

ENHANCED EXPRESSION OF GLUCOSE TRANSPORTER 1 ON ERYTHROCYTE MEMBRANE IN HEMODIALYSIS PATIENTS: THE POSSIBLE ROLE IN ERYTHROCYTE ASCORBATE RECYCLING

Joseph G Wann¹, C-S Lin², P-H Shen³, X-W Yang⁴, C-C Chang⁵, H-C Huang⁶, C-F Chen⁷

Department of Physiology, Medical College, National Taiwan University^{1,7}; Department of Emergency and Critical Care^{2,3,4}; Division of Nephrology, Department of Internal Medicine^{5,6}, Cheng-Hsin Rehabilitation Medical Center.

BACKGROUND: Human erythrocytes can take up dehydroascorbate on the glucose transporter 1 (GLUT 1) and reduce it to ascorbate. Intra-erythrocyte ascorbate has been proven to be directly responsible for the decreased oxidation of extra-erythrocytic ascorbate. In addition to spontaneous and irreversible loss of ascorbate in plasma, the hemodialysis (HD) process itself also consumes plasma ascorbate. However, the status of intra-erythrocyte ascorbate in uremic patients during HD has yet to be reported.

METHODS: Plasma and intra-erythrocyte ascorbate, dehydroascorbate concentrations, the GLUT 1 expression levels on the erythrocyte membrane (EM), and in vitro studies of “erythrocyte ascorbate recycling” were investigated in age- and sex-matched healthy subjects (CN group) and in HD patients (HD group).

RESULTS: We found that intra-erythrocyte ascorbate concentrations decreased after one session of HD, compared with those of pre-HD, and recovered to the values of pre-HD 2 days later, whereas plasma ascorbate concentrations did not recover. In vitro studies suggested that erythrocytes of HD patients possess a stronger ability to maintain intracellular ascorbate concentrations compared with those of healthy subjects. This ability could be inhibited by cytochalasin B (GLUT 1 inhibitor). We also found increased expression levels of GLUT 1 ($p = 0.002$) on EM in the HD group compared with those in the CN group.

CONCLUSION: Erythrocytes of uremic patients lost a large amount of ascorbate during HD, but regained it to the pre-HD level 2 days later. Enhanced expression of GLUT 1 on EM in HD patients compared with healthy subjects may contribute to better preservation of intracellular ascorbate.

Keywords: Ascorbate, erythrocyte, glucose transporter 1, hemodialysis.