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## **Incidence of Subclinical Ketosis in Dairy Cows in Fars Province of Iran and Reproductive Performance in Early Lactation Period**

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### **ABSTRACT**

As the dairy industry continues to strive for increased genetic gains in milk production, cows will continue to be at increased risk of developing ketosis. Subclinical ketosis is defined as increased levels of circulating ketone bodies without the presence of clinical signs of ketosis. In this study, subclinical ketosis incidence in dairy cows in Fars province of Iran and its correlation with some reproductive performance values was investigated. A total of 167 cows in 14 Holstein crossbreed herds were monitored for subclinical ketosis in a period of calving to 70th day postpartum, weekly. Milk samples were collected and the level of milk ketone bodies was determined qualitatively by the use of nitroprusside milk test. The incidence rate of subclinical ketosis was 7.2% (percent of cows with at least one positive test) in early lactation (0-70th day) period and the peak prevalence of subclinical ketosis occurred during the fourth week of lactation and there was no significant difference between positive and negative groups in reproductive performance values.

**Key words:** Ketosis, subclinical, early lactation, performance, cow

### **INTRODUCTION**

Subclinical ketosis in dairy cattle is characterized by the presence of an excess of circulating ketone bodies in the absence of clinical signs of ketosis (Andersson, 1988). Ketone levels in blood of dairy cows rise naturally after calving. Milk production is increasing dramatically after calving. The increase in milk production occurs prior to a sufficient increase in dry matter intake and specifically energy intake. The majority of cows cannot meet their energy requirements for milk production and are forced to mobilize body fat to attempt to meet their energy needs. The fat that is mobilized enters the liver and is converted to ketone bodies when gluconeogenic precursors are limiting. As the dairy industry continues to strive for increased genetic gains in milk production, cows will continue to be at increased risk of developing ketosis (Duffield, 2000). Subclinical ketosis causes economic losses through decreased milk production and association with periparturient diseases.

The risk of ketosis increased with increases in milk production and milk fat yield (Uribe *et al.*, 1995). Prevalence of subclinical ketosis and its association with reproductive performance has been detected in some modern countries (Anderson and Emanuelson, 1985; Andersson, 1988; Dohoo and Martin, 1984; Kauppinen, 1983) that have higher mean of milk production per cow in comparison with developing countries; but there is no information about the status of subclinical ketosis in developing countries.

The purpose of this study was investigation of subclinical ketosis incidence rate in dairy cows in Fars province of Iran and its correlation with some reproductive performance values.

**MATERIALS AND METHODS**

A total of 167 cows in 14 holstein crossbreed herds in Fars province of Iran were monitored for subclinical ketosis in a period of calving to 70th day postpartum, weekly from 1th Apr 2008 to 25th Jun 2009. Milk samples were collected and the level of milk ketone bodies was determined qualitatively by the use of rothera nitroprusside milk test. For this, nitroprusside milk test powder was made by mixing of sodium nitroprusside ammonium sulfate and anhydrous sodium bicarbonate in ratio of 1:20:20, respectively (Duffield *et al.*, 1997). The reactions scored as negative and positive.

After putting a pinch of mixed powder on a filter paper, two milk droplets were poured it on. If the level of ketone bodies in milk is more than 2 mg dL<sup>-1</sup> (a cut off for subclinical ketosis), a violet color can be observed (Schutz and Myers, 1959). Milk samples were tested immediately (on farm) after sampling to prevent false negative reactions due to conversion of acetoacetate to acetone (Duffield *et al.*, 1997). Reproductive performance values such as calving to first service interval and calving to conception interval were recorded. Cows with clinical signs of ketosis were culled from statistical population.

**RESULTS AND DISCUSSION**

The incidence rate of subclinical ketosis was 7.2% (percent of cows with at least one positive test) in early lactation (0-70th day) period and the peak prevalence of subclinical ketosis occurred during the fourth week of lactation (Fig. 1). There was no significant difference between positive and negative groups in reproductive performance values (Table 1).

Most studies have reported the prevalence of hyperketonemia or hyperketolactia rather than subclinical ketosis and the range in reported prevalence will vary according to the definition of hyperketonemia, with lower thresholds yielding a higher prevalence. Prevalence of subclinical ketosis (hyperketonemia or hyperketolactia) in the first two months of lactation range from 8.9 to

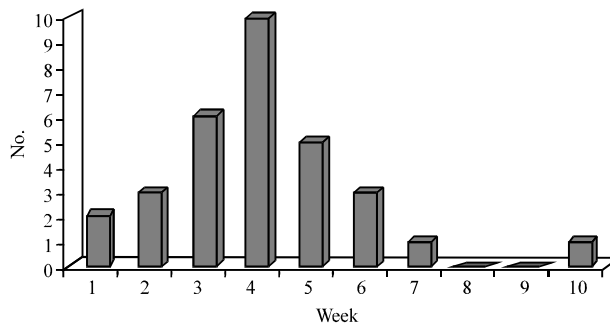


Fig. 1: Incidence of subclinical ketosis during first 10 weeks

Table 1: Reproductive performance values in nitroprusside test positive and negative groups

Groups	Calving to first service interval (day)	Calving to conception interval (day)
Positive	75.9±13.6	109.1±16.3
Negative	77.3±17.4	108.3±19.7

34% in various studies (Adler *et al.*, 1957; Dohoo and Martin, 1984; Duffield *et al.*, 1997; Kauppinen, 1983; Nielen *et al.*, 1994; Sakha *et al.*, 2007). Intensive negative energy balance due to high milk production is one of the most important factors that affect the occurrence of subclinical ketosis (Duffield, 2000). In the present study the lower incidence rate of subclinical ketosis (7.2%), in comparison with other studies; is probably due to genetics and lower milk yield.

The peak prevalence of hyperketonemia is reported that occur between second to fourth week of lactation (Anderson and Emanuelso, 1985; Dohoo and Martin, 1984; Kauppinen, 1983; Simensen *et al.*, 1990). In the present study, the peak incidence has occurred in the fourth week post calving. There is no distinct explain for this variation, although It has been approved that some factors such as genetics and feeding management influence metabolic challenge and peak time (Duffield, 2000).

Increasing the degree of negative energy balance in early lactation has been shown to increase the interval from calving to first ovulation (Butler and Smith, 1989). That cow with a longer interval from calving to first ovulation experience a decrease in pregnancy rate at first service, because conception rate is related to the number of ovulatory cycles that occur prior to insemination (Butler and Smit, 1989; Stevenson and Call, 1983; Whitmore *et al.*, 1974). In the other hand, cows with a longer interval from calving to first ovulation experience a decrease in pregnancy rate at first service. Because of hyperketonemia and subclinical ketosis are signs of disturbed energy metabolism, many authors have investigated the relationship between subclinical ketosis and reproductive performance (Abe *et al.*, 1984; Andersson, 1984; Duffield, 2000) and emphasize that subclinical ketosis increase calving to first service and calving to conception interval, but in this study was not found. In addition to this study, no effect of either subclinical or clinical ketosis on cow fertility was found in two other studies (Anderson and Emanuelson, 1985; Kauppinen, 1984). This maybe because of in Iran (and probably other developing countries) herds fertility management factors are more important and have more share in infertility than subclinical ketosis.

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