HYPOGLYCEMIC ACTIVITY OF CAMEL MILK IN STREPTOZOTOCIN INDUCED DIABETIC RATS

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ABSTRACT

Oral hypoglycemic activity of camel milk in streptozotocin (50 mg/kg, I.P.) induced diabetic rats was investigated in this controlled study. These rats were maintained on normal diet of wheat dalia and in addition to that they were offered raw camel milk (Group I), raw cattle milk (Group II), water (Group III) and untreated control rats on normal diet (Group IV) Their blood glucose levels were estimated at weekly interval, for three consecutive weeks. Initial mean blood glucose levels of treated animals were 191.33±7.46 mg/dl, whereas in case of untreated controls it was 80.6±12.07 mg/dl. In Group I after 1st, 2nd and 3rd week of trial, mean blood glucose levels were 98.0±3.37, 89.0±5.23 and 86.25±12.77 mg/dl, in Group II they were 158.4±11.34, 132.8±23.49 and 110.0±9.97 mg/dl, whereas in Group III they were 203.6±10.11, 162.8±13.29 and 167.57±19.39 mg/dl, respectively. On every occasion the mean blood glucose level in the untreated control group was within the normal range (70 to 90 mg/dl). During three weeks of trial there was a decrease in the mean blood glucose level of all the treated groups getting raw milk, but decline rate was higher (210%) in Group I animals getting raw camel milk compared to raw cattle milk.

KEY WORDS: Streptozotocin diabetic rats; Camel milk; Cattle milk; Hypoglycemic effect.

INTRODUCTION

Camel milk is different from other ruminant milk; having low cholesterol, low sugar, high minerals (sodium, potassium, iron, copper, zinc and magnesium), high vitamin C (1), low protein and large concentrations of insulin. There are no allergens, and it can be consumed by lactase deficient persons and those with weak immune systems. The milk is considered as having medicinal properties. In Sahara, fresh butter is not eaten, but is often used as a base for medicines. The products developed also include cosmetics or pharmaceuticals (2). It is claimed that the value of camel milk is to be found in the high concentrations of volatile acids especially, linoleic acid and polyunsaturated acids, which are essential for human nutrition. A series of metabolic and autoimmune diseases are successfully being treated with camel milk. In India, camel milk is used therapeutically against dropsy, jaundice, problems of the spleen, tuberculosis, asthma, anemia, piles and diabetes (3). Beneficial role of raw camel milk in chronic pulmonary tuberculosis patients has been observed (4). In repeated trials, it was observed that there was 30-35 percent reduction in daily doses of insulin in patients of type 1 diabetes receiving raw camel milk (5, 6). A controlled study of the oral hypoglycemic activity of camel milk in streptozotocin induced diabetic rats was undertaken, with the aim that such an investigation would help to establish a more rational use of camel milk to control blood glucose levels.

MATERIALS AND METHODS

We used thirty six white albino rats, 8 weeks old weighing 140-160gm. They were acclimatized under laboratory conditions for a week by keeping them on diet of wheat dalia and water ad libitum. They were allowed free access to water but were deprived food overnight and their fasting blood sugar level was estimated. The rats were divided into four groups (Group I, Group II, Group III and Group IV) of 8 rats each. Diabetes was induced in rats of Group I, Group II and Group III by intra-peritoneal administration of Streptozotocin (50 mg/kg body weight). Whereas rats in Group IV were kept as untreated controls. Fasting blood glucose levels of all these animals were estimated after three days of treatment. These animals, besides normal diet of wheat dalia, were fed with raw camel milk (Group I), raw cattle milk (Group II), water (Group III) and normal diet (Group IV). Rats of Group I and Group II were given 250 ml of milk daily through watering bottle instead of water. Whereas animals in Group III and Group IV were given tap water. The blood glucose levels of all these rats were estimated at weekly interval for three consecutive weeks. Blood samples were drawn from cardiac puncture using tuberculin syringe from overnight fasted

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rats, serum samples were harvested and glucose level was determined spectrophotometrically employing glucose oxidase method.

RESULTS

Initial mean blood glucose of treated animals was 191.33±7.46 mg/dl whereas in case of untreated controls it was 80.6±12.07 mg/dl. In Group I after 1st, 2nd and 3rd week of trial mean blood glucose levels markedly dropped to 98.0±3.37, 89.0±5.23 and 86.25±12.77 mg/dl, whereas in Group II, it dropped at lower rate to 158.4±11.34, 132.8±23.49 and 110.0±9.97 mg/dl and in Group III it dropped at still lower rate 203.6±10.11, 162.8±13.29 and 124.5±24.21 mg/dl, respectively (Table1and Fig 1). Every time mean blood glucose level in untreated control group was within the normal range (70 to 90 mg/dl). The overall mean of three weeks trial showed significant decreases in mean blood glucose level of Group I rats getting camel milk, as compared to Group II rats getting raw cattle milk. During three weeks trial overall drop in blood glucose level in diabetic rats was observed to be 210%, 141% and 114% in rats getting raw camel milk, raw cattle milk and water, respectively.

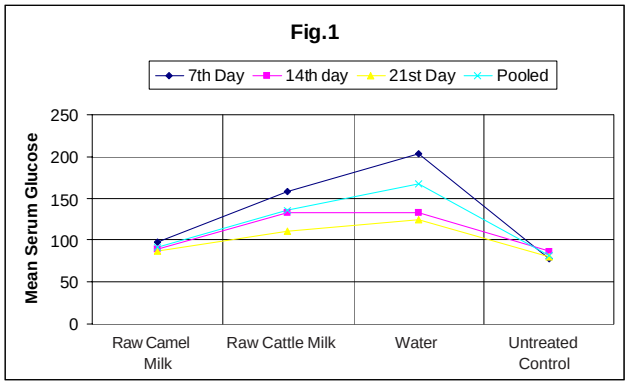
Table 1: Weekly Mean Blood Glucose Status in Different Groups of Diabetic Rats.

Mean blood glucose level (mg/dl)	Raw Camel Milk	Raw Cattle Milk	Water	Untreated Control
Before trial		191.33±7.46		80.6±12.07
7th day	98.0±3.37	158.4±11.34	203.6±10.11	77.6±8.68
14th day	89.0±5.23	132.8±23.49	162.8±13.29	86.2±12.41
21st day	86.25±12.77	110.0±9.97	124.5±24.21	80.0±10.81
Pooled	91.42±4.15	135.42±10.50	167.57±19.39	81.26±5.82
Total/% fall-B.Glucose (3 weeks)	191/91=~210%	191/135=~141%	191/167=~114%	

DISCUSSION

The study was performed to observe the role of camel milk in achieving glycemic control in streptozotocin induced hyperglycemia in rats. The positive effects may be because of high concentrations of insulin like protein of camel milk. Agrawal et al. (6) reported 30-35 percent reduction in doses of insulin in patients of type I diabetes getting raw camel milk. Camel milk contains approx 52 units/litre insulin (7). Oral insulin has been known since many years but the critical draw back is its coagulum formation in acidic media in stomach, which neutralizes its potency. One property of camel milk is that it does not form the coagulum in the stomach or the acidic media; thereby it prevents degradation of insulin in the stomach. Beg et al. (8) found that amino acid sequence of some of the camel milk protein is rich in half cystine, which has superficial similarity with insulin family of peptides.

Fig 1: Effect of Milk Therapy on Blood Glucose



High mineral content (sodium, potassium, iron, zinc, copper and magnesium) as well as a high vitamin-C intake may act as antioxidant there by removing free radicals, which may provide an additional benefit to the animals. The vitamin C levels are three times that of cow milk and one-and-a-half times that of human milk (2). The camel milk works as a laxative on people unaccustomed to drinking this milk (3). The milk also has slimming properties (9). High concentrations of antioxidants and removal of fat from the body may make the insulin receptors more responsive to available insulin.

Compared to cow and buffalo, camel milk fat contains less short-chained fatty acids, but the same long-chained fatty acids can also be found. (10). Gast et al, (2) claim that the value of camel milk is to be found in the high concentrations of volatile acids, especially, linoleic acid and the polyunsaturates. The belief among the Bedouins of the Sinai Peninsula is that drinking camel milk can cure any internal disease. The milk is said to be of such strength, and to have such health-giving properties, that all the bacteria are driven from the body. This action of camel milk may put less pressure on the immune system of the body, which in turn may improve the other functions of the body.

Unlike human immunoglobulin, which has a more complex structure, with two light chains bound to the heavier Y-shaped main chain, camel immunoglobulin has only the main Y-shaped heavy chain, without

these additional parts (11). The camel's antibodies find it easier to penetrate enzyme active sites than other animal's antibodies. This, and the relatively small size and weight of the immunoglobulin molecule, offers enormous potential. Camel immunoglobulin could be used to neutralize viral enzymes, he suggested. This action of camel immunoglobulins present in milk, might offer a better action of other proteins like insulin.

Since blood glucose level is controlled by endocrine, paracrine and autocrine interactions, there might be some other active principle in milk and that too more in camel milk compared to cattle milk (12). Insulin like growth factor system in the bovine mammary gland have insulin receptors and binding proteins. Concentrations of these change at different stages of lactation. Further studies are warranted to fractionate the active principle and to find out its exact mode of action.

In conclusion, the study shows a significant hypoglycemic effect of camel milk. Till now it is being thought that amount of insulin present in milk is playing this role. Its therapeutic efficacy may be due to lack of coagulum formation in the acidic media. From the data presented here a scientific justification is apparent for drinking camel milk by certain diabetic patients.

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