

Serum Leptin Concentrations in Some Ruminant Species and Breeds

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Abstract: Leptin, a 16-kDa protein secreted from white adipocytes has been implicated in the regulation of food intake, energy expenditure and whole-body energy balance in animals and humans. It was the focus of this study to establish serum leptin values for several animal species and breeds. To this purpose, serum leptin concentrations were measured using a double antibody Radio Immuno Assay (RIA) kit containing guinea pig multispecies leptin antibody. Serum leptin concentrations were determined in healthy subjects of various species and breeds including Brown Swiss and Holstein bull, Awessi sheep, Saanen and Turkish hair goat. They were as follows (average values in $\text{ng mL}^{-1} \pm \text{SEM}$): Brown Swiss bull (12 months of age): 2.35 ± 0.34 , Holstein bull (12 months of age): 3.55 ± 0.53 , Awessi sheep (16 months of age): 2.16 ± 0.29 , Saanen goat (16 months of age): 2.23 ± 0.46 , Turkish hair goat (16 months of age): 0.94 ± 0.10 .

Key words: Leptin, ruminant, radioimmunoassay, breeds, serum leptin, adipocytes

INTRODUCTION

Leptin, the *ob* gene product is involved in the hypothalamic control of body homeostasis as an afferent signal informing about body fat reserves and an efferent regulator of appetite and energy expenditure. Several studies have shown leptin to be implicated in metabolic regulation through its action on both the hypothalamic pituitary-adrenal axis activity and on reproductive function (Keisler *et al.*, 1999). The leptin gene was identified in 1994 by positional cloning and its mutation was found to underlie the phenotype of extreme obesity and infertility in *ob/ob* mice (Zhang *et al.*, 1994).

Since its discovery, much interest has focused on its physiological role in rodents and humans the effect of this protein on metabolism and nutritional behaviour of farm animals has not yet been adequately investigated (Wauters *et al.*, 2000). However in recent years, there has been interest in leptin and elucidation of its function in other species and particularly in ruminants in which food intake, body composition and reproductive performance are of considerable economic importance (Tokuda *et al.*, 2000b; Veniant and Lebel, 2003; Williams *et al.*, 2002).

High adipose tissue deposition in farm animals negatively affects the whole body metabolism, production efficiency, reproduction and meat quality. The comprehension of food intake and energy expenditure regulatory mechanisms involving leptin in ruminants may contribute to the improvement of management and welfare issues (Delavaud *et al.*, 2002; Magistrelli *et al.*, 2011; McFadin *et al.*, 2002; Herrera *et al.*, 2008).

The aim of the present study was to determine serum average leptin levels in some ruminant species and breeds.

MATERIALS AND METHODS

The study was conducted at the Animal Welfare and Animal Production Research and Application Center in Uludag University, Faculty of Veterinary Medicine. Fifteen Brown Swiss and Holstein bulls at 12 months of age, Awessi sheep, Saanen and Turkish hair goats at 16 months of age were used in this study. The bulls were fed on a concentrate ration mixture (Crude protein = 15.38%, crude fat = 2.57% and crude cellulose = 7.17%) consisting of corn, wheat, sun flowers meal, dicalcium phosphate, limestone, salt and vitamin premix. As roughage, straw (Crude protein = 4.88%, crude fat = 1.51% and crude cellulose = 43.0%) was given to animals. The sheep and goats were fed free choice source of high quality clover hay with 300 g concentrate mixture.

The concentrate mixture was composed from mainly whole barley (70%), maize (20%) and soybean meal (10%) supplemented with mineral/vitamin combination. Blood samples were collected by jugular venipuncture (Venoject, serum separator tubes). After clotting at room temperature, sera was separated by centrifugation and transferred to plastic tubes. Sera was stored at -20°C until analyses. Serum leptin concentrations were measured using a double antibody Radio Immuno Assay (RIA) kit containing guinea pig multispecies leptin antibody, human (125I) leptin and as standard, human leptin (Linco,

Multispecies Leptin RIA kit, Cat#XL-85K) following the manufacturer's instructions. SPSS 10.0 programme was used for calculations. Results are expressed as mean (\bar{x}) and Standard Error of Mean (SEM).

RESULTS AND DISCUSSION

In the present study, serum leptin levels in Brown Swiss bulls at 12 months of age were found to be 2.35 ± 0.34 ng mL⁻¹. Serum leptin levels in Holstein bulls at 12 months of age were found to be 3.55 ± 0.53 ng mL⁻¹. Average serum leptin concentrations in Awessi sheep at 16 months of age were 2.16 ± 0.29 ng mL⁻¹. Serum leptin concentrations in Saanen and Turkish hair goat at 16 months of age were found to be 2.23 ± 0.46 ng mL⁻¹ and 0.94 ± 0.10 ng mL⁻¹, respectively.

Leptin seems to play a critical role in the regulation of a wide spectrum of functions of organisms including overall metabolism, immune function, reproductive maturation and bone formation in humans and animals. There are many factors such as birth weight, feeding, maternal diseases and fetal pathology that affect the levels of leptin in human and animals. Leptin levels in animals may also vary according to species and breeds. In recent years, serum leptin concentrations were studied in humans and several animal species (especially rats) and breeds (Veniant and Lebel, 2003; McFadin *et al.*, 2002). In this study, researchers determined serum leptin levels in Brown Swiss and Holstein bulls, Awessi sheeps, Saanen and Turkish hair goats.

Thomas *et al.* (2002) studied about relationships of metabolic hormones and serum glucose to growth and reproductive development in performance-tested Angus, Brangus and Brahman bulls and found as 3.2, 1.9 vs. 1.8 ng mL⁻¹ of serum leptin levels in Angus, Brangus ve Brahman cows, respectively. In a further study, serum leptin levels were reported as 2.0-6.5 ng mL⁻¹ in Brahman hybrid cows (Zieba *et al.*, 2004). The data were comparable with the result of the present study in Brown Swiss bulls. Delavaud *et al.* (2002) demonstrated that serum leptin levels in adult Holstein cows were determined as 1.3-2.8 ng mL⁻¹ and the data were quite lower than this study in Holstein bulls. McFadin *et al.* (2002) reported that mean serum concentrations of leptin were 5.21-4.97 ng mL⁻¹ in periparturient ewes. Blache *et al.* (2000) reported as 0.65-1.27 ng mL⁻¹ of serum leptin concentration in mature male sheeps and the data were quite lower than the levels of this study in Awessi sheeps. Serum leptin concentrations in Saanen goats at 23-50 days of age were reported as 3.22-5.20 ng mL⁻¹ by Magistrelli *et al.* (2011) and the data were quite higher than this study in Saanen goats. Human-specific

sandwich ELISA kits in dogs, rat-specific kits in rats, multi-species kits or RIA Methods which were developed by some researchers in sheep and cattle were used for determining the concentration of leptin (Chelikani *et al.*, 2004; Delavaud *et al.*, 2002; Ishioka *et al.*, 2002; Licinio *et al.*, 1998; Pinilla *et al.*, 1999; Tokuda *et al.*, 2000a). Delavaud *et al.* (2000, 2002) measured leptin levels in ruminant using their own RIA Method which have developed using sheep-specific antigen and a commercial multispecific leptin RIA kit. They found 7.48 and 3.46 ng mL⁻¹ in sheep and 5.9 and 2.4 ng mL⁻¹ in cows according to method, respectively (Delavaud *et al.*, 2000, 2002). Leptin levels were found 5.4 ng mL⁻¹ using sheep specific kit and 2.8 ng mL⁻¹ using multispecific RIA kit in Holstayn cows by Ehehardt *et al.* (2000). Although, there are quite different values, the two method is appropriate for determining the leptin levels due to observe piks in similar changes within the period examined. The researchers also used multicpecies leptin RIA kit for measuring leptin levels in Brown Swiss and Holstein bulls, Awessi sheeps, Saanen and Turkish hair goats and determined a little variations between these species and breeds.

CONCLUSION

From the data, it was observed that little variations were found for leptin levels among the some ruminant species and breeds.

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