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Annual rhythmicity and maturation of physiological parameters in goats

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Abstract

This study was conducted to investigate seasonal rhythmicity and maturation of physiological parameters in goats. Five kids (*Capra hircus*, Maltese breed) were studied for 24 months, starting at 5 months of age. Rectal temperature and various blood-borne substances (melatonin, cholesterol, urea, total bilirubin, albumin, glucose, calcium, magnesium, phosphate, and sodium) were measured once a month at dawn and dusk. Serum bilirubin concentration exhibited statistically significant 12-month rhythmicity, and melatonin concentration exhibited 6-month rhythmicity. Changes in the dusk-to-dawn difference in rectal temperature during the course of the study provided suggestive evidence that the circadian rhythm of body temperature in goats is not fully developed until the end of the second year of life. The results documented also maturational changes in cholesterol production and blood glucose regulation.

Keywords: Bilirubin; Biological rhythm; *Capra hircus*; Maturation; Melatonin; Rectal temperature; Seasonality

1. Introduction

Except at the Equator, animals housed outdoors are exposed to seasonal variation in environmental variables, principally photoperiod and ambient temperature. A great deal of research has been conducted on the effect of seasonal environmental cycles on animal physiology (Gorman et al., 2001; Lincoln et al., 2003), but most studies on farm animals have dealt with sheep and horses. Very little is known about seasonality in other farm animals such as goats. Studies conducted on goats dealt almost exclusively with reproductive seasonality. These studies have shown that goats breed mostly during the fall months (Mohammad et al., 1984) and that this seasonal pattern is primarily controlled by changes in photoperiod (Chemineau et al., 2004; Delgadillo and Chemineau, 1992; Delgadillo et al., 1999, 2004), although seasonal changes in ambient temperature may also play a role (Gebbie et al., 1999).

Little attention has also been paid to the maturation of homeostatic and circadian processes in young animals (Refinetti, 2006). We have previously investigated the maturation of the circadian rhythm of body temperature in cattle (Piccione et al., 2003) and in sheep and horse (Piccione et al., 2002b), but not in goats. The present study was conducted to investigate seasonal rhythmicity and maturation of various physiological parameters in goats.

2. Materials and methods

2.1. Animals

The experimental subjects were five female kids (*Capra hircus*, Maltese breed). Data collection started after weaning, when the animals were five months old. None of the kids was pregnant or lactating before or during the study. The kids were housed in separate indoor stalls under

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