EFFECT OF DEXTRAN ON RESISTANCE OF ANIMALS TO INFECTION AND TO THE TOXIC ACTION OF NIKETHAMIDE

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The effect of dextran was studied on the resistance of albino mice (432) to infection with Escherichia coli and Staphylococcus aureus and on the resistance of rats (146) to the toxic action of nikethamide. Prophylactic administration of dextran to the animals in a dose of 1 ml/100 g was found to increase their resistance to these pathogenic agents. The protective action of dextran against nikethamide poisoning was slight if both substances were injected intraperitoneally. The authors explain this fact by assuming that dextran, when given by this route, enhances the transudative and resportive properties of the peritoneum.

Dextran solutions (Polyglucin, Rheopolyglucin, Macrodex, Rheomacrodex, etc.) have achieved wide popularity in clinical practice for the treatment of certain disturbances of the cardiovascular system, diseases of the gastro-intestinal tract, poisoning, and so on [1, 3-6]. In these cases the dextran solutions are injected intravenously. During recent years intraperitoneal injections of these substances have been given with success as a means of preventing adhesions in the abdominal cavity [7-9]. The mechanism whereby intraperitoneal injections of dextran prevent adhesion formation has received insufficient study.

The writers' experiments on 45 rats showed that intraperitoneal injection of dextran with a molecular weight in the middle range, in a dose of 1 ml/100 g body weight considerably enhances the transudative and resorptive properties of the peritoneum. For instance, 36 h after injection of the dextran the rate of transudation and resorption of human serum albumin I^{131} was almost doubled. Enhancement of the transudative and resorptive function of the peritoneum, as a factor in the anti-adhesive action of dextran, may also increase the degree of penetration of microorganisms and toxic products into the blood stream from the peritoneal cavity.

It was therefore decided to study the effect of dextran on the course and outcome of generalized septic infection in animals infected intraperitoneally (experiments on mice) and also of poisoning produced by the convulsant drug nikethamide (rats).

EXPERIMENTAL METHOD

Experiments were carried out on 432 albino mice of both sexes (weighing 18-27 g) and 146 albino rats (weighing 100-140 g).

The mice were infected by intraperitoneal injection of suspensions of 24-h agar cultures of Escherichia coli isolated from the peritoneal cavity of mice dying from peritonitis after artificial production of intestinal obstruction (4×10^8 bacterial cells in 0.4 ml isotonic NaCl solution) or of Staphylococcus aureus obtained from pus from a septic finger (5×10^8 bacterial cells in 0.5 ml isotonic NaCl solution). The experimental mice received a single intraperitoneal injection of dextran in a dose of 1 ml/100 g body weight 24 h before administration of the pathogenic agents.

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TABLE 1. Survival Rate of Control and Experimental Mice

Organism	Control		Expt.		Diff. bet. expt. and control (%)	P
	n	Survival rate, %	n	Survival rate, %		
E. coli	107	53,3	115	70,5	17,2	<0,01
S. aureus	102	34,3	108	55,6	21,2	<0,01

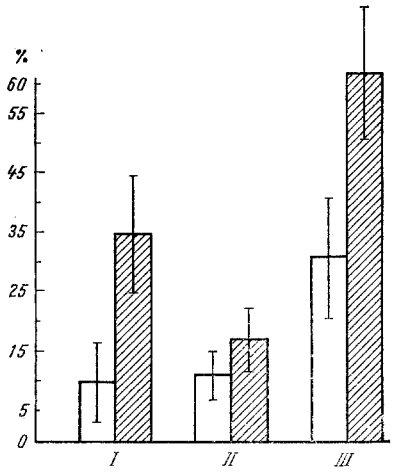

Fig. 1. Survival rate of control and experimental rats after administration of nikethamide. Unshaded columns) control: Shaded columns) experiment. Abscissa, series of experiments (I, II, III); ordinate, survival rate (in %).

The rats of series I and II received a single intraperitoneal injection of nikethamide, while the rats of series III received a subcutaneous injection of the drug in a dose of 200 mg/100 g body weight. Dextran was injected into the femoral vein of the experimental rats (32) of series I 24 h before the injection of nikethamide, while into the rats of series II (18) and III (23) it was injected interperitoneally in a dose of 1 ml/100 g body weight.

The control animals received the equivalent volume of 0.85% NaCl solution.

Dextran activity was estimated from the number of animals dying in the control and experimental series.

EXPERIMENTAL RESULTS

The prophylactic administration of dextran had a marked protective action against acute generalized infection induced by E. coli or S. Aureus (Table 1).

The results demonstrate that dextran increases the resistance of the animal to infection. These results confirm those obtained by other workers [2], who found that various native dextrans have a protective action in mice against infection with E. coli. The dextran also was active in experiments on rats. It increased the resistance of these animals to the convulsant and toxic action of nikethamide. Under the influence of dextran the mortality was reduced in series I by 25% and in series III by 30.5% compared with the control (Fig. 1).

The absence of effect in the experiments of series II was evidently attributable to the enhancement of peritoneal resorption by dextran.

The results suggest that the presence of intra-abdominal infection is no contra-indication to the intraperitoneal injection of dextran.

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