported, under basal conditions, medullary PO2 was significantly lower than cortical PO2. Furosemide, which inhibits reabsorptive transport in the medullary thick ascending limb, increased medullary PO2 from 16 +/- 4 to 35 +/- 4 mmHg ($P < 0.0005$) without altering cortical PO2. This effect, reproduced by ethacrynic acid and bumetanide, was selective for loop diuretics and was directly due to decreased tubular O2 consumption, since medullary blood flow was remarkably reduced by furosemide (-28 +/- 6% from baseline, $P < 0.0001$, as measured by a laser-Doppler probe). By contrast, acetazolamide, which decreases proximal tubule metabolism, selectively increased cortical PO2. These data are, in general, consistent with tubular metabolism as a major determinant of intrarenal oxygenation and suggest, in particular, that medullary reabsorptive work is at least in part responsible for renal medullary hypoxia.

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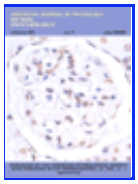
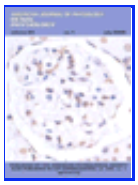


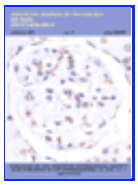
Am. J. Physiol: Renal Physiology HOME

M. Pedersen, Z. Vajda, H. Stodkilde-Jorgensen, S. Nielsen, and J. Frokiaer
Furosemide increases water content in renal tissue
Am J Physiol Renal Physiol, May 1, 2007; 292(5): F1645 - F1651.
[Abstract] [Full Text] [PDF]



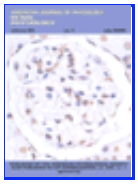
Am. J. Physiol: Renal Physiology HOME

N. Li, F. Yi, C. M. Sundy, L. Chen, M. L. Hilliker, D. K. Donley, D. B. Muldoon, and P.-L. Li
Expression and actions of HIF prolyl-4-hydroxylase in the rat kidneys
Am J Physiol Renal Physiol, January 1, 2007; 292(1): F207 - F216.
[Abstract] [Full Text] [PDF]



Am. J. Physiol: Renal Physiology HOME

P. V. Prasad
Functional MRI of the kidney: tools for translational studies of pathophysiology of renal disease
Am J Physiol Renal Physiol, May 1, 2006; 290(5): F958 - F974.
[Abstract] [Full Text] [PDF]



Am. J. Physiol: Renal Physiology HOME

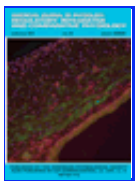
W. Zhang and A. Edwards
A model of glucose transport and conversion to lactate in the renal medullary microcirculation
Am J Physiol Renal Physiol, January 1, 2006; 290(1): F87 - F102.
[Abstract] [Full Text] [PDF]

The Journal of Physiology HOME

W. Neuhofer, M. Vastag, M.-L. Fraek, and F.-X Beck
Effect of ammonium on the expression of osmosensitive genes in Madin-Darby canine kidney cells
J. Physiol., March 1, 2005; 563(2): 497 - 505.
[Abstract] [Full Text] [PDF]

Seminars in Cardiothoracic and Vascular Anesthesia HOME

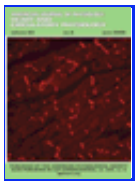
S. Garwood
Renal Insufficiency After Cardiac Surgery
Seminars in Cardiothoracic and Vascular Anesthesia, September 1, 2004; 8(3): 227 - 241.
[Abstract] [PDF]



Am. J. Physiol: Regulatory, Integrative and Comparative Physiology HOME

D. L. Mattson
Importance of the renal medullary circulation in the control of sodium excretion and blood pressure
Am J Physiol Regulatory Integrative Comp Physiol, January 1, 2003; 284(1): R13 - R27.

[Abstract] [Full Text] [PDF]



Am. J. Physiol: Heart and Circulatory Physiology HOME

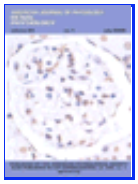
W. Zhang and A. Edwards
Oxygen transport across vasa recta in the renal medulla
Am J Physiol Heart Circ Physiol, September 1, 2002; 283(3): H1042 - H1055.
[Abstract] [Full Text] [PDF]

Physiological Genomics HOME

A.-P. ZOU, Z.-Z. YANG, P.-L. LI, and A. W. COWLEY JR.
Oxygen-dependent expression of hypoxia-inducible factor-1{alpha} in renal medullary cells of rats
Physiol Genomics, August 28, 2001; 6(3): 159 - 168.
[Abstract] [Full Text] [PDF]

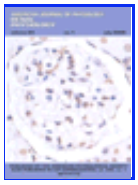
Physiological Reviews HOME

E. Feraille and A. Doucet
Sodium-Potassium-Adenosinetriphosphatase-Dependent Sodium Transport in the Kidney: Hormonal Control
Physiol Rev, January 1, 2001; 81(1): 345 - 418.
[Abstract] [Full Text] [PDF]



Am. J. Physiol: Renal Physiology HOME

W. Lieberthal and S. K. Nigam
Acute renal failure. I. Relative importance of proximal vs. distal tubular injury
Am J Physiol Renal Physiol, November 1, 1998; 275(5): F623 - F632.
[Abstract] [Full Text] [PDF]



Am. J. Physiol: Renal Physiology HOME

A. D. Baines, G. Adamson, P. Wojciechowski, D. Pliura, P. Ho, and R. Kluger
Effect of modifying O2 diffusivity and delivery on glomerular and tubular function in hypoxic perfused kidney
Am J Physiol Renal Physiol, April 1, 1998; 274(4): F744 - F752.
[Abstract] [Full Text] [PDF]

Circulation HOME

B. C. Kone
A `BOLD' New Approach to Renal Oxygen Economy
Circulation, December 15, 1996; 94(12): 3067 - 3068.
[Full Text]

Circulation HOME

P. V. Prasad, R. R. Edelman, and F. H. Epstein
Noninvasive Evaluation of Intrarenal Oxygenation With BOLD MRI
Circulation, December 15, 1996; 94(12): 3271 - 3275.

[Abstract] [Full Text]

The NEW ENGLAND JOURNAL of MEDICINE HOME

M. Brezis and S. Rosen
Hypoxia of the Renal Medulla -- Its Implications for Disease
N. Engl. J. Med., March 9, 1995; 332(10): 647 - 655.
[Full Text] [PDF]