POTENTIAL USEFULNESS OF PLASMA INSULIN LEVELS AS AN INDIRECT SELECTION CRITERIA FOR GROWTH IN SHEEP

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SUMMARY

Fifty Awassi lambs, offsprings of nine sires, were used in this study to estimate genetic and phenotypic correlation of plasma insulin levels (INS) at early age (7 weeks) with each of birth weight (BW), weaning weight (WW), slaughter weight (SW) and daily gain from birth to weaning (G_1) and from weaning to slaughter (G_2). Prediction equations for (WW) and (SW) From insulin levels were derived. Genetic and phenotypic correlations between insulin levels and each of (BW), (WW), (SW), (G_1) and (G_2) were 0.499, 0.438; o.593, 0.428; 0.558, 0.388; 0.398, 0.226 and 0.655, 0.142, respectively. Heritability of insulin levels was 0.2. It appears that plasma insulin levels at early age could be used as a predictor of subsequent growth, and that selection for high insulin levels may be effective for improving growth rate.

INTRODUCTION

Selection for growth improvement is an effective way of increasing economic efficiency of sheep production. Far progress could be made by combining physiological and genetic techniques. In meat animals, insulin is an anabolic hormone, it promotes transport of glucose, acetate and amino acids into peripheral tissues, and in absence of insulin, lipolysis and proteolysis are promoted (Brockman, 1978). In sheep, Althen et al. (1984) reported that plasma insulin levels in rapid growth line were higher than that of slow growth line. Also, a significant simple correlation was found between plasma insulin levels and birth weight (Witmer et al. 1984). The present work was conducted to estimate genetic and phenotypic correlations between plasma insulin levels and some growth traits in Awassi sheep, to derive equations aiming at predicting weaning and slaughter weights from plasma insulin levels.

MATERIAL AND METHODS

Fifty Awassi lambs (25 males and 25 females), offsprings of nine sires were used in this study to estimate genetic and phenotypic correlations of plasma insulin levels at 7 weeks of age with each of birth weight (BW), weaning weight (WW), slaughter weight (SW), daily gain from birth to weaning (G_1) and from weaning to slaughter (G_2) and the heritability of plasma insulin levels.

Prediction equations for (WW) and (SW) from the insulin levels were also derived. Lambs were from the college farm, Ameria. They were born during December 1988 and January, 1989, and weaned at an average age of 12 weeks. Thereafter, they were fed ad libitum and individualy a diet of 16% CP for a period of 16 weeks prior to slaughter. Blood samples were drawn via jugular puncture at 30-min intervals for 1.5 h beginning at 1000 hr (lambs were fed after the end of sampling period). Blood samples were centrifuged within 20 min. of sampling and plasma was removed and kept frozen at-20°C until assayed for insulin by radioimmunoassay using a commercially available kit obtained from CIS international, France. Statistical analysis was performed using the maximum likelihood method (Schaeffer, 1976), according to a mixed model that included fixed effects of sex, age of dam, regressions on dam body weight and lamb age, and a random sire and residual effects. Paternal half-sib method was used for estimating heritability of insulin levels. Genetic and phenotypic correlations between insulin levels and some growth traits were estimated. Prediction equations of (WW) and (SW) from insulin levels were formulated.

RESULTS

Statistical analysis revealed no significant differences in insulin levels between males and females, their levels averaged 43.3 ± 8.7 and 40.0± 8.5 uU/ml, respectively. Age and body weight of dam had no significant effect on plasma insulin levels. Heritability of insulin levels was medium (0.2). Genetic and phenotypic correlations of plasma insulin levels with each of (BW), (WW), (SW), (G_1), and (G_2) were 0.499, 0.438; 0. 593, 0.428; 0.558, 0.388; 0.398, 0.226 and 0.655, 0.142, respectively (Table 1). Prediction equations obtained were WW (Kg)= 7.061+ 0.281 (INS (uU/ml) and (SW(Kg)= 20.136 + 0.268(INS (uU/ml)). Regression coefficients of both equations were highly significant ($P<0.01$).

Table 1 Genetic and phenotypic correlations (r_g and r_p) of studied growth traits with plasma insulin levels

	INS & BW	INS & BW	INS & SW	INS & G1	INS & G2
r_g	0.499	0.593	0.558	0.398	0.655
r_p	0.438	0.428	0.388	0.226	0.142

DISCUSSION

The non significant differences in plasma insulin levels found in the present study between males and females is consistent with the findings of AL-Raheem et al. (1989). The genetic and phenotypic correlations between insulin and (BW), (WW), (SW), (G1) and (G2) were positive and high. This supports earlier findings of Witmer et al. (1984) who found a positive significant simple correlation betwee plasma insulin levels and lamb birth weight, as well as the findings of Althen et al. (1984) who reported that insulin levels in fast growing sheep were higher than that of slow growing sheep.

In pigs, Atinmo et al. (1976) observed a high correlation between fetal insulin levels and fetal growth rate. Body weight of diabetic pigs was 50% lower than that of control pigs after induction of diabetes, and administration of insulin restored growth to a rate comparable with that of the controls (Romsos et al. 1971). Furthermore, Norton et al.(1986) indicated that plasma insulin levels were higher for rapid growth line gilts as compared with that of slow growing line. In steers, plasma insulin levels were higher in faster growing and heavier steers and may have attributed to their heavier chilled carcass weights and larger rib eye areas (Beaver et al. 1986). The heritability estimate of plasma insulin levels as found in the present study is defined as moderate level and indicates that selection could be effective for higher insulin levels. The high positive genetic correlation observed between plasma insulin levels and growth in the present work, suggets that selection for high levels at early age could be effective as an indirect selection criteria for subsequent growth. Lower phenotypic correlation than genetic correlation found between the same pair of traits may be due to low environmental correlations.

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