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Proposed Mechanisms in Changes of the Cellular Composition in Potassium-depleted and - Repleted Rat Kidneys

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Proposed Mechanisms in Changes of the Cellular Composition in Potassium-depleted and - Repleted Rat Kidneys

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Purpose : Potassium depletion induces hypertrophy and hyperplasia of intercalated cells (IC) and principal cells (PC), in particularly change of cellular composition of IC and increased cell proliferation. In contrast, potassium repletion induces regression of structural changes, and the decrease of cell number results from apoptosis. The purpose of this study was to examine the time course of changes in the cellular composition, the possible mechanism behind these changes, and the origin of IC in potassium- depleted and repleted rat kidney.

Methods : Sprague- Dawley rats received K^+- depleted diets for 1, 7, and 14 days. After 2 weeks of K^+- depletion, some rats were received normal diets for 1, 3, 5, and 7 days. H+- ATPase, pendrin, and AE1 were used to identify IC, and AQP2 was used to identify PC. Proliferating cells were identified with an antibody against 5- bromo-2- doxyuridine (BrdU), and apoptosis were identified by using the ApopTag kit.

Results : In K^+- depletion, BrdU- positive nuclei appeared mainly in AOP2- positive/H^+- ATPase- and pendrin-negative PC, however, the fraction of the cell density of PC was decreased compare to the control rats. While only a few AOP2- negative/H^+- ATPase- and pendrin- positive IC had BrdU- positive nucleus, but the fraction of the cell density of IC was markedly increased in K^+- depletion. In K^+- repletion, these changes were rapidly disappeared and became the control level on K^+- repleted 7 days. We determined the role of apoptosis in these changes. As a result, TUNEL- positive cells were detected mainly in AOP2- positive/H^+- ATPase- and pendrin-negative PC after K^+- repletion, but not observed in K^+- depletion. There was no TUNEL- positive/ H^+- ATPase- and pendrin- positive IC in both K^+- depleted and repleted groups.

Conclusion : In conclusion, the K^+- induced fractional change in the density of IC is associated with high proliferative and apoptotic rate of PC than a selective proliferation and apoptosis of IC.

Key Words : 저칼륨혈증, Transdifferentiation, 전구세포
K^+- depleted and repleted rat, Transdifferentiation, Precursor cell