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RELATIONSHIP BETWEEN THE ESTABLISHMENT OF FIRST ESTRUS (PUBERTY) AND LEPTIN LEVELS IN BALI CATTLE

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INTRODUCTION

One measure of reproductive efficiency is the early achievement of early puberty according to its genetic potential. This is important to achieve optimum cattle reproduction performance and provide increased productivity. Information on early puberty is also important as a reference in improving reproductive efficiency based on the potential and problems in the field through various technological innovations. Puberty is controlled by certain physiological mechanisms involving the gonads and adenohypophyse glands, so puberty does not escape the influence of hereditary and environmental factors that work through these organs (Toelihere 1995), the environment (nutrition, climate and season) and males or biostimulation (Rekwort *et al.*, 2000; Getzewick 2005; Abdelgadir *et al.*, 2010). Adipose weight and tissue mass are thought to play an important role in regulating the onset of puberty (Maciel *et al.*, 2003). In prepubertal ruminants, short-term feed restriction will reduce the expression of the adipose leptin gene and leptin secretion. (Amstalden *et al.*, 2002). In this case, the lack of nutrients will inhibit LH secretion. However, leptin administration will restore LH secretion. This shows a positive relationship between LH and leptin secretion (Amstalden *et al.*, 2002). Furthermore, leptin concentration increases as well as leptin gene expression in heifers. The basic thing needed for the emergence of puberty is GnRH secretion due to the high amplitude and frequency of the GnRH pulsatile and the estradiol feedback system of the ovary with the hypothalamus. However, there are things to note is the complex system of neural pathways, neurohormones and peptides that modulate the secretion of GnRH itself and mediate the effect of estradiol on GnRH. In line with the increasing age and growth of virgin cattle there are factors that induce and interact with various metabolic signals, one of which is leptin where leptin is known by its receptors in the central nervous system. Leptin concentration increases during puberty development. However, leptin concentration must reach a certain threshold to activate the axis of the ovarian pituitary hypothalamus. This study aims to determine leptin levels when the first estrus emergence (puberty) and find out the first estrous quality (puberty) in Bali cattle. Using puberty development together with increased IGF-I concentration and body weight (Garcia *et al.*, 2002). Giving leptin has been studied to produce puberty in rodentia animals. Leptin injection can give rise to puberty earlier in mice by increasing the maturation of the reproductive tract (Chehab *et al.*, 1997; Cheung *et al.*, 1998). However, the hormones and metabolism that link nutrition and puberty, as well as the neuro-endocrine mechanism by which GnRH neurons are stimulated to increase secretory activity resulting in first puberty ovulation, has not been explained in cattle.

Research Methods

This study is an analytic observational study with *CrossSectional Study* design. The sample used was a cattle at puberty. The research sample had a health status that showed no signs of illness. The collection of blood samples from Bali cattle was carried out in several simantri in Mengwi District, Badung Regency. Parameters measured were leptin levels and physical signs of estrus, namely the presence of transparent colored springs. For measuring hormone levels was used the Direct Elisa method, Double Antibody Sandwich. Estrus observation was carried out 2 times a day, that is every morning (06.00-09.00 WITA) and in the afternoon (16.00-18.00 WITA) with estrus signs observed. Data were analyzed with the SPSS for Window version 20 program, including; normality test with Kolmogorov-smirnov, homogeneity test with Leven's Test, and Correlation and Regression test to determine the relationship and evenness between leptin levels and the appearance of the first estrus (puberty).

Results and Discussion

The average levels of leptin hormone in Bali cattle kept in several Simantri in Sobangan village, Badung regency showed that the emergence of puberty in Balinese cattle ranged from 20.80 months with an average leptin level of 5.62 ng / ml which is presented in Table 1. Statistical analysis of the relationship between the age of puberty with hormone leptin gives the correlation coefficient (r) = 0.826 and the coefficient of determination (r^2) = 0.682 with a regression line $y = 68.39 + 8.46x$, where y is the age and x is leptin levels (Figure 1). The graph above shows the age of puberty is closely related to levels of leptin hormone and contributes 68.2% to the level of the hormone leptin. Increasing age by 1 point causes an increase in leptin levels of 8.46%. Serum leptin increases at puberty in rodents and humans (Ahima *et al.*, 1997; Quinton *et al.*, 1999). Weight gain, seasonal changes, and serum leptin-binding proteins are variables that have been shown to contribute to increased circulation of leptin (Maffei *et al.*, 1995; Bocquier *et al.* 1998; Housknecht *et al.*, 1996). In conditions of lack of nutrition, inhibition of LH secretion can be treated with leptin. This shows a positive relationship between LH and leptin secretion (Amstalden *et al.*, 2002). Serum leptin concentration increases during puberty in mice, pigs and cattle (Garcia *et al.*, 2002). In prepubertal ruminants, limited feed reduces leptin gene expression in adipose tissue and leptin secretion, but increases hypothalamic OB-rb expression. Leptin does not function as a trigger signal but acts primarily as a permissive signal that allows puberty to occur. Therefore, in ruminants, leptin 1) acts primarily as a passive hormone that allows puberty to occur when sexual maturity is reached; and 2) function as a metabolic signal that can regulate gonadotropin secretion in response to limited acute or chronic energy (Maciel *et al.*, 2013)

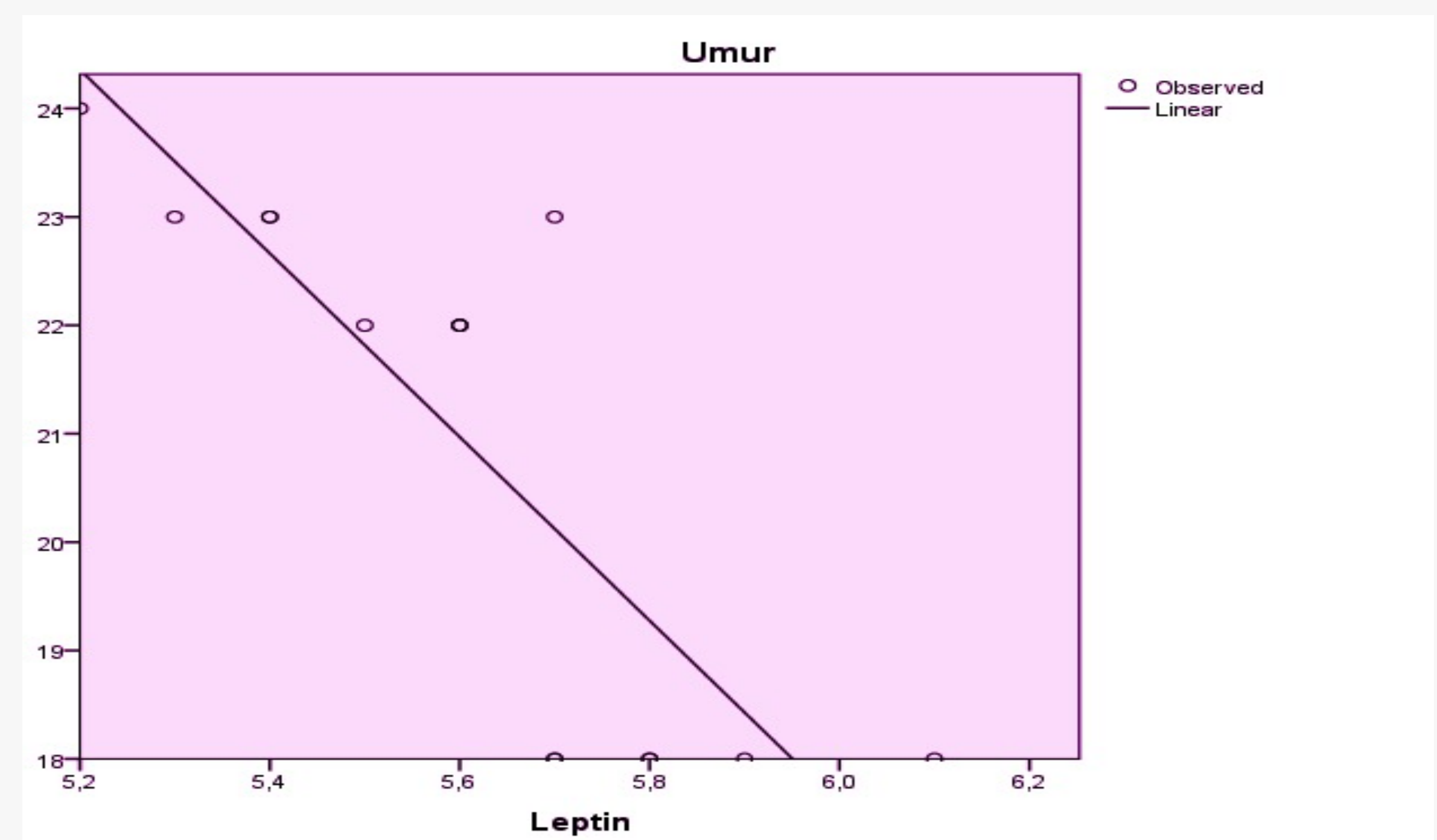


Figure 1. Graph of Correlation Between Age and Leptin Hormone Level in Bali Cattle

Table 1. Average ($x \pm SD$) levels of leptin (ng / ml) and age (months) the appearance of puberty in Bali cattle

Ages	Leptin level
20.80 ± 2.43	5.62 ± 0.24

Conclusion

Leptin levels when the first estrus emergence (puberty) in Bali cattle is an average of 5.62 ng / ml. There is a close relationship between the age of the appearance of puberty with leptin levels in Balinese cattle with a level of correlation (r) = 0.826.

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