Integrated Metabolic Profiling of Earwax Samples for Studying Physiological Changes During Pregnancy and Early Lactation in Ewes

Engy Shokry[1] (PG), Maria Clorinda S. Fioravanti [2] (PQ), Paulo Henrique J. da Cunha[2] (PQ), Anselmo Elcana de Oliveira[3] (PQ), Antônio Dionísio F. Noronha Filho[2] (PQ), Jessica Alves da Silva[2] (PG), Jair G. Marques Jr.[1] (PG), Julião Pereira[1] (PG), Nelson R. Antoniosi Filho[1*](PQ)

[1]*Universidade Federal de Goiás (UFG), Campus II, Samambaia, Instituto de Quimica (IQ)- Laboratório de Métodos de Extração e Separação (LAMES) - CEP: 74001-970 Goiânia – GO, Brasil.*

[2]*Hospital Veterinário - Escola de Veterinária e Zootecnia da UFG, Rodovia Goiânia - Nova Veneza, km 8 Campus Samambaia CEP 74001-970 Goiânia – Goiás, Brasil.*

[3]*Universidade Federal de Goiás (UFG), Campus II, Samambaia, Instituto de Quimica (IQ)- CEP: 74001-970 Goiânia – GO, Brasil.*

Key words: Pregnancy, lactation, metabolomics

Abstract

This study monitors changes in transition period of late pregnancy and early lactation by earwax chemical composition.

Introdução

Profound hormone derived metabolic changes take place in pregnant females, and the physiological mechanisms involved in these changes are more pronounced during the late gestation due to exponential increase in energy requirements which cannot be met by the increased appetite leading to a negative energy balance[1]. Also, the period of transition between late pregnancy and early lactation presents an enormous metabolic challenge as failure to adequately meet this challenge can result in a range of pregnancy complications or early postpartum health problems. Although the negative energy balance was explored in studies of dairy cows, there are only few studies addressing sheep, which may suffer from an even more marked energy deficit due to its high prolificacy and high incidence of twin births. That develops the need for methods monitoring these physiological changes. In this work, a novel non-invasive approach, using earwax metabolites was used for this purpose.

Resultados e Discussão

In this work, an integrated profiling strategy was proposed to quantitate a broad range of small-molecule metabolites and trace elements in ewes in two stress states pre- and post parturient in comparison to healthy non-pregnant ewes using different techniques namely, headspace gas chromatography coupled with mass spectrometry (HS/GC–MS), high performance liquid chromatography coupled with mass spectrometry (HPLC-MS/MS) and inductive coupled plasma optical emission spectrometry (ICP-OES). A comparative study was conducted on ewes of three groups: pre- and post parturient and healthy non-pregnant. Mass spectrometry based metabolomics and ICP-OES were employed to study the metabolic

phenotype variations in the maternal earwax that are induced by physiological changes associated with this stress conditions. Multivariate statistical technique using robust PCR was employed to afford a global view of similarities and separation trend of the three populations (Figures 1) while the interrelation between variables was shown in correlation matrix map (CMM) (Figure 2)
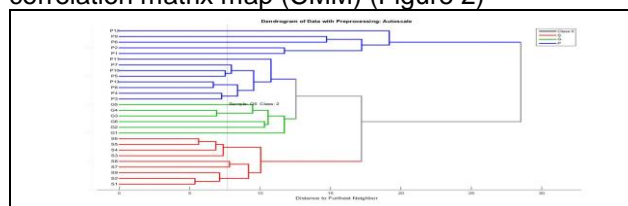

Figure 1. Hierarchical cluster analysis of the three studied populations: healthy non pregnant (red), pre-parturient (green) and post parturient (blue) based on the complete data matrix derived from HS/GC-MS, HPLC-MS/MS and ICP-OES.
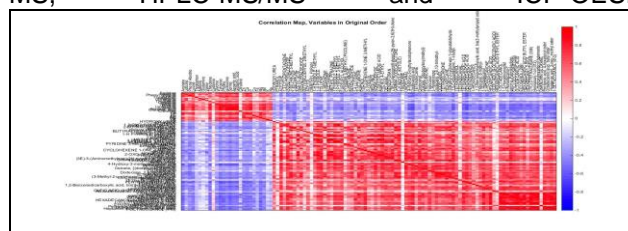

Figure 2. Correlation matrix map (CMM).

Conclusões

The results show that metabolic profiles of earwax can be used to evaluate pre- and post parturient metabolic changes and can be applied as a future wise approach for diagnosis of metabolic diseases as pregnancy toxemia and in the assessment of the nutritional status of sheep.

Agradecimentos

---
[1] Bell, A..W., *Journal of Animal Science* **1995**, *73*, 2804.