

Expression of Na⁺ and K⁺ channels in neonatal rat kidney tubules.

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Summary

In neonatal Wistar rats, development of the formation of concentrated urine and the excretion of potassium (K⁺) in the kidney was investigated. Urine was collected every 2-3 hours from the external urethral orifice with micro pipette. Neonates from the same mother were kept without administration one by one in an environment of constant humidity and temperature (30-31 °C). In rats of 4-10 days of age, 10-12 h dehydration results in decrease of urine volume per hour (U.V.) and increase in urinary osmolality. U.V. decreased during the first 4 hours and saturated. On the other hand, urinary osmolality increased during the first 7 hours and saturated. The maximum osmolality was 700, 850, and 850 mOsm/kgH₂O on 4, 7, and 10 days of age, respectively. In dehydrated rats contribution of urea to the formation of concentrated urine increased during the development: the maximum of urea contribution was 50%, 65%, and 70% on 4, 7, and 10 days of age, respectively. The maximum of free-water absorption was, in sequence, 40, 35, 56 μl/min/kg. These values are in agreement with the loss of body weight - the total U.V. which may equal to the loss of pure water during dehydration. We found that the kidney could control the body fluid osmolality even in the early neonates. In the second series of experiments, the eight neonates were divided into the two groups: low and high potassium administration. In both groups, K⁺ excretion showed the maximum at 3 hours after the K⁺ intake. The ratio of the total K⁺ excretion of the initial 6 hours and the K⁺ administration increased during development: 75%, 74%, and 92% for the high K⁺-intake group and 81%, 145%, and 203% for the low K⁺-intake group on 7, 10, and 14 days of age, respectively. In summary, the kidney controls osmolality and K⁺ concentration of the body fluid even in the early neonates.