63. Laser Induced Breakdown Spectroscopy to Dose Zinc in Camel Skin in the South of Morocco

A. Kamili*, B. Faye, M. Bengoumi, N.S. Tligui, Y. Mbesse and G. Taieb

Corresponding author email: asma_kamili@yahoo.fr

Introduction

Promoting camel dromedary as livestock animal is a strategic issue for the economic development of Southern provinces of Morocco. However, this promotion is limited by zootechnical and socio-economic constraints as well health conditions, particularly, skin diseases that represent major concern for both veterinary authorities and camel farmers.

Recent studies on the characteristics of mineral metabolism in camels showed that it differs from other species by a remarkable adaptability to sub-mineral nutrition (Faye *et al.*, 2000). However, due to prolonged exposure to under-nutrition and years of recurring drought in southern Morocco, the camel could suffer from deficiencies in essential minerals, some of which may be the cause of skin sensitivity to diseases. Thus, the present work is part of a study on the relationship between skin diseases and mineral deficiencies in camels in Morocco.

Context and purpose

Relationship between mineral deficiencies and skin diseases has been widely documented in many species. Some trace elements are involved in the defense and the integrity of the skin including zinc and copper (Ramiche, 2001). Zinc has a catalytic role in the migration, proliferation and maturation of epidermal cells. It has also an important role in the functioning of the immune system (Mc Dowell, 2003).

Several studies conducted for determination of zinc in camel plasma have concluded that this animal has lower zinc levels compared to other species, mainly sheep and cattle (Bengoumi *et al.* 1995; Ghosal and Shekawat, 1992). Ghosal and Shekawat (1992) have explained this low levels by camel adaptation to extreme thermal conditions and nutritional stresses; stress causes increase in zinc dependent enzymes requirement so then causing an increase in intestinal absorption and liver uptake of zinc. A study was conducted in Indian camels to determine normal zinc levels in seminal plasma, blood serum and hair of camel showed estimated levels of zinc are higher in camel hair (279.6 ± 3.6 µg/100ml) compared to seminal plasma level (126.6± 3.9 g / 100ml) and blood serum level (101±4.1) (Singh *et al.*, 1994). For this purpose, the present study aims to determine zinc levels in both camel diseased skin and healthy skin in order to evaluate relationship between occurrence of skin diseases and skin zinc levels.

Experimentation

Laser Induced Breakdown Spectroscopy (LIBS) is a quick and simple method to analyze trace elemental concentration used by Sun *et al*. (2000) to trace zinc in human skin. There are several analytical techniques for elemental analysis in skin including particle probes, X-ray micro-analysis, X-ray fluorescence. These instruments are both very complicated and expensive, or require extensive sample preparation. However, LIBS is simpler, relatively inexpensive and requires little or no sample preparation.

LIBS is a technique is based on a significant power density by focusing the radiation coming from a pulsator laser which operates at fixed wavelength to generate plasma light from the sample. The plasma composition is representative of the elemental composition and the system consists among other things, a computer equipped with software for data collection and analysis.

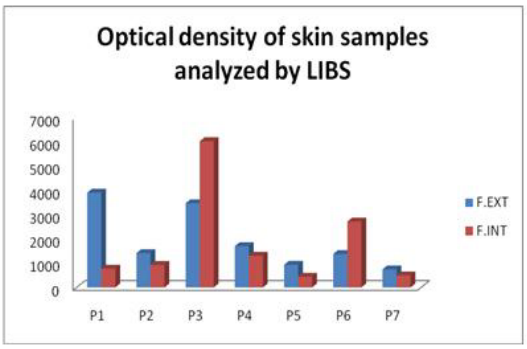
To prepare the analysis system, we conducted the pre-alignment of the laser beam for vertical focusing of this beam on the sample. Then, we started to optimize the parameters by location of exact positions of the lines of Zinc observable with a piece of metallic zinc. Lines observed and identified are those that corresponding to 2138 A°, 3282 A°, 3302.5 A° and 3345.9 A° unresolved and 3345.02A°, 3345.57 A° and 3345.9 A ° are unresolved too. Then we used a sample of camel skin to see if the same lines indicated above are observable. Thus, the lines that are around 3300 have not been identified, probably because of the presence of other lines that are very intense in this area but the line 2138 A ° was well identified, this result corresponded to the line of determination of zinc used

by Sun *et al*., 2000. Samples were used to determine the intensity of the laser beam, the size of the slit of monochromator, the number of shots, the number of spectra and cumulative length of the line.
Sun *et al*. study in 2000 for determination of zinc by LIBS has been carried out in an area corresponding to the average area of the blades studied. The goal of the current study is to dose zinc in skin samples that have substantial thickness. So then, LIBS will be applied to both deep and superficial surface of skin samples and results obtained will allow us to see if there is a significant difference between the two surfaces. Otherwise, the average zinc content of the two surfaces will be given to the content of each sample. If the difference is significant, it is planned to conduct a study to check zinc content variation according to different layers of the skin. Skin samples were collected from different parts of the body in camels at slaughterhouses in three towns in southern Morocco and preserved in formalin in Eppendorf tubes. Before LIBS analyses, sample was dried in air which makes handling easier, dimensions (length, width and thickness) of each were taken before and after analysis to calculate the area.

According to Sun *et al*., 2000, calibration was performed on the basis of a preparation of PMMA, which provides a matrix similar to the skin. This product was not available in the laboratory that's why we stuck to qualitative analysis of seven samples to study if there is any difference between zinc content in outer and inner layers of the skin.

Results and Recommendations

Analysis of variance with two factor srepetition of zinc content with Excel Microsoft shows that difference is significant between the skin samples analyzed. Furthermore, the difference was not significant between the innerand the outer surface of the skin.These results should be interpreted with caution given the small numberof samples analyzed. To this end, further analysis will be put in placeto confirm, the homogeneity of the zinc content between the different layersof the skin, including the inner and the outer face. In addition, the acquisition of the PMMA will help to determine the amount of zinc in the skin by LIBS.



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