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Ion Transports in Mouse Collecting Duct Cells (M-1)

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The mammalian cortical collecting duct (CCD) plays a major role in regulating renal NaCl absorption, which is important in controlling total body Na and Cl homeostasis. The M-1 cell line, derived from the mouse cortical collecting duct, is being used as a mammalian model of the CCD to study electrolytes transport.

M-1 cells were grown as monolayers on collagen-coated permeable support and short circuit current (I_{sc}) was measured. M-1 cells developed amiloride-sensitive current 4-5 days after seeding. Apical and basolateral addition of ATP induced increase in I_{sc} in M-1 cells. Experiments with ion channel blockers and ion substitution showed that the current represented amiloride-sensitive Na current and CFTR-mediated Cl current. RT-PCR analysis demonstrated M-1 cells express CFTR and ENaC transcripts. Nucleotide sentitivity study revealed the ATP-induced response was mediated via P2U receptors in the apical and basolateral membrane of M-1 cells, which was supported by RT-PCR analysis. Dexamethasone-treated monolayers showed higher transepithelial resistance and ATP and vasopressin-induced I_{sc} responses than control monolayers. However, dexamethasone did not affect expressions of ion channels and P2U receptor. We analyzed effect of dexmethasone on expression of the proteins which are involved in the formation of tight junction.

These results showed that ATP regulated Na and Cl transport in M-1 cells via P2U purinoceptors of the apical and basolateral membranes, and that dexamethasone induced the formation of tight junctional complex.