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INTERNATIONAL JOURNAL OF
Veterinary Science and Research
OPEN ACCESS JOURNAL

ISSN: 2640-7604 DOI: https://dx.doi.org/10.17352/ijvsr

Research Article

Effect of fresh and fermented camel milk and colostrums on body weight and blood glucose level in alloxan-induced diabetic rabbits

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Received: 13 December, 2021
Accepted: 03 January, 2022
Published: 04 January, 2022

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Keywords: Camel milk; Colostrums; Body weight; Blood glucose; Diabetics rabbits

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Abstract

To study the effect of fresh camel milk, fermented camel milk and colostrums on blood glucose levels 30 Alloxan-induced diabetic rabbits were taken. Diabetes was induced in rabbits using Alloxan, the diabetic rabbits were then treated with fresh camel milk, fermented camel milk and colostrums as well as insulin for 60 days. The results demonstrated that the body weight of rabbits treated with camel milk and its derivatives found to be kept within the accepted body weights range of 1.8- 2.5 kg. The lowest serum glucose levels were recorded by Group 1 (control), Group 3 (diabetic-treated with colostrums), Group 4 (diabetic-treated with milk), Group 5 (diabetic-treated with gars) and Group 6 (diabetic-treated with Insulin16 mg/kg body weight daily for 8 weeks) and the levels found to be within the normal level range of 75- 140 mg/dl, the highest level of serum glucose level was recorded by Group 2 (diabetic-non supplemented) and it was higher than the upper limit of the normal range.

Introduction

Camel milk and fermented milk products can be used as a medicament for stomach and intestinal diseases [1]. This effect has been attributed to the presence of antimicrobial substances in camel milk, including lysozymes, hydrogen peroxide, lactoferrin, lactoperoxidase, and immunoglobulin's [2]. Then the camel milk was much experienced about the healing properties and it has been used for the treatment of a number of health problems in humans [3,4]. Furthermore [2], found that the lactoperoxidase camel milk acts as a bacteriostatic activity against Gram-positive strains and as bactericides against Gram-negative cultures.

Diabetes is the most common metabolic disorder worldwide and its pathogenesis involves insufficient insulin secretion and/or resistance to the action of insulin [5]. The defect in insulin secretion and/or action leads to various metabolic defects that include hyperglycemia, dyslipidemia, and other forms of tissue damage by several mechanisms [6].

Treatment of diabetes was based on compounds derived from natural products and other types of traditional foods before the advent of insulin therapy.

[7] indicated the therapeutic efficiency of camel milk for diabetic rats. These results may have important implications for the clinical management of diabetes mellitus in humans. Camel milk is already being used to treat diabetes [8,9,10]. [11] stated that camel milk can provide an effective effect for patients with diabetes type 1.

[12,13] concluded that regular intake of camel milk for 30 days the blood sugar level was reduced. It was reported that camel milk in diabetic rabbits was more effective compared

Citation: Elhassan SA, Babeker AM, Ebahiem MA, Bakhiet SA (2022) Effect of fresh and fermented camel milk and colostrums on body weight and blood glucose level in alloxan-induced diabetic rabbits. Int J Vet Sci Res 8(1): 001-004. DOI: https://dx.doi.org/10.17352/ijvsr.000103

to sole insulin treatment to avoid the induced oxidative stress [14]. [15] indicated the positive effect of camel milk on alloxan-induced diabetic rats. [16] found that treating rats with camel milk significantly prevented the alloxan-induced elevation of blood glucose levels.

The objective of the present research was to study the effect of fresh camel milk, fermented camel milk and colostrums on blood glucose levels in Alloxan-induced diabetic rabbits.

Materials and methods

Materials

Materials used in the experiment include balance, assay conditions, centrifuge, test tubes, reagents and rabbits.

Methods

Experimental design: Thirty clinically normal rabbits of both sexes closely in weight (3-3.5 Kg) and age (1 year old) were provided; Completely Randomized Design (CRD) was used where they were divided to six groups each with rabbits. The animals were fed with green carrot (Caucus carrot) and tap water and provided with air-conditioned quarters at 24°C under standard husbandry conditions. The study was carried out on the experimental farm of the University of Kordofan.

Body weight: Animals were weighed at the beginning of the experiment and the weighting was repeated every 15 days and the data were recorded till the end of the experimental period (60 days).

Alloxan inducing diabetes: Diabetes in the rabbits was induced by intravenous injection of Alloxan [11]. Alioxan is toxic glucose, which selectively destroys insulin-producing cells (beta cells) in the pancreas and causes insulin diabetes mellitus (called alloxan diabetes). Fresh solution of Alloxan was prepared and the rabbits in five groups were administered by 80 mg/Kg body weight of the solution while one group was left untreated with Alloxan as a control group. After one week of Alloxan injection, diabetes was confirmed through the measurement of blood glucose levels from heart blood using glucometer (Prestige). Rabbits with blood glucose concentrations≥ 8.0 mmol /L were selected for the experiment.

Treatments groups

The treated groups were designated as follow:

1. Group 1 (control) to which no Alloxan induction no Fresh camel milk, colostrums and fermented camel milk supplementation.

2. Group 2 (diabetic-non supplemented) to which diabetes was induced but no Fresh camel milk, colostrums and fermented camel milk supplementation.

3. Group 3 (diabetic-treated) to which diabetes was induced and supplemented with fresh camel milk, each rabbit in Group 3 was daily treated with 5ml of camel milk using a 5ml syringe for oral administration for 4 weeks, and the dose was then increased to 5ml for additional 8 weeks.

4. Group 4 (diabetic-treated) to which diabetes was induced and supplemented with 5 ml of Colostrums, each rabbit in Group 4 was treated daily with Colostrums using a 5ml syringe for oral administration for 4 weeks where the dose was then increased to 5ml for additional 8 weeks.

5. Group 5 (diabetic-treated) to which diabetes was induced and supplemented with 5ml of fermented camel milk, each rabbit in Group 5 was daily treated with Gars using a 5ml syringe for oral administration for 4 weeks and the dose was then increased to 5ml for additional 8 weeks.

6. Group 6 (diabetic-treated) to which diabetes was induced and supplemented with Insulin and each rabbit in Group 6 was daily treated with Insulin by injection (16 mg/kg body wt) for 12 weeks.

Blood glucose test

Blood glucose in rabbits was measured every 15 days for total period of 60 days. Serum was removed from the clot, Assay conditions of 505 nm (490-510) wavelength, 1 cm light path Cuvette at 37°C/15-25°C Temperature was used and the instrument was adjusted to zero with distilled water. Pipette into a cuvette. Absorbance (A) of the samples and standard was read, against the blank. The color was left to be stable for at least 30 minutes. Glucose concentration in the sample was calculated as follow:

$$G.C = \frac{A_S - A_B}{A_{St} - A_B} \times 100 \quad (1)$$

Where,

GC = Glucose concentration in the blood, mg / dl A_S = A sample A_B = A blank A_{St} = A standard

GC in mole / l = GC in mg / dl × 0.0555 (2)

Result and discussion

Body weight

Body weight of the rabbit's blood was shown in Table 1 and Figure 1 below.

Table 1 and Figure 1 demonstrated that the highest weight at the initial time (0 day) was ranging between 1.2- 2.0 kg During the period from first day to 60 days, Group 1 showed no significant difference in weight. It was recorded that the weight of Group 2 decreased from 1.5 kg at first day to reach the lowest value of 0.53 kg at 60 days. In the case of group 3 (diabetic-treated with colostrums) the weight was increased from 1.3 kg at first day to 2.1 kg at 60 days. It was found that weight of rabbits in Group 4 (diabetic-treated with milk) increased from 1.3 kg to 1.8 kg at first day to 60 days. In group 5 (diabetic-treated with gars), weight of rabbits increased from

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1.2 kg at first day to reach 2.2 kg at 60 days. In case of Group 6 (diabetic-treated with Insulin16 mg/kg body weight daily for 8 weeks), the lowest weight was 1.4 kg at first day while the highest weight was 2.5 kg at 60 days. The results demonstrated that the weight showed by Group 3, Group 4, Group 5 and Group 6 were at end of period recorded no significant differences (P≥0.05) as compared with control.

Blood glucose level

Glucose level in rabbit's blood was shown in the following Table 2 and Figure 2 below.

As shown in Table 2 and Figure 2 the lowest serum glucose level at 0 day was 90.8 mg/dl and it was recorded by Group 1 (nondiabetic - none supplemented) while the highest serum glucose level at 0 day was 229.9 mg/dl and it was recorded by Group 2 (diabetic-non supplemented). At 60 days the lowest serum glucose levels were 89.0 mg/dl, 78.6 mg/dl, 97.0 mg/dl, 110.4 mg/dl and 81.5 mg/dl and they were recorded by Group 1 (control), Group 3 (diabetic-treated with colostrums), Group 4 (diabetic-treated with milk), Group 5 (diabetic-treated with gars) and Group 6 (diabetic-treated with Insulin16 mg/kg body weight daily for 8 weeks) respectively and there were no significant differences in serum glucose levels between the groups at 0.05 level of significance, and the values found to be within the normal level range (75- 140 mg/dl), the highest level of serum glucose level at 60 days was 256.0 mg/dl and it was recorded by Group 2 (diabetic-non supplemented). It is concluded that treatments of diabetic rabbits with fresh camel milk, fermented camel milk, colostrums and insulin resulted in keeping the serum glucose at the normal level and the present results found to be agreed with [1,12] findings.

Table 1: Effect of fresh camel milk, fermented camel milk and colostrums on rabbits body weight (kg).

Groups	Zero day	15 days	30 days	45 days	60 days
Group 1	2.0± 0.0^{a}	1.98±04^{a}	2.0±0.00^{a}	1.97±0.05^{a}	2.0±0.02^{a}
Group 2	1.5± 0.0^{a}	1.10±0.3^{b}	0.96±1.2^{b}	0.67±2.2^{b}	0.53±2.7^{b}
Group 3	1.3±0.0^{b}	1.00±0.0^{c}	1.3±0.06^{c}	1.5±0.65^{c}	2.1±0.88^{a}
Group 4	1.3±0.0^{c}	1.00±0.1^{c}	1.2±0.0^{c}	1.4±0.01^{c}	1.8±0.04^{a}
Group 5	1.2±0.5^{d}	1.10±0.0^{b}	1.3±0.07^{c}	1.6±0.34^{c}	2.2±0.08^{a}
Group 6	1.4±0.2^{c}	1.30±0.0^{d}	1.5±0.03^{c}	1.9±0.22^{c}	2.5±0.33^{a}

*Each value is mean ± SD of three replicates.
*Values in column share same superscript letter show no significant difference at p = 0.05 as separated by Duncan's Multiple Test

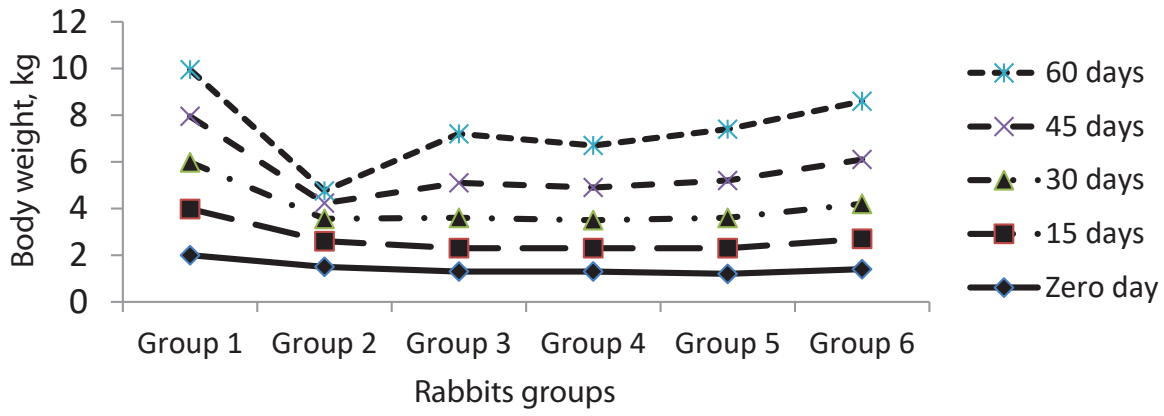

Figure 1: Body weight.

Table 2: Effect of fresh camel milk, fermented camel milk and colostrums on blood glucose levels of Rabbits.

Groups	Day 1	15 days	30 days	45 days	60 days
Group 1	90.8±0.7^{a}	89.6±1.2^{a}	87.3±2.0^{a}	88.9±0.4^{a}	89.0±0.5^{a}
Group 2	129.9±5.3^{b}	238.1±6.6^{b}	242.6±3.1^{b}	(247.4±3.9^{b}	256.0±5.6^{b}
Group 3	116.6±3.1^{b}	111.3±4.2^{c}	102.3±2.6^{c}	84.5±1.5^{a}	78.6±1.2^{a}
Group 4	137.2±4.3^{b}	135.2±3.8^{c}	111.9±2.7^{c}	103.0±3.2^{a}	97.0±1.6^{a}
Group 5	134.4±2.6^{b}	133.4±2.4^{c}	114.3±3.1^{c}	100.2±2.0^{a}	93.4±1.3^{a}
Group 6	129.1±1.4^{b}	102.4±1.0^{c}	100.7±1.9^{c}	83.9±2.2^{a}	81.5±2.7^{a}

*Each value is mean ± SD of five replicates.
*Values in column share same superscript letter show no significant difference at p = 0.05 as separated by Duncan's Multiple Test.
*Glucose levels Normal range 75 – 140 mg/dL

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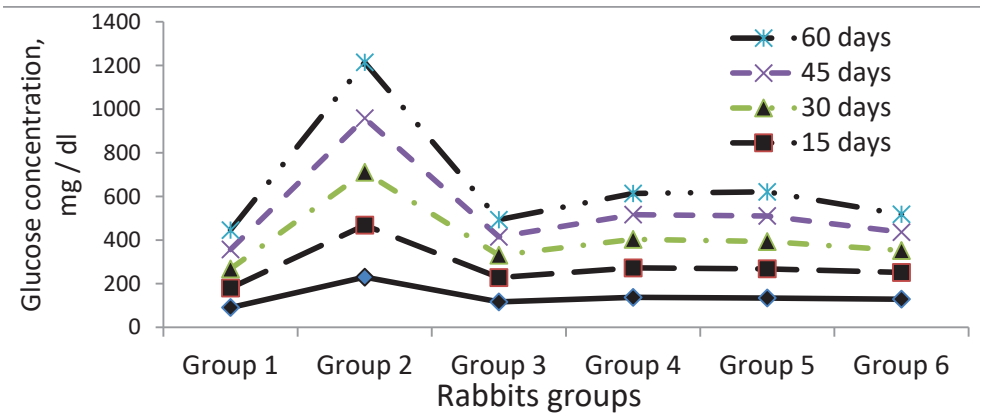

Figure 2: Blood glucose concentration in experimental rabbit groups.

Conclusion

It is concluded that feeding the diabetic rabbits with fresh and fermented camel milk and colostrums maintains the body weight at accepted range and reduced the level of glucose in the blood. So, camel milk and its derivatives are playing the same role as insulin in reducing blood glucose level.

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