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With 6 figures in the text

Case report

Organophosphate and Carbamate Insecticides poisoning in the Dromedary Camel (*Camelus dromedarius*) in North Kordofan State, Sudan.

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ملخص البحث

تم هذا التقصى فى قطيع من الإبل بممنطقة الرهد بولاية شمال كردفان بالسودان. يتكون القطيع من مائتين وأربعين رأس كانت ترعي علي أكوام من مخلفات نبات السمسم، نفق منها علي الفور مائة رأس وظهرت علي المتبقي منها علامات مرضيه متمثله في اعراض عصبية وإسهال مدمم تم علاجها بمركب سلفات الأتروبين و محاليل وأملاح التروية الوريدية. بإجراء التحاليل الكيميائية لمحتويات كرش الإبل النافقة وعينات من مخلفات السمسم المحصود والتربه ثبت انها تحتوي على مركبات الملاثيون(Malathion) والكلوربيرويغوس (Chlorypyrifos) والكاربارايل(Carbaryl)

أظهرت الفحوصات المجهرية لأنسجة بعض أعضاء الإبل النافقة وجود فراغات في هلام الخلية الكبدية مع وجود نزف ونخر في بعضها، كما ظهر في الأمعاء الدقيقة فى خلايا الشبكة الظهارية مع وجود إحتقان ونزف ونزوح الخلايا الالتهابية إليها. نفقت فئران التجارب والتي تم حقنها بمحتويات معدة الإبل النافقة و تطابقت النتائج المجهرية لأنسجة العينات التي أخذت من بعض أعضائها تماماً مع تلك التي لوحظت من قبل في أنسجة بعض أعضاء الإبل النافقة. أثبتت الدراسة أن مركبات الفسفور العضوية سامة للإبل.

Summary

One hundred camels immediately died while one hundred and forty showed nervous signs accompanied with bloody diarrhea. The survivors were given both atropine sulphate and fluid therapy. Samples taken from ruminal contents of freshly dead camels and from sesame hulls in the area and the presence of Malathion, Chlorpyrifos and Carbaryl. Organophosphrus and carbamate compounds are used in the agricultural sector in the Sudan.

Histopathologically **showed cytoplasmic vacuolation, haemorrhages and necrosis of the liver cells. Intestine showed necrosis of epithelial cells, congestion, haemorrhage and infiltration of inflammatory cells. Mice inoculated with the ruminal contents from intoxicated camel showed the same histopathological lesions that were observed in the intoxicated camels.**

Introduction

Camel's movement in the Sudan, like other animals, takes place along routes that are determined by the availability of water and feed in form of trees, bushes and shrubs inaddition to pasture along the route.

In the Sudan the organophosphate and carbamates insecticides are common used for the control of plant and animal pests (Wahbi *et al*, 1979). Their use in horticulture has drawn attention to their extreme toxicity. They cause reversible or irreversible inhibition by its phosphor-rylation or carbamylation, respectively, leading to its accumulation at the synapses of the neuromuscular junction (Chan and Critchley, 1998).

Organophosphorous compounds vary greatly in their toxicity. The carbamates are generally less toxic organophosphates. Malathion is slightly toxic via the oral route. It is the least toxic organophosphorus insecticide. Its LD_{50} is 1000 mg/kg, greater than 10,000 mg/kg in rat (Chan and Critchley, 1998) or 2800 mg/kg according to Holmes (1953). In mice, the LD_{50} is 400 mg/kg (Chan and Critchley, 1998). Carbaryl is moderately toxic via the oral route with a dose of 200mg/kg in mice (Clarke and Harvey, 1975). Bustos Obregon *et al*. (2003) reported that Malathion has effects on the reproductive system in mice. The oral toxic dose to calves is 10-20 mg/kg, (Radeleff and Woodard, 1957; Clarke *et al*., 1981).

Mohamed (1988) studied the interaction between some pesticides. Furthermore, Mohamed and Adam (1990) studied the effects of Chlorypyrifos, dursban and aldicarb in Nubian goats. Insecticides are commonly used in North Kordofan state.

This study reports an intoxication of a camel herd in North Kordofan State after grazing on sesame hulls residues

Materials and Methods

A camel herds of two hundred and fourty head at Alrahd locality (100 km south east El Obeid town, North Kordofan State, Sudan) showed bloody diarrhoea and nervous signs. They had grazed on sesame hull residues. One hundred camels immediately died and the rest survived. The survivors received atropine sulphate and fluid therapy.

Blood in EDTA, sera, faecal samples and saliva were collected from survivors. Soil samples and sesame hulls were also collected. Necropsy was done on one freshly dead camel from which the ruminal contents were collected in sterile plastic bags. Portions from the intestine, heart, omasum and liver were collected in 10% formalin; they were processed, sectioned and stained with haemotoxlin and eosin (H&E).

For further investigation and confirmation, three male mice were injected 1/P with the stomach contents taken from the dead camel after being diluted with distilled water. Post- mortem examination was made and samples from the liver, kidney, lung and heart were taken in 10% formalin,

processed, sectioned at 4-6 µm thick, stained with haemotoxylin and eosin for histopathologicaly.

Saliva, stomach contents and fats around the heart were also taken. In addition, sesame hulls samples were collected from the area and analyzed for the presence of pesticides. Standard analysis using thin layer chromatography (TLC) (Silica gel GF 254 and aluminum oxide coated plates) and GSMS was conducted according to Kouacs (1964) and Luke (1981). For differentiation between pesticides in TLC, silver nitrate, bromphenol blue and sodium nitrate standards were used.

Results

Dieldrin was detected in the soil samples after visualization by standard silver nitrate spray on silica Gel plate. However, Malathion and Chlorpyrifos were found in ruminal contents and sesame hulls residues after visualization by bromphenol blue on silica gel. A third insecticide, Carbaryl was visualized by sodium nitrate after being loaded on aluminum oxide plate.

Histopathologically, the small intestine showed necrosis of epithelial cells, congestion, haemorrhages, infiltration of inflammatory cells and muscular degeneration (Fig. 1). Haemorrhages and inflammatory cells infiltration were seen in the omasum (Fig. 2). In the liver, necrosis, cytoplasmic vacuolation, heamorrhages and congestion were observed (Fig. 3).

The histopathological pictures observed in specimens collected from mice were typified those observed in the camels. Kidneys showed haemorrhages and necrosis of the renal tubules and infiltration of leukocytes (Fig. 4). Severe degeneration was seen in the heart muscle. In mice, the liver showed congestion and haemorrhages (Fig. 5). Lung showed congestion, hemorrhages, oedema and thickening of the alveolar septa (Fig. 6). The spleen exhibited depletion of lymphocytes as well as deposition of haemosidirn. Prominent ulceration of epithelial cells, haemorrhage, and infiltration of leukocytes were observed in the small intestine. All inoculated mice died within 24 hours.

Discussion

The hazards of animal exposure to pasture and crops treated with organophosphate and carbamate pesticides can cause great economic losses in livestock, including camels. Therefore, the irrational use of these compounds can cause long-lasting pollution (Schulz and Liess,1999; Fulton and Key, 2001).

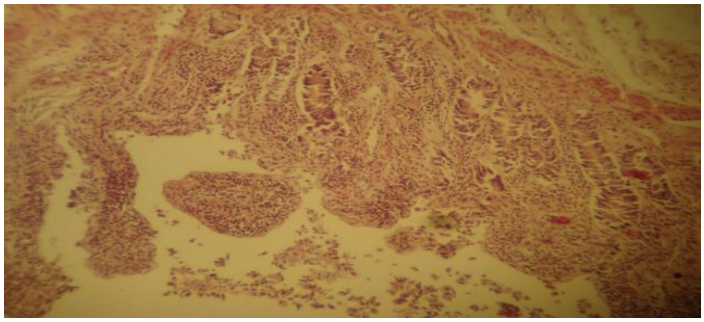

Fig. 1: Camel small intestine, note necrosis of epithelial Cells and inflammatory cells infiltration (H& E X 10).

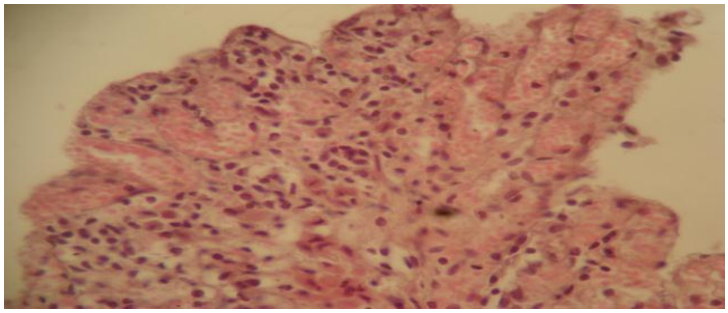

Fig. 2: Camel omasum, severe haemorrhage and inflammatory cells infiltration (H & E X 40).

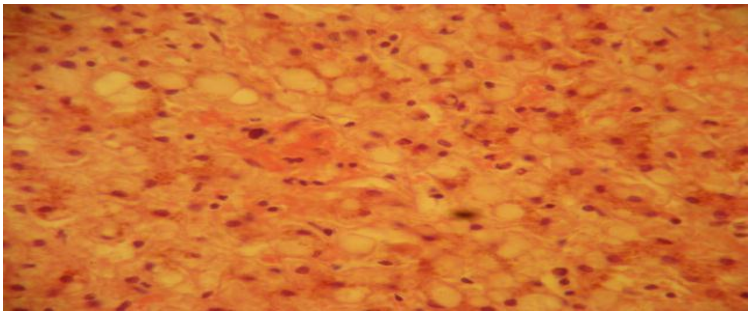

Fig. 3: Camel liver, showing cytoplasmic vacuolation and severe heamorrhage (H & EX 100).

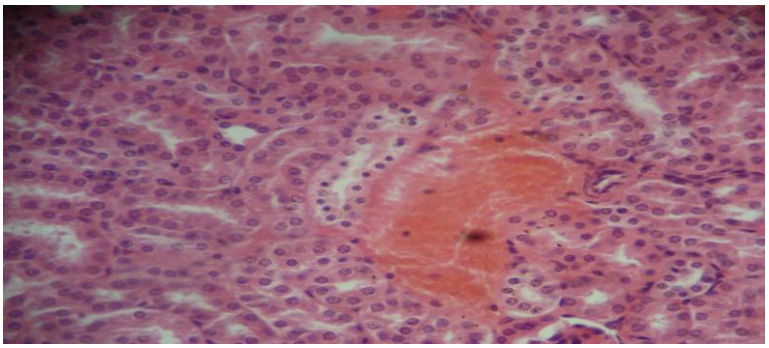

Fig. 4: Mouse kidney showing severe heamorrhage (H & E X100).

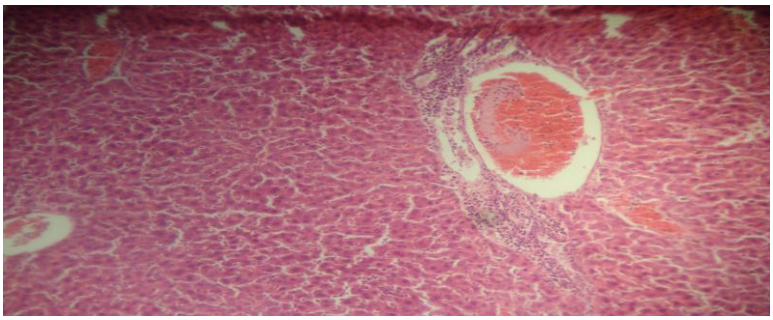

Fig. 5: Mouse liver showing congestion and haemorrhage (H & E X10).

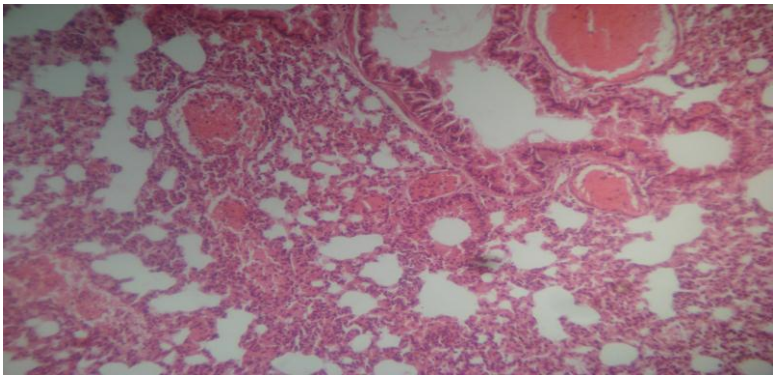

Fig. 6: Mouse lung: Note severe haemorrhage, emphysema and thickening of the alveolar septa (H &E X 40).

Clinical signs and histopathological changes seen in these camels are probably due to organophosphate intoxication that gives rise to muscurinic (salivation, sweating, bronchiolar constriction), nicotinic (muscular tremors, heart block) and central nervous system involvements (convulsions, central depression of respiration).

The histopathological findings are typical to those shown in sheep poisoned by Malathion (Wahbi *et al*, 1979). In our study, one hundered camels immediately died and the early signs of poisoning were non-specific. However, in many documented, cases severe poisoning may result in coma, pulmonary oedema, respiratory failure and death (Haynes, 1982).

Chadee *et al* (1988) reported an occupational hazard of vector-control workers. He found that these compounds decrease the level of cholinestrase to the levels of 0.20-2.6 IU/ ml and no clinical symptoms were observed. The available literature has revealed that, serious poisoning can occur after ingestion of low level of these toxic substances. However, some patients may survive after taking doses greater than the estimated lethal dose.

This investigation has clearly demonstrated that Malathion, Chlorpyrifos and Carbaryl are highly toxic to the dromedary in the Sudan.

Acknowledgments

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References

Bustos-Obregon, E. F.; del Rio, C. and Sarabia, L. (2003). *Asian J. Androl*., **5**:105 -17.

Chadee, D. D.; Le Maitre, R. Paul and Laurent, E. C. (1988), *Ind. Med. J.* **37:** 16 -21.

Chan, T. Y. K; Critchley, J. A. H. (1998). *H K Pract*., **20**: 604 - 613.

Clarke, E. G. C. and Harveys, D. G. (1975). *Veterinary Toxicology*.

Clarke, E. G. C.; Humpreys, D. J. and Harvey, D. G. (1981). In: G. D Lander. (ed) *Veterinary toxicology*. 2nd edn, Bailliere Tindall, London, UK.

Fulton, M. H. and Key, P. B. (2001). *Environ. Toxicol. Chem.*, **20:** 37– 45.

Haynes, W. J. (1982). Pesticides Studies in Man, Williams and Walkers, Baltimore, M. D.

Holmes, R. (1953). *Proc. R. Soc. Med.*, **46**: 799.

Kouacs, J. J. (1964). *Assoc. Agric-Chemis.*, **47:**1097.

Luke, M. A. (981). *J. Assoc. Chem.*, **64**: 1187-1195.

Mohamed, O. S. A. (1988). Studies on the toxicity of certain pesticides with emphasis on their interaction of factors. Ph.D. Thesis, University of Khartoum. Khartoum, Sudan

Mohamed, O. S. A. and Adam, S. E. I. (1990). *Vet. Hum. Toxicol.* **32**: 47-49.

Radeleff, R. D. and Woodward G. T. (1957). *J. Am. Vet. Med. Assoc*., **130**: 215.

Schulz, R. and Liess, M. (1999). *Aquat. Toxicol.*, **46:** 155.

Wahbi, A. A. I.; Abdel Gadir, S. E.; Idris, O. F. and Idris, S. H. (1979). *Sudan J. Vet. Res.*, **1:** 15-29.