INCREASE OF Na^+ GRADIENT-DEPENDENT L-GLUTAMATE AND L-ASPARTATE TRANSPORT IN HIGH K^+ DOG ERYTHROCYTES ASSOCIATED WITH HIGH ACTIVITY OF (Na^+, K^+)-ATPase

Mutsumi INABA

Department of Veterinary Internal Medicine
Faculty of Veterinary Medicine
Hokkaido University, Sapporo, 060, Japan

As reported previously (MAEDE, Y., INABA, M. & TANIGUCHI, N. (1983): *Blood*, **61**, 493-499), certain dogs possess red cells characterized by low Na^+, high K^+ concentrations and high activity of (Na^+, K^+)-ATPase, although normal dog red cells contain low K^+, high Na^+, and lack (Na^+, K^+)-ATPase. Furthermore, these red cells show increased activities of L-glutamate and L-aspartate transport, resulting in high accumulations of such amino acids in their cells. The present study demonstrated: (i) Na^+ gradient-dependent L-glutamate and L-aspartate transport in the high K^+ and low K^+ red cells were dominated by a saturable component obeying Michaelis-Menten kinetics. Although no difference of the Km values was observed between the high K^+ and low K^+ cells, the Vmax values for both amino acids transport in the high K^+ cells were about 3 times those of low ones. (ii) L- and D- Aspartate but not D-glutamate competitively inhibited L-glutamate transport in both types of the cells. (iii) Ouabain decreased the uptake of the amino acids in the high K^+ dog red cells, whereas it was not effective on those in the low K^+ cells. (iv) The ATP-treated high K^+ cells ($[K^+]_{in} \fallingdotseq [K^+]_{out}$, $[Na^+]_{in} > [Na^+]_{out}$) showed a marked decrease of uptake rath of both amino acids, which was almost the same as that of the low K^+ cells. (v) Valinomycin stimulated the transport of the amino acids in both of the high K^+ cells ($[K^+]_{in} > [K^+]_{out}$, $[Na^+]_{in} < [Na^+]_{out}$), suggesting that the transport system of L-glutamate and L-aspartate in both types of cells might be electrogenic. These results indicate that the increased transport activity in the high K^+ dog red cells was a secondary consequence of the Na^+ concentration-gradient created by (Na^+, K^+)-ATPase.