ВЕТЕРИНАРИЯ
ФЫЛЫМИ-ТЖИРИБЕ ЖУРНАЛЫ / НАУЧНО-ПРАКТИЧЕСКИЙ ЖУРНАЛ / SCIENTIFIC AND PRACTICAL JOURNAL

ИСОКАРД КОФАМЫНЫҢ
«ЖІБЕК ЖОЛЫ ТҮЙЕЛЕРІ:
ТҮРАҚТЫ ДАМУДА
КАМЕЛИДТЕРДІ ЗЕРТТЕУ»
4 ІШ КОНФЕРЕНЦИЯСЫ

4TH CONFERENCE OF ISOCARD
“SILK ROAD CAMEL:
THE CAMELIDS, MAIN STAKES
FOR SUSTAINABLE DEVELOPMENT”

4РА КОНФЕРЕНЦИЯ ISOCARD
«ВЕРБЛЮДЫ ШЕЛКОВОГО ПУТИ:
ИССЛЕДОВАНИЯ КАМЕЛИДОВ
ДЛЯ УСТОЙЧИВОГО РАЗВИТИЯ»
ПРОЦЕДУРЫ
4-ий конференции ISOCARD
"Верблюды шелкового пути: исследования камелидов для устойчивого развития"
8-12 июня, 2015 Алматы, Казахстан
ISSN 1999-3951

ISSN 1999-3951
Citation of the Proceedings as « Special Issue of Scientific and Practical Journal Veterinariya #2 (42) 2015 »
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Key words: trace elements, heavy metals, organs, camel, consumption

than that observed in other organs. For lead, the highest concentration was observed in liver. For copper, the highest concentrations in different organs of camel, it is difficult to link our results to polluting context, because no data are available in literature on copper and zinc concentrations in different organs of camel. The highest concentration of cadmium in kidney and liver were higher on these elements in camel organs available. However, the concentrations of cadmium in kidney and liver were higher on these elements in camel organs available. However, the concentrations of cadmium in kidney and liver were higher than than that observed in other organs. For lead, the highest concentration was observed in liver.

Copper was observed in liver. For zinc the highest concentrations being recorded in meat and liver. Regarding cadmium and lead concentrations in different organs of camel, it is difficult to link our results to polluting context, because no data on these elements in camel organs available. However, the concentrations of cadmium in kidney and liver were higher than that observed in other organs. For lead, the highest concentration was observed in liver.

References

Acknowledgments
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TRACE ELEMENTS AND HEAVY METALS IN ORGANS OF CAMELS (CAMELUS DROMEDARIUS) SLAUGHTERED IN CASABLANCA CITY, MOROCCO

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Abstract
The present work was carried out to determine the concentrations of trace elements (copper and zinc) and heavy metals (cadmium and lead) in the different organs of camel slaughtered in municipal slaughterhouse of Casablanca, which is the main source of consumption of camel meat in the study area. The samples of meat, liver, lung, heart and kidney of 30 camels were collected. All the samples were digested, mineralized and analyzed for minerals using an Inductively Coupled Plasma - Atomic Emission Spectroscopy. The concentrations of trace elements and heavy metals ranged from 1.10 to 14.22 ppm for copper, 4.05 to 10.88 ppm for zinc, 0.023 to 0.69 ppm for cadmium and 0.71 to 1.33 ppm for lead. Few data are available in literature on copper and zinc concentrations in different organs of camel. The highest concentration of copper was observed in liver. For zinc the highest concentrations being recorded in meat and liver. Regarding cadmium and lead concentrations in different organs of camel, it is difficult to link our results to polluting context, because no data on these elements in camel organs available. However, the concentrations of cadmium in kidney and liver were higher than that observed in other organs. For lead, the highest concentration was observed in liver.

Key words: trace elements, heavy metals, organs, camel, consumption
Introduction

Camel is a source of high quality animal protein especially in arid and semi-arid areas which adversely affect the performance of other meat animals (Faye et al., 2013). Camel meat contains some trace elements, such as copper (Cu) and zinc (Zn), that are useful for the metabolism and biological processes of the human consumers (Faye and Bengoumi, 1998). However, they may also accumulate heavy metals, such as cadmium (Cd) and lead (Pb), which do not play any known metabolic role and may be a potential health hazard to human as consumer and camel (Konuspayeva et al., 2011). To our knowledge, no analytical work has been undertaken so far on trace elements and heavy metals contents in camel organs in Morocco. The aim of the present study was to investigate the distribution of copper, zinc, cadmium and lead in meat, liver, lung, heart and kidney of camels in municipal slaughterhouse of Casablanca which is the main source of camel meat in the study area.

Materials and methods

Samples collection: Samples of meat, liver, lung, heart and kidney were collected from thirty healthy camels 4-5 years old weighing 300-350 Kg. For each animal, samples were collected accompanied by a veterinary hygiene inspector who helped in the organs’ collection.

Samples analysis: For each collected sample a quantity of 0.2 to 0.7 g is digested with sulfuric acid in eppendorf tubes, and mineralized by using a plate of mineralization in two steps, with nitric acid first, then by hydrogen peroxide in the second step (Hill et al., 1986). Trace elements and heavy metals analyses were conducted at the Technological and Scientific Research Support Units (UATRS) of the National Center for Scientific and Technical Research (CNRST) at Rabat, Morocco. The mineral contents were determined using Inductively Coupled Plasma - Atomic Emission Spectroscopy (ICP-AES). Standard solutions used are of commercial type containing the mineral analyzed in a pure state. Each analysis was repeated in triplet.

Statistical analysis: Statistical differences between mineral contents of the organs (meat, liver, lung, heart and kidney) were determined by one-way analysis of variance (ANOVA). Pearson correlation analysis was conducted for the organs Cu, Zn, Cd and Pb contents.

Results and discussions

Trace elements status and reference values are relatively scarce and few data regarding their contents in camel organs are available in the literature. However, data on heavy metals are not available in camel organs, but there are some studies which were realized on heavy metals in camel blood and milk. On the other hand, the data on heavy metals were widely described in other species as cattle and sheep. The results are summarized in Table 1. The low contents observed in other organs than liver attested the predominant role of this organ in copper and zinc storage. In camel liver, copper contents varied according to the copper status of the diet and could change with the type of food supplementation, but no change in zinc contents was observed in spite of zinc supplementation in the diet (Bengoumi et al., 1998). The lower contents observed in our study may be attributed to copper and zinc deficiency in the diet consumed by camel. The significant difference between organs in term of minerals accumulation could be attributed to specific physiological functions of the organs.

| Table 1. Trace elements and heavy metals contents in camel organs (Mean±SD). |
|-----------------|-----------------|-----------------|-----------------|
|                 | Cu (ppm)        | Zn (ppm)        | Cd (ppm)        | Pb (ppm)        |
| Meat            | 1.10±0.24       | 9.84±0.36       | 0.12±0.03       | 0.71±0.06       |
| Liver           | 14.22±6.12      | 10.88±1.73      | 0.25±0.03       | 1.33±0.29       |
| Lung            | 1.65±0.49       | 4.05±0.15       | 0.023±0.002     | 0.86±0.17       |
| Heart           | 2.06±0.22       | 4.85±0.41       | 0.089±0.02      | 1.04±0.31       |
| Kidney          | 1.43±0.14       | 4.71±0.50       | 0.69±0.13       | 0.96±0.17       |
In our study, it was difficult to attest if cadmium and lead contaminations of camel organs were important or not, as to our knowledge, no reference was available for this species in the literature. However, cadmium and lead contents found in camel organs appeared widely higher than the tolerable values for meat and offal of bovine as proposed by the European Commission (European Commission, 2006), with the exception of cadmium contents found in liver and kidney that were lower than the limit of European Commission in bovine liver and kidney (European Commission, 2006). The sources of cadmium and lead may be attributed to the pasture on which these animals grazed and the source of water from which these animals drank.

Relationships between elements contents are not well explained, especially when those relationships could change from one organ to another. Few data are available on the distribution of trace elements among organs, especially in camel. The interactions are complex, including competition on site-binding, potentiation, target-organ preference, storage and excretion priorities.

**Conclusion**

The study showed that the liver play an important role for storing trace elements. High level of heavy metals (cadmium and lead) contents were observed in meat, lung, heart and kidney. Livers content of these heavy metals are lower than the limit fixed by the European Commission? Further studies are still needed it better understand the metabolism of trace elements and heavy metals in camels.

**References**