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Metabolomic profiling of the goat mammary gland secretory tissue using NMR: *a methodological optimization*

Introduction

• Demand for goat (*Capra hircus*) milk and dairy products is increasing all over the world, due to their health related benefits [1, 2].

• The yearly production of goat milk shows seasonal fluctuations due to the scarcity of pastures during the dry season, leading to **Seasonal Weight Loss** (SWL) in ruminants [3].

• Identification of **physiological markers** indicative of SWL tolerance on goat breeds with different levels of adaptation to SWL so as to be used in **goat selection in drought-prone regions**.

• Study developed with two native goat breeds from Canary Islands: *Majorera*, highly adapted to arid environment and with higher milk production [4, 5] and *Palmera*, adapted to rainy environment and with lower milk production [6].

• Study focus on the **mammary gland** secretory tissue, since it is likely related to the major and significant difference in the milk production yield [4, 5, 7].

Methodology

Tissue fraction extraction, using modified Bligh and Dyer Method [8]



NMR experiments

Dried aqueous fraction:

- → Add phosphate buffer (300 mM, 100 µM DSS, pH 7.0), ¹H₂O, ²H₂O
- 800 MHz Bruker AVANCEII⁺ NMR (1D NOESY, 1D Selective TOCSY, J-Resolved, COSY)



Method validation (spiking)

- · Added lactate, glutamate, taurine and glycine to the powdered sample.
- · Follow the extraction and NMR procedures.



1D NOESY spectra from aqueous fractions of goat mammary gland. Magnification of the aromatic region (top) and the central spectrum (bottom), with examples of identified compounds



• Extraction method and NMR techniques are adequate to metabolite identification in the aqueous fraction of the goat mammary gland secretory tissue.

Method was validated by the spiking test.

Future Work:

Study of the entire visible metabolome and comparison between breeds will allow the identification of markers for physiological tolerance to SWL.

FCT PhD Grant: SFRH/BD/85391/2012 FCT Project: PTDC/CVT/116499/2010 Instituto Canario de Investigaciones Agraria Faculdade de Medicina Veterinária (UTL) CERMAX sferences: 1. Int J Dairy Technol. 2010, 63(4): 516-522. 2. Small Rumin Res. 2010, 89: 225-233. 3. Trop Anim Health Prod. 2006, 83: 443-449. ch Zootec. 1994, 43: 181-186. 5. Options Mediterranéennes. Série A, 2011, 100: 205-210. 6. Mediterranéennes. Série A, 2006, 70: 95-100. 7. Tro: im Health Prod. 2013, 45: 1731-1736. 8. Can J Biochem Physiol. 1959, 37: 911-917. 9. Talanta. 2008, 77:433-444. 10. Physiol Genomics. 2007, 3 e2ul images from Biological Magnetic Resonance Data Bank