de Paiva CHF and Bastos GA, J Anim Res Vet Sci 2019, 3: 016
DOI: 10.24966/ARVS-3751/100016

HSOA Journal of
Animal Research and Veterinary Science

Review Article

Blood Metabolites as a Zootechnical Tool

Celso Henrique Ferreira de Paiva[1]* and Gabriela Almeida Bastos[2]

[1]*Veterinarian, Federal University of Minas Gerais, Belo Horizonte, Brazil*

[2]*PhD student in zootechnics, Federal University of Minas Gerais, Belo Horizonte, Brazil*

Abstract

For long years the metabolic profile has been used to help in diagnostic in the veterinary clinic. However only after the 70's year the study of metabolic profile came to be used as zootechnical tool, like an adjuvante to evalue the productive and reproductive performance of animals.

There are several factors or situations in which the concentrations of metabolites increase or decrease in the blood. These variations are studied in metabolic profiles, aiming to identify deficiencies or excesses of some nutrients or to diagnose biochemical alterations that decrease production, fertility or are responsible for diseases and deaths of animals.

Keywords: Blood; Energetic and protein metabolites; Goat; Sheep

Introduction

It's known that the blood parameter could be influenciated by breed, age, sex, phisical activity, nutritional conditions, environment, management, reproductive and lactation stage, season of the year and milk production among others [1-3]. Gestation, as exemple, causes several changes in maternal metabolism, increasing by approximately 75% the nutritional demand at the end of gestation [4]. Pogliani et al., [5] evidence that gestation influenced the lipid in Dutch cows, because the serum levels of non-esterified fatty acids were higher in the final third of gestation, while the serum levels of betahydroxybutyrate were higher during the initial third of gestation.

Studying the blood parameters, glucose (mg/dL), cholesterol (mg/dL) and triglycerides (mg/dL) represent energetic metabolism; urea (mg/dL), total proteins (g/dL) albumin (g/dL) and globulins (g/dL) represent protein metabolism; calcium (mg/dL), inorganic phosphorus (mg/dL), magnesium (mg/dL), iron (µg/dL), sodium (mEq/L), potassium (mEq/L) represent the minerals. Aspartate aminotransferase (AST), Gamma Glutamyl Transferase (GGT), Alanine aminotransferase (ALT) and alkaline phosphatase (FAL) represent enzymes, althoug ALT is less importante to rumminants. Insulin and cortisol are the main hormones studied in ruminants

***Corresponding author:** Celso Henrique Ferreira de Paiva, Veterinarian, Federal University of Minas Gerais, Belo Horizonte, Brazil, Tel: +55 31999244454; E-mail: celsohfpaiva@gmail.com

Citation: de Paiva CHF, Bastos GA (2019) Blood Metabolites as a Zootechnical Tool. J Anim Res Vet Sci 3: 016.

Received: June 03, 2019; **Accepted:** June 18, 2019; **Published:** June 25, 2019

Energetic Metabolites

The evaluation of energy substrats inside the cell, as is the case of variations in blood phosphorus, is made as a consideration of energy status. Marques et al., [6] find in his study higher levels os blood phosphorus in animal that recive diets with higher energy contente.

Ther first antecedentes regardin the evaluation of energy metabolism in cattle reference to the determinate blood glucose concentration, a technique that was quickly ignored considering the strong hormonal homeostatic control that the body maintains over its concentration, which allows it to remain very constant. Bomfim et al., [7] determine that the glucose concentrations in sheep are between 35 and 45 mg/dL. Pregnancy, number of fetus and lactation decrease considerably the blood concentration of glucose.

Another energetic metabolism representing is the cholesterol. In animal may be endogenous synthesized from acetyl-coa, or exogenous amount obtained from ingestion of food. Serum cholesterol concentration will be high when diets rich in carbohydrates or fats are used. Higher blood cholesterol levels were found in the group of lambs that consumed diets with protected fat [8].

Triglycerides are energy reserves vital to animals and can be found in high concentrations in lipid storage tissues. Bomfim et al., [7] define the triglycerides as important in the follicular development being stored in the ovary, in addition, the teak cells contribute to the production of the same. The quality of the diet may exert an influence on the metabolism of triglycerides. Espinoza-Villavicencio et al., [9] concluded that supplementation of crossbred cows with protected fat increased serum triglyceride levels.

Protein Metabolism

González et al., [10] showed that the decrease of the total proteins in the plasma is related to deficiency in the feeding. Albumin is considered as most sensible indicator to evalue the nutritional status than the total proteins. Persistently low albumin values suggest inadequate protein intake.

The blood urea concentration has been employed in metabolic profiles as an indicator of protein metabolism. Urea is Urea is synthesized in the liver in amounts proportional to the concentration of ammonia produced in the rumen and its blood concentration is directly related to dietary protein levels and dietary energy / protein ratio. Serum creatinine level is few affected by diet, therefore it´s used as a reference to correct changes in blood urea variations.

Proteins are mainly synthesized in the liver. About 80% of body proteins are stored in the striated musculature, skeletal and skin, and the rate of synthesis is directly related to liver function capacity and nutritional status. The reduction of total proteins in the bloodstream may be related to liver problems, renal or intestinal disorders and food deficiency. However, in cases of dehydration and chronic infections the total protein values are increased [11].

Alvarenga [11] defines albumin being synthesized in the liver and represent 50% to 65% of total circulating protein. Besides being an important protein reserve, it acts in the transport of free fatty acids and amino acids, being important in the regulation of blood pH. This concentration may be affected by liver function, protein deficiency in the diet. Souto et al., [12] evidenciated reduction in the albumin levels in goats with pregnancy toxemia. This can be justified by the occurrence of hepatic or renal failure as a consequence of the toxemic.

The rate of urea production is related to the rate of protein metabolism, which is higher when eating a high-protein diet or degrading protein during prolonged fasting. Oliveira et al., [13] reported increases in plasma and milk urea concentrations, linearly with non-protein nitrogen levels in the diet.

Globulins are related to the body's immune conditions. Immediately after the onset of an infection, a high concentration of globulins can be noted. Globulins increase with age and during pregnancy. Araújo et al., [14] concludes that sheep with toxemia of pregnancy had a higher concentration of globulin when compared to affected sheep in the final third of gestation.

Conclusion

By evidencing the nutritional conditions and identifying the source of problems, the blood metabolites can aid in the productive and animal reproductive control, becoming excellent zootechnical tools.

References

1. Peixoto LAO, Osório MTM (2007) Perfil metabólico proteico e energético na avaliação do desempenho reprodutivo de ruminantes. R Bras de Agrociência 13: 299-304.
2. González FHD, Conceição TR, Siqueira AJS (2000) Variações sangüíneas de uréia, creatinina, albumina e fósforo em bovinos de corte no Rio Grande do Sul. A Hora Veterinária 20: 59-62.
3. Mundim AV, Costa AS, Mundim SAP, Guimarães EC, Espindola FS (2007) Influência da ordem e estádios da lactação no perfil bioquímico sangüíneo de cabras da raça Saanen. Arq Bras Med Vet Zootec 59: 306-312.
4. Schmitt E, Schneider A, Goulart MA, Schwegler E, Pereira RA, et al. (2012) Calcium and insulin correlation during the glucose tolerance test in pregnant non-pregnant ewes. Arq Bras Med Vet Zootec 64: 1127-1132.
5. Pogliani FC, Azedo MR, Souza RM, Raimondo RFS, Birgel Junior EH (2010) Influência da gestação e do puerpério no lipidograma de bovinos da raça Holandesa. Arq Bras Med Vet Zootec 62: 273-280.
6. Marques LT (2010) Fornecimento de suplementos com diferentes níveis de energia e proteína para vacas Jersey e seus efeitos sobre a instabilidade do leite. R. Bras. Zootec 39: 2724-2730.
7. Bomfim GF (2012) Desempenho de cabritas Saanen submetidas a diferentes níveis de energia na dieta: Perfil metabólico e hormonal. Universidade de São Paulo, São Paulo, Brazil.
8. Balaro MFA. Cardoso EC, Peneiras ABV (2012) Ganho de peso e perfil metabólico sanguíneo de cordeiros alimentados com dietas contendo gordura protegida. Revista Agroecossistemas 4: 42-49.
9. Espinoza-Villavicencio JL, Ortega-Pérez R, Palacios-Espinosa A, Guillén-Trujillo A (2010) Efecto de la suplementación de grasas sobre características productivas, tasas de preñez y algunos metabolitos de los lípidos en vacas para carne en pastoreo. Arch med vet 42: 25-32.
10. González FHD, Patino HO, Barcelos JO, Ribeiro LAO (2000) Perfil metabólico em ruminantes: Seu uso em nutrição e doenças nutricionais. F.H.D. González, Brazil.
11. Alvarenga EA (2013) Perfil metabólico de vacas da raça holandesa durante o período de transição, locais de colheita e métodos de análise de beta hidroxibutirato. UFMG, Belo Horizonte, Brazil.
12. Souto R.JC, Afonso JAB, Mendonça CL, Carvalho CCD, Filho APS, et al. (2013) Achados bioquímicos, eletrolíticos e hormonais de cabras acometidas com toxemia da prenhez. Pesq Vet Bras 33: 1174-1182.
13. Oliveira AS, Valadares RFD, Filho SCV, Cecon PR, Rennó LN, et al. (2001) Produção de proteína microbiana e estimativas das excreções de derivados de purinas e de uréia em vacas lactantes alimentadas com rações isoprotéicas contendo diferentes níveis de compostos nitrogenados não-protéicos. Rev Bras Zootec 30: 1621-1629.
14. Araújo CASC (2010) Estudo comparativo do perfil metabólico e hormonal de ovelhas com gestação única, gemelar e não gestantes alimentadas com dieta de alta densidade energética. Universidade de São Paulo, São Paulo, Brazil.