Influence of Urea Level in the Milk on the Day of Artificial Insemination in Holstein Cows

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Abstract

Several studies have shown low fertility in dairy cows due to the high rate of presence of urea nitrogen (UN) in the blood [1-4]. However, data regarding to the levels of urea (LU) in milk affecting reproduction in the milk production system are scarce in Brazil. This work has the goal to measure which levels of urea in milk reduce the pregnancy rate of dairy Holstein cows.

Keywords : Milk analysis; Cattle; Reproduction; Urea nitrogen

Introduction

The overage ammonia cross through the rumen wall and carried to the liver. The liver converts the ammonia in urea and sends it to the bloodstream. From here, it may follow two different paths: return to the rumen by swallowing or even by rumen wall or it is excreted in the urine via the kidneys, and in the milk through the mammary gland [5]. Due to low molecular weight, the blood urea nitrogen crosses the alveolar epithelium of the mammary gland and spreading in the milk, it makes to have a high correlation between the urea concentration in blood and in cow's milk (r =0.904; p<0.01 [6].

Materials and Methods

Milk samples from 316 dairy Holstein cows ranging between 60-90 days after calve, with body condition score of 3 (scale of 1-5, where 1 extremely thin and 5 obese) at their second parity were collected on the day of artificial insemination for analysis of urea nitrogen level in the milk. 50mL of milk from individual milk flow meters, after homogenization, were immediately transferred to prepared jar containing Bronopol® pads (preservative), and forwarded to analyses in the Laboratory. Milk collection was made 1 to 2 hours before insemination. Animals used in this experiment were all artificially inseminated based on their natural heat. After 35 days of the artificial in semination, the animals were checked using an Ultrasound Midray® with transrectal probe 5MHz to confirm the pregnancy.

The animals were divided into three groups of urea nitrogen levels in their milk. Group I (n=86) animals remained equal to or below the levels 11.9mg/ dL, Group II (n=186) the level in the animals was between 12 to 20.6mg/dL, and Group III (n= 44) animals with levels above or equal to 20,7mg/dL. For setting the interval of urea levels in milk were performed simple linear regression analysis, considering the independent variables as classificatory variables, each value becomes a class. The study design was completely random, unbalanced factorial arrangement. The data were submitted to descriptive statistical analysis (average and standard deviation), analysis of variance with one factor, considering the effect of urea level, confirmation of pregnancy after 30 days and the number of animals in each group. The correlations between variables were performed and the averages were compared and analyzed with 0.05 significance.

Results

a.	The Group I: The average of urea nitrogen in milk was 9.17 mg/dL, standard deviation of 3.72 with confirmation of conception rate after 35 days of 31.4% (n=27/86), indicating a significant difference (P=0.01853) to conception rate from other groups.

b.	Group II: Average of UN 15.67 mg/dL, standard deviation of 1.88, confirmation of conception rate after 35 days was 76.7% (n=112/146) with no significant difference (P=0.59596).

c.   Group III: Average of UN was 24.80 mg/dL, standard deviation 2.33, confirmation pregnancy rate after30 days was 18, 19% (n=8/44) with a difference significant pregnancy rate (P=0.02513).

Discussion

The literature suggests that both, high [7-9] and low, ROSELER and GODDEN [6,9] concentrations of levels of urea in milk can indicate nutritional issues in dairy herds and diet. High values of levels of urea may indicate about the provider of the raw dietary protein, caused by excesses of DPR (degradable protein in the rumen) and/or NDPR (non-degradable protein in the rumen) in the diet, or low ruminal fermentation rate of non-carbohydrates fiber (NCF), or, yet relation PB:NCF increased. Since values below the average may indicate a lack of PB in the diet, limited amounts of DPR e NDPR in the diet, or even NCF high fermentation rate in rumen [9].

A decrease in protein consumption consequently reduces the amount of glucose present in the circulation, further decreasing the insulin levels, thereby reducing factors IGF1 and IGF 2 intimately linked to the production of follicles, thereby delaying the pregnant and increasing the interval of calving [10]. In Butler's study [1] these authors pointed that urea level concentrations above 19mg/dL were associated with decreasing of conception rates, as far as by changing the uterine PH or by effects of progesterone in the uterine environment. The average concentration of urea level in this study with the lowest pregnancy rate was 20.7 ± 2.33mg/dL, while acceptable values should be located 10-16mg/dL second [2].

In the study of Rajala Schultz [4] cows with higher values of urea level 15.4mg/dL have a lower likelihood of getting pregnant; in contrast to cows with minor urea levels than 15.4mg/dL, and further found that cows to levels below 10mg/dL before conception has 2.4 times more likely to be pregnancy than cows with higher levels 15.4mg/dL. In this study, cows with urea level less than 11.9mg/dL were 1.7 times more likely to impregnate cows that urea level greater than 20.7mg/dL, suggesting a negative association with the elevation of urea level values and the rate of fertility. Added to this, the cows in Group II, with levels between 12 and 20.6mg/dL NU, were significantly more likely to be confirmed pregnant than cows in Group I and III.

Conclusion

In conclusion, the results of this study indicate that on the day of artificial insemination values greater than 20.7mg/dL and less than 11.9mg/dL urea nitrogen in milk are negatively associated with pregnancy rates of dairy cows diagnosed 35 days after the insemination.

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