The changes of pendrin-positive intercalated cells in hypokalemia mouse kidney

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Hypokalemiais associated with elevated plasma bicarbonate concentration and enhanced bicarbonate reabsorption in the distal nephron including connecting tubule (CNT) and collecting duct (CD). In CNT and CD, intercalated cells play a major role in bicarbonate secretion and reabsorption. We therefore examined the response of pendrin-positive intercalated cells to K depletion in the mouse. Mice received a K-deficient diet for two weeks. Kidneys were processed for light and electron microscopic immunocytochemistry using antibodies to H^+-ATPase, AE1, and pendrin for identification of subtypes of intercalated cells. In normal mouse kidney, strong apical pendrin immunoreactivity was observed in both type B and non A-non B intercalated cells. However, the subcellular location of pendrin was different between these two cell types. In non A-non B cells, pendrin was mainly located on the apical plasma membrane, whereas pendrin was mainly located in apical cytoplasmic vesicles in type B intercalated cells. In hypokalemiamouse kidney, immunoreactivity for H^+-ATPase and pendrin was markedly reduced in both type B and non A-non B intercalated cells, and the cell size and the relative number of these cells were reduced. In contrast, type A intercalated cells revealed cellular hypertrophy, elaborate apical microplicae, enhanced apical H^+-ATPase polarization and basolateral AE1 immunolabeling, and an increase inthe relative number of cells. The relative number of principal cells was also decreased in hypokalemia animals. However, BrdU-positive nuclei were observed mainly in AE1- and H^+-ATPase-negaitive cells and in a few type A intercalated cells, suggesting that non-intercalated cells might be the source of the increased of type A intercalated cells in hypokalemia animals. These results suggest that reduction of HCO_3^- secretion by inactivated pendrin-positive non A-non B and type B intercalated cells and increased HCO_3^- reabsorption by activated type A intercalated cells play a role in maintaining metabolic alkalosis associated with hypokalemia mice.

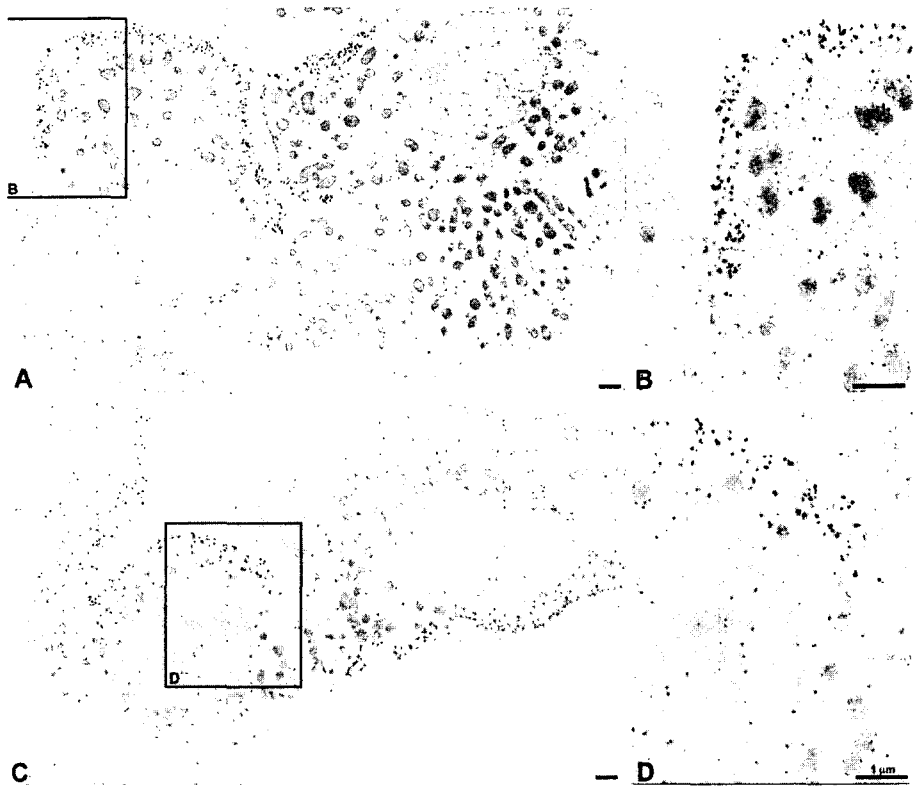

Fig. 1. Transmission electron microscopic localization of AE1 and pendrin in the control (**A** & **B**) and in the hypokalemia (**C** & **D**) mouse kidneys. In non A-non B intercalated cell, pendrin labeling immunogold particles are well localized on the apical plasma membrane. The cell size and pendrin immunoreactivity of non A-non B cells are dramatically decreased in the potassium-depleted than in the control. Note that type A intercalated cell with basolateral AE1 labeling is larger than inactivated non A-non B intercalated cell in hypokalemia animal. **B** and **D**are higher magnification of the area indicated by rectangle in A and C respectively. Bar = 1 ㎛.