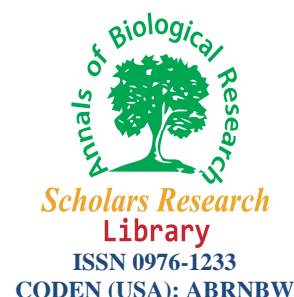




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## Some blood biochemical parameter changes in Ouled Djellal ewes during lactation and dry period

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### ABSTRACT

*This study was conducted to determine changes in some biochemical parameters reflecting the energy and protein metabolism status during lactation and dry period in Ouled Djellal ewes. The study was conducted on thirty clinically healthy ewes aged between two to four years. Blood samples were collected during three periods: the first week of lactation (early lactation); the 8<sup>th</sup> week of lactation (mid lactation) and three weeks after drying off. Plasma glucose concentrations on dry period were higher than those lactation ( $P < 0,05$ ). The same parameter was higher in early lactation than in mid lactation ( $P < 0,001$ ). The highest cholesterol concentrations were recorded on dry period compared to lactation ( $P < 0,02$ ). Similarly total protein levels in dry period were higher than those of lactation period ( $P < 0,001$ ). A decrease in plasma albumin levels were recorded in dry period and on early lactation compared to those obtained on mid lactation ( $P < 0,001$ ). The plasma urea concentrations on dry period were lower than those recorded on the 1<sup>st</sup> and 8<sup>th</sup> week of lactation ( $P < 0,006$ ). creatinine concentration on mid lactation were higher, than those of early lactation and dry period ( $P < 0,001$ ). Current findings showed marked changes in certain biochemical parameters in Ouled Djellal ewes between lactation and dry periods. Several studies have demonstrated the impact of factors such as breed, season, feed, and experimental conditions on changes in blood biochemical parameters in sheep. All these factors could explain the differences observed between our results and those reported by other authors.*

**Keywords:** blood parameters, dry period, ewes, lactation, Ouled Djellal

### INTRODUCTION

In order to produce viable lambs, ewes must be in good health before and after parturition. Monitoring metabolic changes using biochemical profiles data can help to detect abnormal metabolic statutes, and assess nutritional status of animals during the peri- partum.

Among blood biochemical parameters: total protein, urea, glucose, triglycerides and free fatty acids are considered important indicators of metabolic activity in lactating ewes [1]. Indeed, during this period, mammary gland cells use approximately 80 % of blood metabolites for milk synthesis. As a consequence we witness a decrease in blood glucose, amino acids and fatty acids, which are considered as precursors of proteins, lactose and milk fat. Some uncontrolled variations can lead to a considerable reduction in milk production and a change in its composition [2]. Ouled Djellal is the most important sheep breed in Algeria; it represents approximately 58 % of the national livestock. This well adapted breed to the Algerian steppe environment is known for its exceptional meat and wool production qualities [3]. Most studies on this breed concerned its zootechnic performances, while its metabolic profile is rarely investigated.

The aim of this study is to determine the concentration of certain blood biochemical parameters, reflecting the energy and protein metabolism in early lactation, mid lactation and dry period in Ouled Djellal ewes bred in semi -

arid areas of north east Algeria. The collected data can provide clinicians of these regions with some common blood biochemical values of Ouled Djellal ewes, which could help to diagnose metabolic disorders in this breed.

## MATERIALS AND METHODS

### Animals

Thirty ewes of Ouled Djellal breed were used in this study. Animals, belong to a state farm in Constantine region (North -East Algeria). Ewes were clinically healthy, aged 2 to 4 years, with an average live weight of  $51.3 \pm 7.7$  kg. The study was conducted between October 2011 and March 2012 . In dry period; ewes were grazing and had free access to hay and water.

While during lactation period, besides free access to hay and water ewes received a daily fed of 400 g of grain mixture (85% barley and 15% faba beans) once a day (8:00 am).

### Sampling and analyses

Blood samples were collected during three periods: the first week of lactation (early lactation); the 8th week of lactation (mid lactation) and three weeks after drying off. Blood was taken in the morning before feed intake from jugular vein into heparinized vacuum tubes Venoject®, plasma was immediately separated by centrifugation at 3000 rpm/15min, and stored at  $-20^{\circ}\text{C}$  until analyzed. Using the Random Access Clinical auto Analyzer, the following blood biochemical parameters were analysed : glucose, cholesterol, triglycerides, creatinine, total proteins, albumin, urea.

### Statistical Analysis

All data were expressed as means  $\pm$  standard deviation (SD). Differences between group means were estimated using a one-way analysis of variance (ANOVA) and a Tukey Multiple Comparison Test was performed to test the significance of differences between all groups using the software STATISTICA (version 99). Results were considered as statistically significant at  $P < 0.05$

## RESULTS

Significant differences in biochemical parameters were recorded between lactation and dry periods (Table 1).

**Table1. Plasma concentrations of various blood parameters in Ouled Djellal ewes during lactation and dry period**

|                      | early lactation   | mid lactation    | Dry period       | P value |       |       |
|----------------------|-------------------|------------------|------------------|---------|-------|-------|
|                      | mean $\pm$ SD     | mean $\pm$ SD    | mean $\pm$ SD    | a       | b     | c     |
| Glucose (g/l)        | $0.57 \pm 0.17$   | $0.46 \pm 0.09$  | $0.63 \pm 0.08$  | 0.001   | 0.03  | 0.001 |
| Cholesterol (g/l)    | $0.48 \pm 0.15$   | $0.49 \pm 0.13$  | $0.57 \pm 0.14$  | NS      | 0.02  | 0.01  |
| Triglycerides (g/l)  | $0.10 \pm 0.07$   | $0.10 \pm 0.04$  | $0.12 \pm 0.05$  | NS      | NS    | NS    |
| Creatinine (mg/l)    | $8.02 \pm 1.10$   | $8.59 \pm 0.86$  | $7.71 \pm 1.29$  | NS      | NS    | 0.001 |
| Total proteins (g/l) | $61.06 \pm 12.37$ | $66.88 \pm 8.80$ | $79.5 \pm 7.15$  | 0.001   | 0.001 | 0.001 |
| Albumin (g/l)        | $21.68 \pm 3.81$  | $26.79 \pm 1.65$ | $16.73 \pm 1.46$ | 0.005   | 0.005 | 0.001 |
| Urea (g/l)           | $0.53 \pm 0.12$   | $0.55 \pm 0.10$  | $0.45 \pm 0.09$  | NS      | 0.006 | 0.006 |

a : early lactation vs mid lactation ; b : early lactation vs dry period ; c : mid lactation vs dry period.

Blood glucose was significantly higher in dry ewes ( $P < 0.05$ ) while it was significantly lower at mid lactation ( $p < 0.001$ ). Rates of cholesterol and total protein increased significantly during the dry period ( $p < 0.01$ ). Albumin and urea were significantly lower in dry period, however in Mid-lactation they showed a significant increase ( $p < 0.006$ ). Creatinine was significantly higher in mid lactation than in dry period ( $p < 0.001$ ). Triglyceride levels, showed no significant differences between the different studied periods.

## DISCUSSION

In the present study , blood glucose differed significantly between the three periods , in fact it increases during dry periods and decreases during lactation, which is in agreement with the results obtained by Anatnovic et al. 2011 and Deghnouche et al. 20011 who reported a higher blood glucose levels in sheep in dry period. Husted et al. , 2008, observed a 50% increase in plasma glucose concentration during the last 3 weeks of gestation followed by a decrease during the first 8 weeks of lactation. This low blood glucose levels, may be assigned to the mobilization of glucose for the synthesis of milk lactose [8]. However, Henze et al. , 1994 Takarkhede et al. , 1999 Kakapehlivan et al. , 2007, reported a higher blood glucose levels in lactating ewes compared to dry ewes.

In early lactation period, the animal's intake capacity can not meet the considerable demand of the mammary gland on glucose, amino acids and fatty acids for milk synthesis, which explains the acceleration of hepatic

gluconeogenesis and fat reserves mobilization [6]. Furthermore, during this period, insulin resistance developed in late pregnancy persists, resulting in an increased lipolysis, which results in a significant decrease in serum triglycerides and total cholesterol [10]. This could explain our results which are in agreement with those reported by several studies [2, 10, 11, 12].

This situation was also observed in cows by Marcos et al., 1990 and Schouvert, 2000 and in goats by Hussein and Azab, 1998. However, Antunovic et al. Ramos et al. 2004 reported an increase of cholesterol in ewes during pregnancy and lactation compared to non-pregnant ewes.

Plasma albumin concentration differs significantly between the three periods, it is higher in lactating ewes, which is in agreement with the results obtained by several authors [2, 7, 16, 17]. However Shetaewi and Daghighi, 1994, Piccione et al., 2009, reported a decrease in this parameter during lactation in comparison with the dry period.

Our study showed a gradual and significant increase in plasma total protein concentration, from the beginning of lactation up to three weeks after drying off. These results are consistent with those reported by [2, 10, 7, 19]. The decrease in total protein in early lactation is due to the decrease of globulin levels resulting from the rapid extraction of plasma immunoglobulins for colostrum synthesis [7]. However, Baumgartner and Pernthaner, 1994 and Deghrouche et al. 2011 have observed no effect of physiological stage on total protein.

The amount of creatinine formed each day depends on the amount present in the body, which itself depends on the dietary intake, rate of creatine synthesis and muscle mass [10]. Deghrouche et al. 2011, reported a significantly higher creatinine ( $P < 0.01$ ) in lactating Ouled Djellal ewes. In the present study plasma levels of this parameter are higher in mid-lactation compared to the dry period. Piccione et al., 2009 also observed a significant increase in serum creatinine in ewes during the dry period.

Uremia levels found in our study were significantly higher in early and mid lactation, same results are reported by [2] who found that this parameter increases with the progression of lactation and decreases during the dry period. Antunovic et al. 2002 and Deghrouche et al., 2011 also observed high values of uremia during gestation and lactation periods. These recent studies support the hypothesis that changes in blood urea concentration depend on milk synthesis [16].

In our study the high concentration of urea and creatinine associated with a decrease in plasma glucose concentration in mid-lactation, suggest an increase in the catabolism of body protein reserves to support glucose synthesis which is precursor of milk lactose [22].

Several studies have demonstrated the impact of factors such as breed [23], season [21], feed [24], age [25] and experimental conditions [26] on changes in blood biochemical parameters in sheep. All these factors could explain the differences observed between our results and those reported by other authors.

## CONCLUSION

Our results suggest that the increase in metabolic activity of lactating Ouled Djellal ewes, significantly affects the plasma concentrations of blood metabolites. Indeed, blood glucose, cholesterol and total protein decreased significantly while uremia and albumin increases. However, more detailed studies on other physiological stages are required to determine their impact on the metabolic profile.

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