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Effects of Volume Depletion and $NaHCO_3$ Loading on Expression of NHE3, NBC1 and NOS in Rat Kidney

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Purpose : Volume depletion is associated with the development of metabolic alkalosis. In the kidney, bicarbonate reabsorption in the proximal tubule is predominantly mediated by type 3 Na^+/H^+ exchanger (NHE3) and type 1 Na^+: HCO_3^- cotransporter (NBC1). Nitric oxide may play a role in the regulation of proximal tubular reabsorption. The present study was aimed to determine the effects of volume depletion and $NaHCO_3$ loading on the expression of NHE3, NBC1, and nitric oxide synthase (NOS) in the kidney.

Methods : Rats were divided into four groups: control (HC), dehydration (DC), $NaHCO_3$ loading (HB), and dehydration plus $NaHCO_3$ loading (DB) groups. Two days thereafter, the protein expression of NHE3, NBC1 and that of three NOS isoforms, i.e., nNOS, iNOS and eNOS, were determined in the cortex of the kidney by immunoblotting. Tissue contents of the nitric oxide metabolites (nitrite/nitrate, NOx) were determined by colorimetric assay.

Results : The expression of NHE3 and NBC1 increased in DC group, while decreased in HB group. In DB group, the expression of NHE3 was decreased compared with that in DC group, while increased compared with that in HB group. The NBC1 expression was increased in DB group compared with that in the others. NOx contents and nNOS expression were decreased in DB rats, compared with that in HC rats, although there were no significant differences among DC, HB and DB groups. The expression of iNOS was decreased, whereas that of eNOS was increased in DB rats compared with that in the others.

Conclusion : An altered volume status and $NaHCO_3$ loading may alter the regulation of NHE3 and NBC1 in the kidney, in which endogenous NO system may play a role.