Evaluation of Effects of Milk Lipid (Ghee) Supplementation and Thermal Environment on the Metabolic Profile of Alloxan-diabetic Rabbits (*Oryctolagus cuniculus*)

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**Abstract:** The type of dietary fat and thermal environment may influence the metabolic profile and insulin sensitivity in normal and diabetic conditions. The objective of this study was to evaluate the effects of supplementation with anhydrous milk fat, ghee (FS) and season (summer vs winter) on blood metabolites and Body Weight (BW) in alloxan-diabetic and non-diabetic rabbits. In each season, twenty rabbits were assigned to 4 groups of 5 animals each. Two groups were rendered diabetic using alloxan monohydrate injection. Two groups, a normal and a diabetic received orally 2.5 g kg⁻¹ b.wt. of ghee daily for 8 weeks. Blood samples collected weekly were used for determination of insulin and blood metabolite concentrations. During summer, insulin (INS) level for the diabetic and non-diabetic-fat supplemented (FS) rabbits was higher than the non-diabetic rabbits fed Lucerne. Diabetic FS rabbits had slightly higher INS level than diabetic group fed Lucerne. Glucose (GL) level was significantly higher in diabetic groups and GL level of FS diabetic rabbits was significantly higher than respective values of diabetic group fed Lucerne only. GL level of diabetic groups was significantly higher in summer. In both seasons, serum total lipids (TL) was significantly higher in diabetic than non-diabetic groups. TL was significantly higher in FS diabetic group in summer. FS increased triglyceride (TG) levels in diabetic and non-diabetic animals, TG level was significantly lower in winter in non-diabetic groups of rabbits. In both seasons, the FS diabetic significantly higher serum cholesterol (CHOL) level than the diabetic control and non-diabetic groups of rabbits. The CHO level in FS non-diabetic rabbits was significantly higher during winter. In both seasons, serum urea (UR) level was significantly higher in diabetic groups. Diabetic groups showed significantly higher UR during winter compared to summer values. Creatinine (CR) level of FS nondiabetic group was higher during summer. During summer, diabetic groups showed significantly lower mean BW than non-diabetic groups, while with FS, non-diabetic group showed significantly greater mean BW than the other groups. Diabetic FS group had significantly lower mean BW during winter. The findings have implications in pathophysiology and nutritional management of DM.

**Key words:** Rabbits, alloxan diabetes, fat supplementation, season, blood metabolites

**INTRODUCTION**

Diabetes Mellitus (DM) is a common metabolic disease with alterations in carbohydrate, protein and lipid metabolism as a consequence of defects in insulin secretion, insulin action or both (American Diabetes Association, 2010). Recently, the incidence of DM has increased drastically in both developed and underdeveloped countries. In Sudan, DM is currently emerging as an important public health problem, especially in urban areas. Previous survey indicated higher prevalence of diabetes in adult population with marked spatial distribution (Elbagir et al., 1996). The diet composition may have significant effect on insulin sensitivity as well as risk and complications of diabetes (Mann, 2006). Medical nutrition therapy is usually adopted as an effective measure to control hyperglycaemia and dyslipidaemia in diabetic patients (Franz, 2004). The dietary recommendations for diabetic patients seems to be similar for insulin dependent DM (IDDM) and non-insulin dependent DM (NIDDM).

The composition and quantity of dietary fat induce metabolic disorders in normal and diabetic subjects. Chronic consumption of high saturated fat diets deteriorates the metabolic profile and impairs glucose tolerance and increases the risk of type 2 diabetes (Feskens et al., 1995). Also prolonged feeding of high-fat diet in rats, induced hyperinsulinaemia and insulin...