The effect of hyperosmotic glucose infusion and diabetes mellitus induced by alloxan on various solute concentrations of the renal tissue, urine and plasma of rats were determined. The glucose infusion decreased the concentrations of sodium, potassium, chloride and ammonia, but increased in water content of the cortical slices. Both outer medullary and inner medullary sodium, potassium and urea concentrations were decreased. The rats with the glucose infusion had an increase in water content of the outer medulla, but that of the inner medulla was not changed. The rats with diabetes mellitus did not show changes in solute concentrations and water content in the inner medulla. However, the sodium, potassium, urea and ammonia concentrations were decreased in the cortex and the sodium concentration was decreased in the outer medulla. These results are interpreted in terms of both increasing the intratubular fluid flow rate and medullary blood flow rate following the glucose infusion whereas the effects of diabetes mellitus are interpreted in terms of increasing intratubular flow rate alone. In this experiment, it was also found that glucose infusion decreased almost all of the solutes concentration in the urine, except the ammonia concentration. Diabetes mellitus decreased sodium, chloride and urea concentrations but increased ammonia concentration. The significant increase in total output of both experimental groups was the total solute output. The increase sodium and chloride outputs in diabetes mellitus was probably the effect of increasing tubular flow rate and this influence on the tubular reabsorption of sodium and chloride ions. Diabetes increased ammonia concentration and these changes was probably the compensatory response to the chronic metabolic acidosis.
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