INTERACTION BETWEEN RENAL TRANSPORT OF DIODONE, GLUCOSE, AND URATES IN DOGS

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UDC 612.463

Interaction between the renal transport of diodone, glucose, and urates was investigated in chronic experiments on dogs. No changes were found in the maximal secretion of diodone and maximal reabsorption of glucose in response to the combined administration of these substances. It was also shown that with maximal saturation of renal secretory and reabsorption transport the excretion of urates was not significantly altered. The results indicate that combined administration of solutions of diodone and glucose can be used to enable the maximal secretion of diodone, the maximal reabsorption of glucose, and the excretion of urates to be determined simultaneously.

KEY WORDS: *maximal secretion*; *maximal reabsorption of glucose*; *excretion of urates*.

Transport of many organic compounds is known to take place in the proximal portions of the nephron. Some substances (diodone, p-aminohippuric acid — PAH) undergo active secretion, whereas others (glucose, amino acids) are actively reabsorbed in the proximal tubules, and a third group of substances (uric acid) is transported in both directions. Since the transport of each of the compounds mentioned above takes place in the same portion of the nephron and requires a definite expenditure of energy, it was decided to study whether their tubular transport is altered during their combined administration. Data in the literature on this problem are extremely contradictory. For instance, although the opinion is held that during combined administration there is a change in the rate of secretion of diodone and also in the rate of reabsorption of glucose [7], there is evidence that glucose does not affect PAH transport [12] and that PAH does not affect glucose transport [3]. After administration of PAH or diodone some workers found a decrease in the excretion of urates [14], others found an increase [10], and a third group found no effect [5, 8]. As regards the effect of glucose on uric acid excretion, some investigations showed increased excretion of urates [4, 13], whereas others showed no such effect [5, 9]. There is no information on the excretion of uric acid during combined administration of glucose and secreted substances.

In this investigation a) the effect of diodone and glucose on each other's tubular transport was studied and b) the effect of these substances when administered separately and together on the excretion of urates was examined, a matter of considerable procedural importance, for these compounds are frequently given simultaneously during renal function tests.

EXPERIMENTAL METHOD

Chronic experiments were carried out on dogs weighing 14-16 kg with ureters exteriorized by the Pavlov—Tsitovich method. The rate of glomerular filtration was determined with respect to inulin, a 0.5% solution of which was injected along with the solutions containing the test substances by intravenous infusion at the rate of 3 ml/min throughout the experiments (1.5 h). After a relatively stable background had been established urine was collected for three 10-min clearance periods, in the middle of which blood was taken for analysis. Inulin in the plasma and urine was determined by the resorcin method, diodone by the method of Bak et al. [2], glucose by the ortho-toluidine method, and urates in the urine by Sullo's method [1].

Department of Pharmacology, Altai Medical Institute. (Presented by Academician of the Academy of Medical Sciences of the USSR V. V. Zakusov.) Translated from Byulleten' Éksperimental'noi Biologii i Meditsiny, Vol. 83, No. 2, pp. 164-166, February, 1977. Original article submitted June 11, 1976.

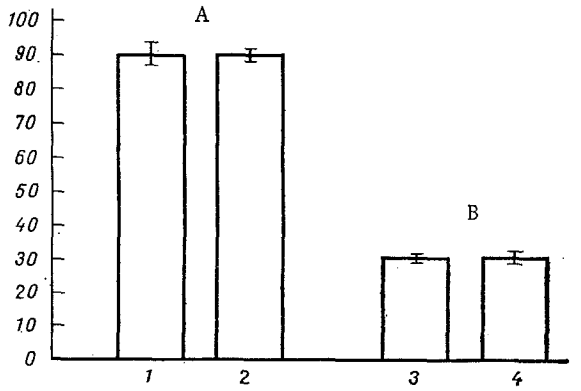

Fig. 1. Maximal reabsorption of glucose (A) and maximal secretion of diodone (B) after injection separately and together: 1) injection of glucose alone; 2) injection of glucose and diodone; 3) injection of diodone alone; 4) injection of diodone and glucose.

TABLE 1. Excretion of Urates after Injection of Solutions of Diodone and Glucose Separately and Together (each experiment is mean of 3 clearance periods)

Experimental conditions	No. of experiments	Excretion of urates, mg/min (M ± m)	P
Without injection of diodone and glucose	6	0,13±0,006	—
Injection of diodone alone	5	0,12±0,014	<0,5
Injection of glucose alone	5	0,14±0,007	<0,5
Injection of diodone and glucose	10	0,14±0,007	<0,5

EXPERIMENTAL RESULTS AND DISCUSSION

After injection of a solution containing 2% diodone and 40% glucose, under conditions of maximal loading of the secretory and reabsorption transport mechanisms, when the plasma diodone concentration was 30-40 mg% and its glucose concentration 400-500 mg %, the levels of maximal diodone secretion and of maximal reabsorption were distinguishable from values obtained when solutions of these substances were injected separately (Fig. 1). The results indicate no mutual influence of the processes of diodone and glucose transport.

With complete loading of the mechanism of tubular secretion as a result of injection of a solution of diodone, the excretion of urates did not differ significantly from the control values (Table 1). The increase in the excretion of urates observed by Miller et al. [10] following injection of Diodrast can be explained, in the writer's opinion, on the grounds that these workers determined the excretion of urates in the urine in the initial period at a time of spontaneous diuresis, but during the experiments at a time of increased diuresis. According to some authorities [6, 11], the excretion of urates depends largely on the magnitude of the diuressis.

After intravenous infusion of hypertonic glucose solution, when the reabsorption transport of glucose was completely loaded, the excretion of urates also was virtually unchanged. Consequently, the increased reabsorption of glucose could hardly modify the mechanisms of uric acid transport. In the present experiments the level of diuresis caused by intravenous infusion of the hypertonic solutions was virtually identical. As might be expected, the combined administration of a solution of diodone and glucose likewise did not change the

excretion of urates (Table 1).

Chronic experiments on dogs thus showed that diodone and glucose do not affect each other's transport if the two are given together. No effect of these substances on the excretion of uric acid with the urine likewise was found. This indicates that combined administration of solution of diodone and glucose can be given in order to determine the maximal secretion of diodone, maximal reabsorption of glucose, and the excretion of urates all in the same experiment.

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HOMOCOAGULATION ON CONTACT OF BLOOD WITH POLYMER MATERIALS WITH ELECTRETIC PROPERTIES

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UDC 612.115.3:678.7

The behavior of hemocoagulation was studied on polymer materials with electretic properties. Negative polarity of the electretic polymers was shown to lead to fibrinogenemia and to hypoadhesion of the platelets compared with electretic materials of positive polarity and with polymers with no static electricity. It is considered that adsorption of fibrin and hyperadhesion of platelets play the principal role in thrombogenesis on implanted polymers.

KEY WORDS: *electretic polymers*; *hemocoagulation*; *platelets*.

Polymers are widely used in clinical and experimental medicine at the present time. The chief complications observed after implantation of polymers is thrombus formation on their surface [1, 4, 6, 11]. The thromboresistant properties of polymers are largely dependent on the character of the electrokinetic processes arising on contact between the polymers surface and moving blood [13-17]. There is evidence in the literature that polymers with a negative surface charge reduce adhesion of platelets on their surface [14, 16, 11].

Polymers which retain their surface charge for a long time in the absence of an electric field are electrets. In the course of time the surface charge of an electretic polymer can fall and its polarity be reversed. However, there are polymers which retain their electretic effect for a long time. The writers have obtained an electretic effect on polymer materials

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(Presented by Academician of the Academy of Medical Sciences of the USSR A. M. Chernukh.) Translated from Byulleten' Éksperimental'noi Biologii i Meditsiny, Vol. 83, No. 2, pp. 166-169, February, 1977. Original article submitted May 5, 1976.