EFFECT OF INSULIN ON BLOOD CHOLESTEROL

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Summary: The effect of plain insulin was studied in normal mongrel dogs on blood cholesterol level. Intravenous administration of plain insulin in different doses on different groups of dogs does not cause any significant change in blood cholesterol level over a period extending upto 5 hrs. Exogenous insulin neither has any direct nor indirect effect on cholesterol metabolism in dogs.

Key words: Insulin blood cholesterol

INTRODUCTION

In the body cholesterol is distributed in two forms (i) free and (ii) esterified with fatty acids. It is assumed that it is the esterified form which changes with dietary, hormonal and other variations (1).

Due to the frequent vascular complications observed in diabetes mellitus, the relationship of this condition to atherosclerosis had been studied in animals. Studies in pancreatectomized dogs did not disclose the presence of atherosclerosis, inspite of the induction of diabetes (4). The effect of insulin on experimental atherosclerosis has been thoroughly studied by Stamler *et al.* (12). The defective metabolism of carbohydrate in diabetes mellitus results in excessive oxidation of fatty acids producing acetyl coenzyme A. Some of this is diverted to cholesterol production and a high blood cholesterol is a well-known feature of this disease.

Taking into consideration the importance of insulin in cholesterol metabolism and etiology of atherosclerosis, it was thought to investigate the effect of intravenous administration of plain insulin on blood cholesterol level in dogs.

MATERIALS AND METHODS

Twentyfour dogs of either sex weighing between 8 to 14 *kg* were divided into three groups consisting of eight animals each, designated as A, B and C. They were anaesthetized with nembutal (30 *mg/kg* body weight) dissolved in normal saline at room temperature. The anaesthesia was maintained by subsequent intravenous nembutal, if necessary. In all the dogs constant ventilation of the lungs was maintained by intubating the trachea and connecting it to a pulmoflator. The femoral vein was exposed and a polythene cathetor was indwelt for taking the successive samples of blood and to infuse saline and drug whenever required. The doses of insulin I.P. (Boots Company India Ltd.) used 0.5 *U/kg* of body weight in the animals of group A, in the animals

of group B 2.5 *U/kg* and in the dogs of group C, 5 *U/kg* in 2 *ml* normal saline intravenously. Intravenous injections were made through a polythene cathetor inserted into the formal vein. A fresh solution was prepared before administration. The blood samples were taken in double oxalate tube just before injection and subsequently at 30 minutes interval upto 300 minutes. The total blood cholesterol was determined according to the technique of Sackett as described by varley (14).

RESULTS

In three groups of dogs (A,B, C) intravenous administration of plain insulin in different doses ranging from .5 *U/kg* to 5 *U/kg* did not cause any signifcant changes in blood cholesterol level in dogs till 4 hours from control values. The results have been summarised in Table I with particular reference to the time interval of sample collection.

TABLE I: Effect of different doses of insulin on blood cholesterol level in different groups (A,B and C) of dogs.

Group dose of insulin	*A* .5 *U/kg blood cholesterol* (*mg/100 ml*) *Mean value ± SD*	*B* 2.5 *U/kg blood cholesterol* (*mg/100 ml*) *Mean value ± SD*	*C* 5 *U/kg blood cholesterol* (*mg/100 ml*) *Mean value ± SD*
Control	168 ± 11.46	154 ± 12.72	165 ± 11.42
30 min	158 ± 12.52	146 ± 8.96	160 ± 9.87
60 min	162 ± 10.66	162 ± 13.27	165 ± 10.20
90 min	159 ± 11.29	148 ± 9.65	165 ± 9.46
120 min	173 ± 9.57	154 ± 11.25	173 ± 10.85
150 min	171 ± 11.82	148 ± 10.44	162 ± 11.16
180 min	160 ± 8.88	147 ± 8.59	165 ± 9.75
210 min	167 ± 9.96	161 ± 11.71	164 ± 10.66
240 min	156 ± 10.87	164 ± 10.84	160 ± 8.83
270 min	170 ± 12.12	152 ± 11.38	166 ± 10.94
300 min	172 ± 11.76	160 ± 9.67	171 ± 12.12

DISCUSSION

In cases of diabetic atherosclerosis increased levels of triglycerides and blood cholesterol were observed (2). Hotta *et al.* (6) found that absence of insulin favours the synthesis of cholesterol. But Worthessen *et al.* (15) reported an increase in concentration of cholesterol in aorta *in vitro*.

Many contradictory reports are available regarding the effect of insulin on blood cholesterol. The incidence of severity of arterial sclerosis is enhanced by the presence of diabetes mellitus and this may be due to increased serum cholesterol levels (7). This would suggest that insulin lowers

blood cholesterol, but Penhos *et al.* (9) reported that there was no change in blood and liver cholesterol when insulin was perfused in rats. On the other hand increasing serum insulin level to double the normal value by diverting the pancreatic venous blood into the vena cava and feeding sucrose resulted in a two fold increase in serum cholesterol, phospholipids and triglycerides in dogs (3). Sloan *et al.* (10) demonstrated that hyperinsulinaemia and hypertriglyceridemia are often associated with atherosclerosis and they proposed that these may be the etiological factors of atherosclerosis. Stout (13) reported that insulin stimulates the incorporation of redioactive sodium acetate into lipids, cholesterol and phospholipids to a significant extent.

In the present study intravenous administration of plain insulin in different doses from .5 *U/kg* to 5 *U/kg* did not cause any significant change in blood cholesterol level in dogs. The possibility of a species difference however cannot be ruled out since an opposite situation to what occurs in dogs, cats and rats has been reported in chickens, where pancreatectomy, which did not induce diabetes, apparently increased the severity of spontaneous aortic atherosclerosis (12). Besides the reported effects of insulin by previous workers are in relation to already raised level of cholesterol. In the light of the present findings, it can be surmized that normal levels of cholesterol are not affected by exogenous insulin which has neither direct nor indirect effect upon cholesterol metabolism.

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