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K^+ Secretion through K^+ Channels along the Kidney Nephron

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Summary

The mouse kidney plays important roles in the body acid-base balance as well as potassium (K) homeostasis, especially in response to dietary acid (0.28 M NH_4Cl) intake. In order to investigate whether pH-sensitive two-pore potassium channel (TASK2) may play an important role in maintaining acid-base homeostasis, we purchased the TASK2 genetrap ES cell from German Gene Trap Consortium (GGTC) and developed TASK2 knockout (KO) mice (homo). It is known that TASK2 is expressed in the kidney proximal tubule and may be responsible for HCO_3^- reabsorption. In the present study we have determined whether TASK2 WT/KO mice maintain plasma pH by reabsorping HCO_3^- from the glomerular filtrate and decreasing the urinary pH. By using a high sensitive in situ hybridization (HS-ISH) method, we found that TASK2 mRNA, counted as dots in approximately 1 μm diameter, was expressed in proximal convoluted/straight tubules (PCT/PST) in the cortex, but NOT in the medullary thick ascending limb of Henle's loop (MTAL) or the cortical collecting duct (CCD). No expression was observed in the region of the inner medulla. TASK2 KO mice (5-11 wk) seemed to be normal, but small in weight (▲15%). Plasma pH showed week acidosis in KO mice fed normal chow. No further decrease in pH was observed during a 6-d period of acid-loading. These results suggest that although TASK2 KO mice have low ability of HCO_3^- reabsorption in kidney, distal nephron may in part compensate acid-base balance, at least, under the acid-loading.