

콩팥의 요세관형성시 Klotho 단백질의 역할 규명 및 발현에 관한 연구

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The Role of Klotho Protein in the Tubulogenesis of Developing Mouse Kidney

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The Klotho gene is involved in the development of a syndrome resembling human ageing. Klotho mutant mouse exhibits various phenotypes in a wide range of organs including arteriosclerosis, neural degeneration, skin and gonadal atrophy, pulmonary emphysema, calcification of soft tissues, and cognition impairment. The most characteristic phenotypes seem to be caused by abnormalities in calcium metabolism. Furthermore, the Klotho gene is expressed principally in the important tissues for calcium homeostasis such as distal tubule cells of the kidney. However, little is known about the expression of Klotho protein in the fetal and neonatal kidney. The purpose of this study was to examine the time of expression and the distribution of Klotho protein in the developing and hypokalemic mouse kidney. Kidney from 16-, 18-, and 20-day-old fetuses and 1-, 4-, 7-, 14-, and 21-day-pups, and adult animals processed for immunohistochemistry and immunoblot analysis. In the adult mouse kidney, Klotho protein was expressed only in a few cells of the connecting tubules (CNT) and cortical collecting ducts (CCD). In the developing mouse kidney, Klotho immunoreactivity was first observed in a few cells of the CNT of 18-day-old fetus. In 20-day-old fetus, Klotho immunoreactivity was increased in CNT and also observed in the outer portion of MCD and in tip portion of renal papilla. During the first 3 wk after birth, Klotho-positive cells gradually disappear from the MCD by apoptosis, whereas remain in the CNT and CCD. To identify Klotho-positive cells in the CNT and CCD, double-labeling procedure was used. H⁺-ATPase and Klotho were labeled simultaneously by a double-labeling technique in both adult and developing kidney. This study demonstrates that Klotho protein is expressed in the intercalated cells of CNT and CCD, and suggests that Klotho protein may have a role in regulation of acid-base balance in the developing and adult mouse kidney. And, it demonstrates that prolonged potassium depletion is associated with decreased expression of Klotho in the CNT, DCT, CCD, and OMCD. These observations suggest that changes in Klotho expression in the intercalated cells of the CNT, DCT, CCD, and OMCD may contribute to the impaired acid-base regulation associated with potassium deprivation.

Key Words : 클로쏘, 발생 콩팥, 저칼륨혈증

Klotho, Developing kidney, Hypokalemia