Continuous determination of Na concentration in CSF during recovery from thermal dehydration in rats.

Morimoto, T., Nose, H., and Doi, Y.
Dept. of Physiol. , Kyoto Pref. Univ. of Med.

To determine changes in Na concentration in the cerebrospinal fluid ([Na]csf) during restitution from thermal dehydration, we developed a method to measure [Na]csf continuously in rats using a double barreled Na sensitive electrode. The Na sensitive membrane was prepared by immobilizing an ion-exchanger (Bis 12-crown-4). The confidence limit for measuring Na concentration was ±0.5 meq/kg H2O within a physiological range. We placed the electrode in the right lateral ventricle of an anesthetized rat thermally dehydrated by about 11% of body wt. Na concentration in plasma ([Na]p) was measured by a flow cell typed Na sensitive electrode placed in an extracorporeal by-pass circuit between the left carotid artery and right jugular vein. We measured changes in [Na]p and [Na]csf continuously during the infusion of 2.5 ml/ 100g body wt of distilled water for 10 min and following 20 min after the end of infusion. [Na]p began to decrease 3 min after the start of infusion and attained the lowest value of -11.6±0.9 meq/kg H_2O at 6 min after the end of infusion. This level was maintained until the end of experiment. [Na]csf decreased slowly after the start of infusion and at the end of experiment the change was -5.9±0.5 meq/kg H_2O. To assess the change in water and/or Na ion movement between blood and CSF in dehydrated rats, the response time of [Na]csf to change in [Na]p was compared between dehydrated(D) and euhydrated rats (E). The response time in E was 5.3±0.6 min which was significantly larger than in D , 2.0±0.5 min ($p<0.01$). The slope of △[Na]csf vs.△[Na]p determined from the data for the infusion period was 0.43±0.07 in E and 0.37±0.07 in D without any significant difference. These results suggest that [Na]csf showed attenuated and delayed response against acute change in [Na]p and recovered more slowly than [Na]p during rehydration. In addition, the movement of water and/or Na between blood and CSF was accelerated during rehydration.