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Blood concentration of GH and leptin in developing Sarda goats*

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ABSTRACT

In this research the blood levels of leptin, GH and glucose and its correlations with body weight, during the development of 20 Sardinian goat kids, was studied, from weaning up to the age of seven months. Blood levels of leptin and GH showed an increase ($P<0.01$) in relation to the rise of the animal's body weight and a decrease upon reaching 28 kg. Leptin was found to positively correlate with GH and glucose and negatively correlate with weight. The variations of leptin ratios and their correlation with GH indicate an involvement of the lipidic hormone in regulating metabolism during development.

KEY WORDS: GH, leptin, goat, development

INTRODUCTION

In many domestic mammals the first period of life is represented by a very rapid body development. This physiological phase is under the control of diverse hormones but especially the somatotropic axis is playing a vital role (Gatford et al., 1997). Actually, the GH, by way of the IGF-I, is responsible for many actions, both direct and indirect, that determine the development of the animal. The pituitary secretion of GH declines with age (Thomas et al., 2000) and could be owed to the presence of circulating factors secreted from some of the body tissues that develop with age such as stored lipids (Delavaud et al., 2002). This last tissue being the one which synthesizes the leptin, one can hypothesize that the

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increase of the circulating blood levels of this molecule determine the decrease of the secretion of GH (Narro et al., 2003). Therefore, the objective of the present research is to study the relationship between GH and leptin in Sarda goats in the first eight months of life.

MATERIAL AND METHODS

Twenty young, female Sarda goats which were born of singular birth in the first days of December, were chosen. From weaning, which occurred at 35 days of age, the animals were raised separately and during the day went to a pasture of polyphytic grass and at night were kept in a goat pen where they were provided *ad libitum* access to concentrate feed, hay and water. The concentrate feed was consisted of 18% protein and gave 12.5 MJ metabolizable energy/kg dry matter. From the 50th day to the 245th day at 15-day intervals, every animal had blood withdrawn from the jugular at 7:00 a.m. using a collection tubes with lithium heparin as anticoagulant. GH and leptin were measured with the RIA method (Gaiani and Mongiorgi, 1984; Multi Species RIA, Limco Research Inc., respectively) and glucose with colorimetric method (Sentinel, Milano). The data was submitted to analysis of variance and of correlations (Minitab ®).

RESULTS

Mean values of body weight, GH and leptin are reported in Table 1.

Table 1. Mean values (± s.d.) of body weight, GH and leptin

Day	Body weight kg	GH ng/ml	Leptin ng/ml	Glucose mg/dl
50	15.3 ± 1.9^{A}	5.1 ± 2.5^{A}	1.8 ± 0.3^{a}	62.6 ± 8.5^{b}
65	16.3 ± 2.0^{A}	5.8 ± 3.5^{A}	1.9 ± 0.2^{a}	60.8 ± 6.4^{b}
80	16.9 ± 2.5^{A}	6.2 ± 3.9^{AB}	2.0 ± 0.4^{ab}	60.2 ± 6.8^{b}
95	16.7 ± 2.3^{A}	13.3 ± 5.9^{C}	2.1 ± 0.4^{b}	58.8 ± 8.7^{b}
110	18.1 ± 2.5^{AB}	9.8 ± 5.5^{B}	2.1 ± 0.4^{b}	58.9 ± 6.3^{b}
125	19.7 ± 2.4^{B}	7.1 ± 2.2^{B}	2.0 ± 0.3^{b}	59.2 ± 7.9^{b}
140	22.3 ± 2.7^{C}	6.4 ± 3.3^{B}	2.1 ± 0.4^{b}	58.6 ± 5.8^{b}
155	22.7 ± 2.8^{C}	6.5 ± 3.2^{B}	1.9 ± 0.3^{a}	56.4 ± 9.2^{ab}
170	24.2 ± 2.6^{CD}	4.9 ± 2.5^{A}	2.0 ± 0.5^{ab}	54.4 ± 6.4^{ab}
185	26.0 ± 2.8^{D}	4.5 ± 2.5^{A}	1.8 ± 0.2^{a}	55.1 ± 5.4^{ab}
200	27.1 ± 3.0^{D}	3.4 ± 1.9^{A}	1.8 ± 0.3^{a}	49.6 ± 6.7^{a}
215	26.8 ± 2.5^{D}	5.7 ± 4.5^{A}	1.8 ± 0.3^{a}	48.7 ± 7.8^{a}
230	26.8 ± 2.9^{D}	5.8 ± 4.2^{A}	1.8 ± 0.3^{a}	50.1 ± 5.1^{a}
245	28.3 ± 2.7^{D}	5.3 ± 3.1^{AB}	1.7 ± 0.3^{a}	51.34 ± 6.4^{a}

^{A,B,C,D} - $P<0.01$; $^{a, b}$ - $P<0.05$

During the course of the observation the animals doubled in weight, beginning at around 15 kg and arriving at around 28 kg The biggest weight gain ($P<0.01$) was registered between 110 and 200 days, while in the last three surveys no weight gain were registered. The blood concentrations of GH gave evidence to growth at the 4th sampling ($P<0.01$) and therefore just before the major weight gain. The leptin ratios showed larger values between the 4th and the 8th sampling ($P<0.05$). Glucose plasmatic concentration shows a decreasing trend with the highest values ($P<0.05$) at the beginning of the observations. Leptin resulted in a negative correlation with weight ($P<0.01$) and a positive correlation with GH ($P<0.01$). Glucose was correlated positively ($P<0,01$) with leptin and negatively ($P<0,01$) with body weight (Table 2).

Table 2. Correlation coefficients (r) of the examined parameters

	Leptin	GH	Glucose
GH	0.127**		
Glucose	0.243**	0.324	
Body weight	-0.180**	-0.270***	-0.251**

*** - $P<0.001$; ** - $P<0.01$

DISCUSSION

The body weight attained at eight months by our goats was similar to the normally of this breed at this age. GH blood level showed not a decreasing trend as observed in lambs by Klindt et al. (1985). Instead, in the present study the peak was showed around the 3rd month of life just before the goats displayed the most rapid growth. Many factors influence the GH secretion as feeding, environmental factors and some hormones. The goats were allowed *ad libitum* access to feed in the present study and the feeding was not changed during the course of the work. In addition the climate at our latitude is mild, consequently we don't believe that feeding or climatic changes caused the GH to peak around 95 to 110 days. Oestrogens increase GH during oestrous, but this was apparently neither the cause of the GH peak in the present because the animals were in the prepubertal age (Gluckman et al., 1987). Our hypothesis is that the GH peak triggers the growth process both directly and through the release of growth factors as IGF. The increase in stored body fat produces an increase in blood leptin concentrations (Daniel et al., 2002; Delavaud et al., 2002). Also with growth, an increased disposition of subcutaneous fat is observed mainly at the end of the body development and thus an increase in the secretion of leptin (Ehrhardt et al., 2000). Our findings are not in agreement with the findings of this last author because the increase in plasmatic leptin was registered only at the moment of maximum development and there was no continuous with age. Furthermore, the highest values of leptin coincided with

the highest levels of GH, which suggests a link between these two molecules. This correlation, however, agrees with what was reported by McMahon et al. (2001) that leptin works at the level of the arcuate nucleus in the hypothalamus, where receptors are present for this hormone, stimulating the secretion of GH by way of the inhibition of the somatostatin.

CONCLUSIONS

The reported data show how GH and leptin are involved in body development but some mechanism stills remains to be clarified. We suggest that the GH peak observed before body weight increase triggers this complicated process and that leptin rise during growth influences lipid metabolism. However these hypotheses remain to be elucidated.

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