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Research Article

Nephrosis Oxalic Poisoning Oxalates Plants of Domestic Ruminants in Eastern Algeria

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ABSTRACT
Our work revolves around a screening of a disease that has caused lots of damages during the 70's and 80's of the last century: the oxalic nephrosis. In this study area, and to assess the implementation of several state outreach campaigns by the veterinary services related to agricultural and hydraulic directions at that time, we investigated this fact through 4 departments in eastern Algeria which are: Annaba, El Tarf, Guelma and Souk Ahras. Although it exists even in some animals, mainly in ruminant livestock (cattle, sheep and goat) results in extensive. We can say at the end of our investigation that this nephrosis still exists, but at a less alarming scale than the 70's and 80's.

Keywords: Oxalic stones, intoxication, plants in oxalates, oxalis, nephrotoxicity.

INTRODUCTION

Several plants across the planet are characterized with high toxicity and can harm their consumers (whether humans and animals) causing from simple digestive disorders to the death of the individual (Tokarnia, 2002; Kawohl and Habermeyer, 2005). Poisoning by plants oxalates (oxalis, sorrel and purslane) is very common and its best known clinical expression in veterinary medicine is oxalate nephrosis. This corresponds to poisoning by ethylene glycol and one of its metabolites is oxalic acid in dogs (Grucker; 2004). Although some chenopodiaceae oxalates are used in veterinary medicine to treat anemia in goats, the three mentioned plants pose a poisoning risk for free grazing livestock (Mc Gaw and Eloff, 2008).

Poisoning, that occurs in herbivores in general and ruminants in particular, is rather confusing due to the difficulty to distinguish it from milk fever, with its clinical and lesional features (Jean Blain and Grisvar, 1973).

Precipitation of calcium oxalate crystals in the renal tubules results in a traumatic nephritis with anuria (Jean-Blain et Grisvar, 1973);

Hypocalcaemia causes nerve damage and reduces blood coagulation;

Deposit of oxalate crystals in the muscle and liver (knife screeching at autopsy (Jean-Blain et Grisvar**,** 1973) …

These poisonings are found all over the world where oxalates plants exist (Botha & Penrith, 2008). In this study area which is located north-eastern Algeria (Fig.1) in particular and in the Maghreb in general, Bermuda oxalis, also called goat's feet Oxalis (*Oxalis pes-caprea* L. = *Oxalis cernua Thunb., Oxalidaceae*) is widespread in the northern region, particularly in the Tellian Atlas where it is known under different names "*Hoummeydha*" in the East, at the Centre and West of Algeria, and called "*Korissa*" in Tunisia. It is a very invasive plant to orchards, understory and acid grounds rich in salts **(**Battandier and Trabut, 1902 Ducellier, 1914, 1923 Mayor, 1952, 1967; Mancheron, 1914). This plant is called "*Tkorris*" in Berber while it is has many appellations in French such as: Cape sorrel, yellow trefoil, sourgrass or vinaigrette (Chevalier, 1974; John Blain and Grisvar 1973). It is also called: Oxalis pes-caprae, goat's foot oxalis, Bermuda oxalis, African wood-sorrel, Bermuda sorrel and goat's foot sorrel.

This pathological entity, disease or poisoning relatively obey to simple pathophysiology because it provokes metabolic disorders that are also somewhat known enough schematically.

Once oxalic acid and its soluble and insoluble salts are trained either to be eliminated in the faeces and urine matter or in the circulatory and metabolized flow in the blood and liver according to this brief description. This is especially in the tubules and néphrocytes that precipitation of calcium oxalate crystals takes place progressively to tackle in stages the destruction of nephron cells, and in all of the urinary tract (Botha & Penrith, 2008).

This poisoning of oxalates plant is very alarming among breeders. When it prevails, they consider it an infectious or contagious disease. They get more mobilized to alert the veterinarian or the nearest veterinary services in an attempt to contain it and save their animals.

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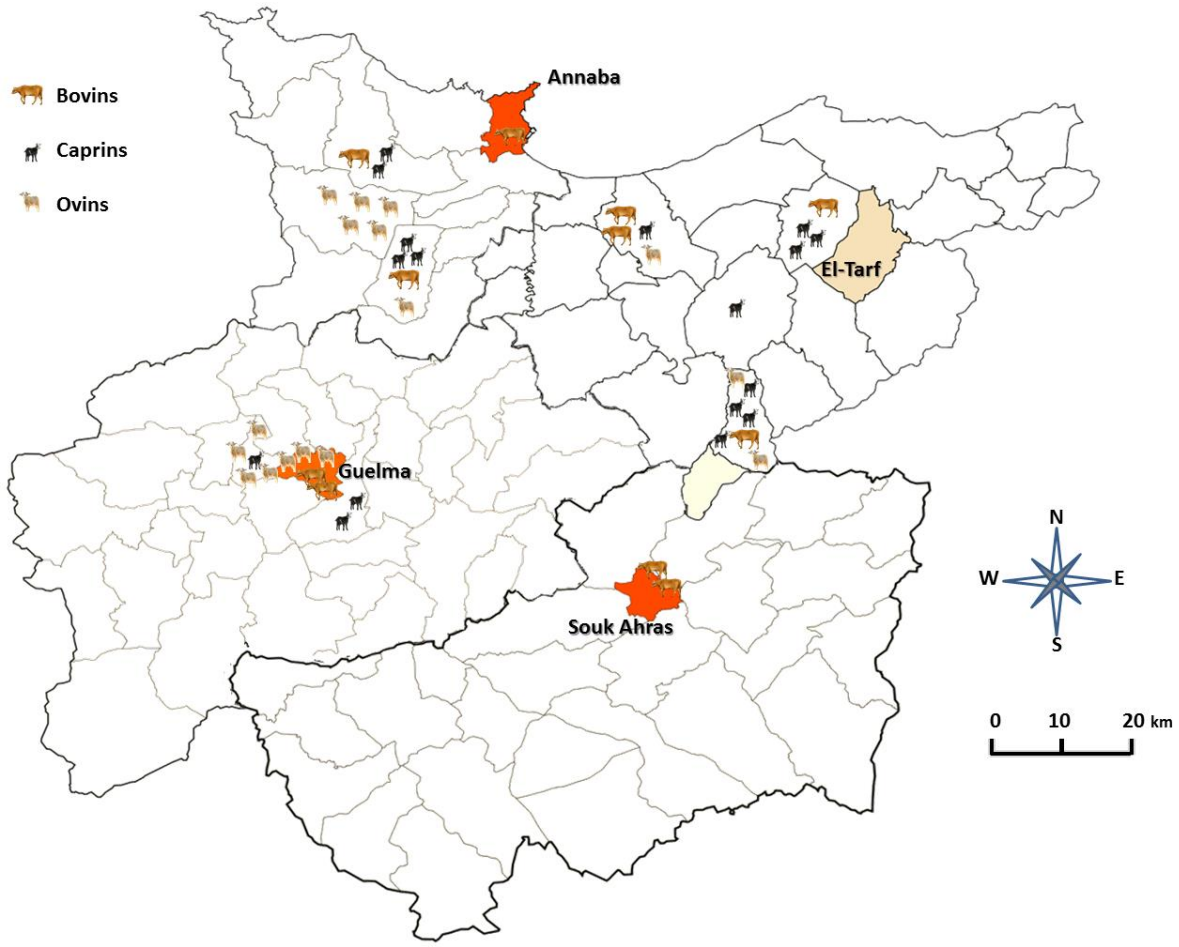


Figure 1: Location map for Animals' kidney samples taken from the bovines, sheep and goats.

It is a poisoning famously known to be very dependent on the weather; after the summer and sometimes autumn drought; it is favored by early growing, after the first rainfall, of weed including goat's foot oxalis (Rekhis and Amara; 1990). Poisoning occurs especially in late fall and may occur if the plant is abundantly present in the meadow, that is to say, until his haymaking in late spring (April -May).

Our contribution would raise this confusion between milk fever and oxalate plants poisoning, although a seasoned clinician aware of the epidemiology and clinical expression of symptoms and lesions of the two disease entities would make a simple differential diagnosis without even involve the histo-pathology on one hand. On another hand, we try to show through this work its existence and we try to draw attention to establish an adequate prophylaxis.

MATERIALS AND METHODS

Biological Material

We report in our work the exploitation of 44 kidney samples taken from 11 bovines, 16 sheep and 17 goats. Ethnobotanical survey revealed that they lived in areas with abundant oxalate plants such as: oxalis, sorrel and purslane. We tried to demonstrate the existence and frequency of this pathological entity by kidney samples either from these animals slaughtered in emergency because the hyperacute poisoning is overwhelming, or as a result of mortalities or at the municipal slaughterhouse under sanitary control of a supervising veterinary from the municipal health office.

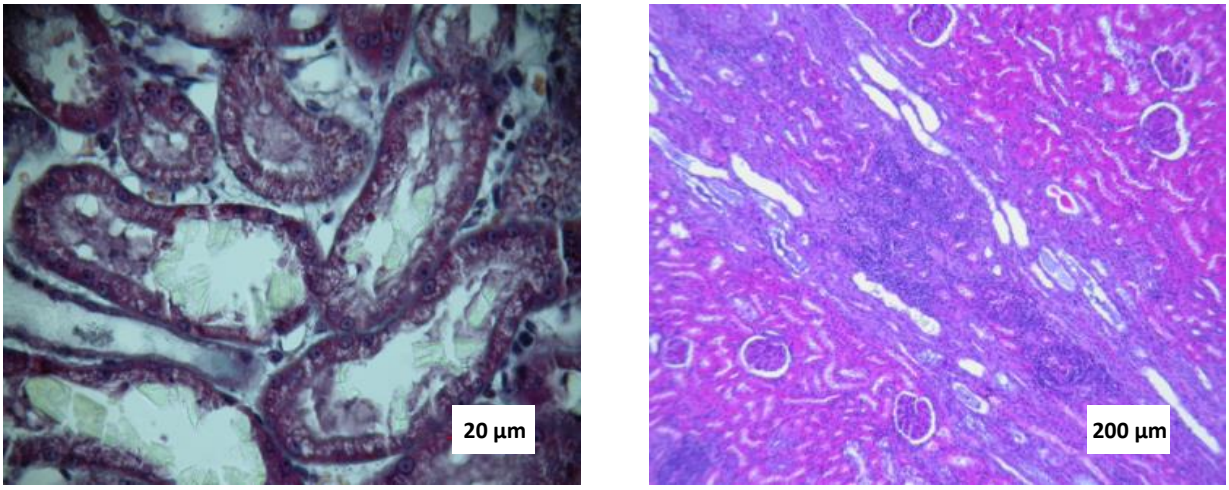
The kidney samples were analyzed in the pathological histoanatomy Department (PAH) at the Veterinary Campus of Lyon (France), in Clinical Epidemiology and Biopathology (ECB) of Pasteur Institute in Algiers and the pathological histoanatomy Department (PAH) of El Tarf Hospital (Algeria). Forty-four (44) kidneys in total were taken from the bovines (11), goats (17) and sheep (16). Figure 1 shows the location of mentioned organ samples.

Laboratory Materials

Several tanks have been used for different steps of fixation, inclusion, dehydration and paraffin wax coating, which is melted, then cast and refrigerated in cassettes for the formation of blocks each containing a kidney prepared for sections; microtome; optical microscope mounted at a camera with various magnifications connected to a microcomputer's central unit and its monitor.

The reagents used are the 10% formalin (fixation), paraffin, eosin (acid dye), hemalun (basic dye) and May-Grunwald Giemsa (Pappenheim staining).

Methods



A B

Figure 2: Lithiasic nephrocytes containing oxalates crystals, A: Kidney bovine with May-Grunwald Giemsa staining (20µm), B: Kidney goat with haematoxylin-eosin staining (200µm)

Table 1: Distribution of the collected species by site and station.

Samples	Species				
	Bovines	Sheep	Goats	Total	Positive results
Annaba Province					
Municipality of O. El Aneb	01	00	02	03	
Municipality of Berrahal	00	05*	00	05	01
Municipality of Ain Berda	01	01	03*	05	01
Municipality of Annaba	01	00	00	01	
Guelma Province					
Municipality of El Fedjouj	00	03	01*	04	01
Municipality of Guelma	02	04	00	06	
Municipality of Khezarra	00	00	02	02	
El-Tarf Province					
Municipality of Ben M'hidi	02	01*	01	04	01
Municipality of Boutheldja	01	00	03	04	
Municipality of Bouhadjar	01	02*	04*	07	02
Municipality of Cheffia	00	00	01	01	
Souk Ahras Province					
Municipality of Souk Ahras	02	00	00	02	
Total	11	16	17		06
Percentage	9,09	17,64	12,05		13,63

* Species presented as positive

The foremost objective of this study was to demonstration oxalate crystals deposited at the néphrocytes and renal tubules in three animal species. We have distributed the forms to conduct an ethnobotanical investigation for each removed kidney. Only two (02) forms have brought us some information: one for a sheep kidney and another for three kidneys (2 for goats and 1 for a sheep).

Therefore, we found it unnecessary to use this track although it would have been significantly interesting because the information provided would allow explaining, partially or wholly, infrequent dominance of oxalic nephrosis in our samples especially among farmers who supplement animal food with monocalcium phosphate (MCP) or di-calcium phosphate (DCP) rich granules, which would prevent grazing animals from developing oxalic nephrosis. Concerning the exploitation of the biological material itself, it is worth recalling the importance of Histo-Pathological Anatomy (HPA) manipulation:

After fixation, the kidneys were cut in the longitudinal direction. Failure to observe any macroscopic lesion, half

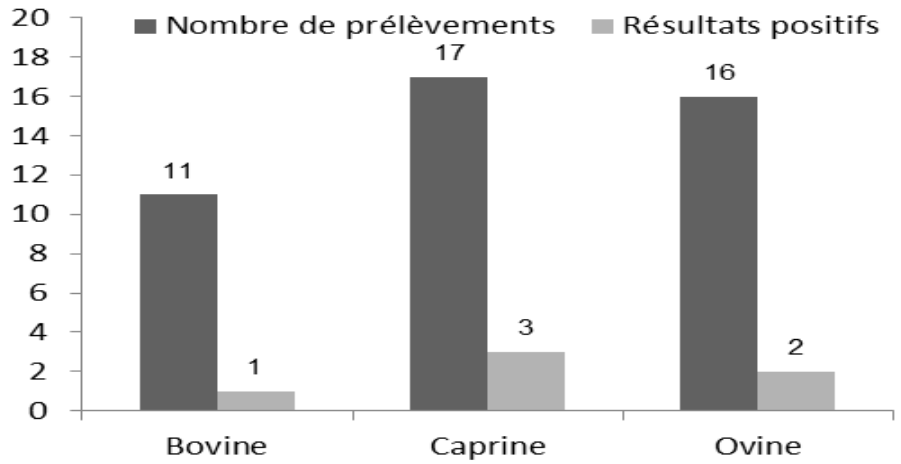


Figure 3: Total kidneys tested with oxalic lithiasis (n = 44)

a kidney has been transversally transected to get into a section in a standard cassette for histological sections.

A post-fixation was performed and samples were dehydrated and embedded in paraffin with an automatic machine following the conventional method used in the laboratory.

Two sections were performed: one stained with haematoxylin-eosin and the other with May-Grunwald Giemsa (interpretations of Prof. P. Belli; Vet-Agro Sup Campus, Lyon, 2012).

Exploitation of kidney samples from the three species of the conducted study

All kidneys were immediately immersed in 10% formalin concentration (preservative and fixative agent) once they were collected. Waiting for the various coming steps by either the controllers or in various tanks of tissue fixation, and other steps of histological sections manipulation with microtome, then in steps of staining with haematoxylin-eosin or with May-Grunwald Giemsa, their mounting according to the technique described by (Culling, 1974) and observation under the optical microscope at different magnifications.

RESULTS

From the forty-four (44) exploited kidneys, only six (06) operated kidneys were detected to contain calcium oxalate crystals (3 from sheep, 2 from goats and 1 from bovine), which is actually very little expressive according to our forecasts. Table I includes all kidney tested with oxalic lithiasis as well as Figure 3.

Especially when we were on the ground, with the predominance of oxalis in grasslands and that these animals were sometimes forced to consume exclusively this plant. During the years of scarcity, the pathology was causing death particularly for ruminant animals. This toxicity caused by plants in oxalates (oxalis, sorrel, purslane, etc ...) was so alarming among livestock producers that they considered it to be an infectious and even contagious disease; they were all mobilized to alert the veterinarian or the closest veterinary services relatives in an attempt to stem the "curse" that stroke their animals. They tried to save their animals (Tab. II).

For histological sections performed in different diagnostic structures to compare the results, we have noticed that no differences were found (Fig.2).

DISCUSSION

Contrary to our expectations and the reputation that goats have more resistance to various diseases, on the tested effective, it is relatively equivalent in number to the sheep. The number of cases oxalate nephrosis in goats is higher. But these results cannot be interpreted unless an experiment in equal numbers and subject to the same zootechnical standardized livestock conditions of feeding and watering (Tokarnia, C. H., bereiner, J.D. and Peixoto PV. 2002).

However, this study has the merit of alert that intoxication does exist indeed. This is added to a local custom that native citizens have used to chew oxalis flower stalks and stems without having health problems. This results in a simple transient diarrhea that can be treated by consuming ground (*Ceratonia siliqua* L.) ground, ground coffee or a glass of Coca-Cola.

This study emphases on the existence of oxalic nephrosis as a manifestation of the disease lesions and provides undeniable proof of alterations caused to the nephrons and tubules, as well as néphrocytes damaged by these oxalic lithiases at different stages of urinary tract (Fig.2).

As we see on the left of Figure 2, the néphrocytes are achieved, whereas the one on the right shows néphrocytes. With two different colors from each other, the first in May-Grunwald Giemsa and the other in haematoxylin-eosin and at different magnifications (Mc Gaw, LJ and Eloff, JN, 2008), it is fortuitous to highlight the presence of calcium oxalate crystals causing the outbreak and even the destruction of néphrocyte whose ultrastructure is sufficiently impaired to the left of Figure 2 compared to the right where néphrocytes are free.

These calcium oxalate crystals are present throughout the urinary tract, from the nephron to the bladder; they can even be detected in urine. They constitute " urinary sands " (Wolfram Kawohl Elmar Habermeyer, 2005).

CONCLUSION

Oxalic nephrosis exists in all the regions of the world (Botha, C. J. Penrith, ML, 2008). Today, many livestock producers are aware of its existence, both on their type of production and by its devastating effects on their livestock.

This research work prospects are intended to reproduce the pathological entity to a smaller scale in laboratory animals (hamsters, mice, rats, etc ...) to see other possible effects and neurobehavioral consequences or endocrinological or others, on one hand.

On another hand and for the future, other surveys incite us add calcium or dicalcium salts to food supplements (granules, pellets and grains) to prevent the appearance of these lithiases in the urinary tract in production species.

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