USE OF THE SPANISH GOAT IN DETERMINATION OF PLASMA MELANOCYTE-STIMULATING HORMONE (MSH)

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INTRODUCTION

Measurement of plasma melanocyte-stimulating hormone (MSH) levels could be a valuable way of investigating the physiological role of this hormone in the mammal. The many extra-pigmentary effects of MSH demonstrable in the mammal have been reviewed by Kastin et al. (1). MSH release from the pituitary gland appears to be controlled by the hypothalamus through secretion of an MSH-release inhibiting factor (MIF) (2). A number of drugs, particularly tranquilizers and anesthetics, have been demonstrated to effect plasma and pituitary MSH levels in the rat (3). Certain inherent problems in the use of the rat as an experimental animal for determination of plasma MSH levels, e. g. presence of a nonspecific inhibitory effect of plasma upon the assay (4), prompted the search for a substitute mammal.

EXPERIMENTAL

The Spanish goat is a breed found mainly in the southwestern United States and Mexico. Adults weigh 18 - 20 kg. and stand approximately 75 cm. at the top of the withers (Fig. 1).

Blood was obtained in heparinized syringes from the external jugular vein of young and adult Spanish goats. Males, females and wethers were utilized in the study.

Plasma MSH levels were measured by the in vitro double response frog skin assay of Lerner and Wright (5). Frog thigh and shank skins were mounted on plastic frames and paled in Ringer's solution; the darkening produced by a measured amount of plasma (diluted 1-20 with Ringer's solution) was measured as a change in the light reflectance of the skin using a Photovolt Model 670 reflectance meter. Duplicate skins were run on each sample. Calculation of the hormone concentration in the unknown sample as compared to a standard hormone preparation has previously been described (6).

Sampling of fetal blood and amniotic fluid was made possible by surgical insertion of a plastic ring with removable cover into the abdominal wall of the female goat. Removal of the cover permitted insertion of a gloved hand through the 12 cm. opening into the abdominal cavity of the animal. The relative size and positioning of this window can be seen in Fig. 1.

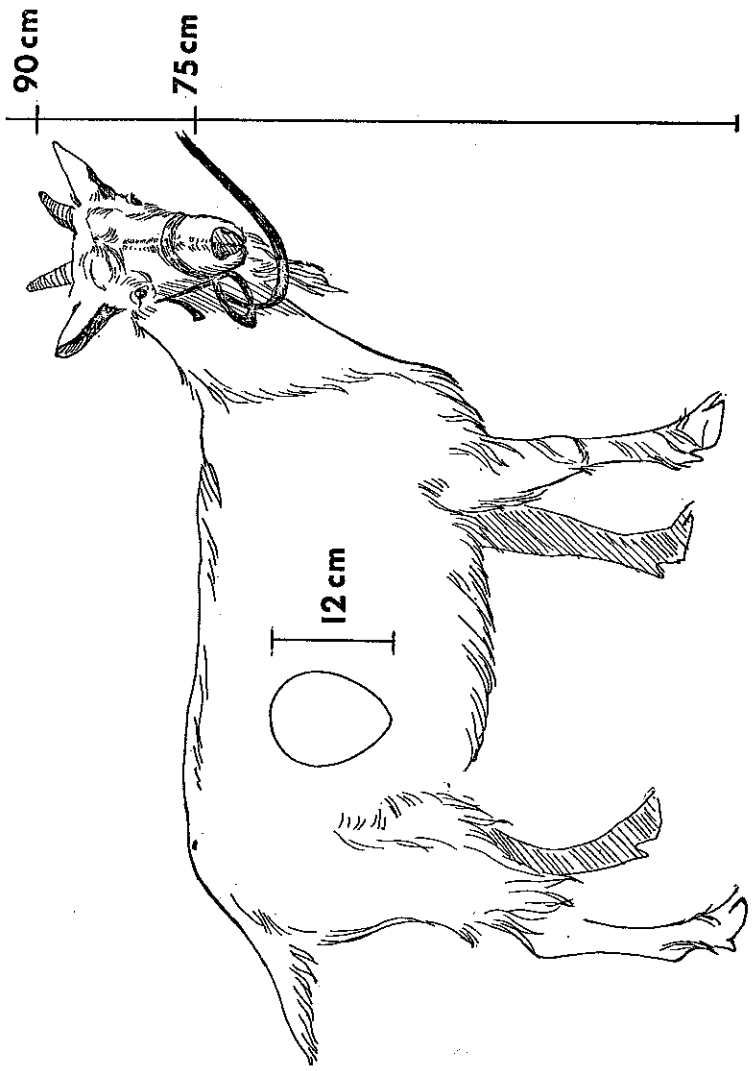

Figure 1. Spanish goat – showing size of animal and relative size and placement of abdominal window.

RESULTS

Levels of circulating MSH in the plasma of male and female adult Spanish goats can be found in Table 1. There are no significant difference in mean values between males and females. This preliminary study was begun in September, 1969, and is continuing.

Table 1. Plasma Melanocyte-stimulating hormone (MSH) levels of adult Spanish goats in U/ml[1]

U/ml[1]

	Female	Male
Plasma MSH	4.2 ± 0.6[2]	4.8 ± 0.7
Range	0.5 - 7.6	0.6 - 11.2
Number of Determinations	15	14

[1] Results obtained from September, 1969, through March, 1970.
[2] Figures are means ± S. E.m

DISCUSSION

The advantages presented by the Spanish goat are associated with its size, tractability, ease of procurement and maintenance, and relatively high resting plasma MSH levels. Multiple, adequate blood samples are easily obtained from the goat and no plasma inhibitory factor has yet been observed. Size and advanced development of the newborn makes early blood sampling possible. The Spanish goat responds to injection of various drugs, e. g. phenothiazine tranquilizers with a tremendous increase in plasma MSH (7), similar to the laboratory rat in this respect (3). This seems to indicate that the release mechanism for MSH in the Spanish goat is similar to that proposed for the rat by Kastin et al. (3).

The Spanish goat has many further possibilities for use in drug and hormone research. For example, insertion of the removable abdominal window into the female permits examination of gross ovarian morphology and uterine musculature. Fetal development can also be assessed in this manner. Administration of drugs or exogenous hormones to the maternal organism and subsequent sampling of fetal blood could provide a means of investigating the effects of these agents upon the endocrine systems of the developing mammal.

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