

# Pesticide poisoning in a free-ranging lappet-faced vulture (*Torgos tracheliotus*)

S. OSTROWSKI, M. SHOBRAK

THE use of labelled pesticides in agriculture has often caused raptor mortality (Balcomb 1983, Henny and others 1987, Goldstein and others 1996, Mineau and others 1999). However, the link between the decline in some raptor populations and pesticide contamination is often difficult to establish. In the Middle East, circumstantial evidence has led Mendelssohn (1972) to suggest that the dramatic decline in the lappet-faced vulture (*Torgos tracheliotus*) in Israel was due to its feeding on rodents, which had been poisoned by thalium for agricultural purposes. This short communication describes a case of exposure to insecticide in a lappet-faced vulture following an aerial insecticide spray operation. This episode appears to be important as it affected a vulnerable raptor species, thus representing, to the author's knowledge, the first documented case of pesticide poisoning of a bird of prey in Saudi Arabia.

An eight-month-old lappet-faced vulture was found alive near the city of Makkah, Saudi Arabia, in September 1999, and was admitted to the National Wildlife Research Center in Taif. The bird had been born in February 1999 at the Mahazat as-Sayd protected area, 300 km north-east of the city of Makkah, and had a radiotransmitter, a plastic wing tag and a ring. It appeared thin, was slightly dehydrated (<5 per cent) and displayed general weakness. It was ataxic and unable to hold its head upright (flaccid neck posture). The eyes, ear canals, buccal cavity and osteoarticular examinations revealed no lesions. The bird showed no evidence of trauma, but there was bradycardia and dyspnea. Its rectal temperature was normal and there were no symptoms of digestive tract disorder. The bird weighed 4850 g, although its body mass in May 1999, at fledging, was 7100 g.

Because of the neurological symptoms and a history of locust control pesticide spraying in the Makkah-Taif region several weeks previously, a tentative diagnosis of insecticide poisoning was made. Symptomatic treatment was carried out; activated charcoal and kaolin/pectin (Kaopectate; Pharmacia & Upjohn) was given orally and 60 ml lactated Ringer's solution was administered intravenously. Blood samples were taken for haematological and biochemical analyses. A heparinised plasma sample was evaluated for cholinesterase (ChE) activity using a colorimetric assay (Cholinesterase kit; Sigma). A similar sample from a captive griffon vulture (*Gyps fulvus*) was also analysed as an unexposed control.

An above average packed-cell volume (65 per cent) and total protein values confirmed the mild dehydration state (Table 1). Plasma creatinine, uric acid, triglycerides and serum glutamic-pyruvic transaminase (SGPT) values were within reference ranges (Table 1). Glucose and serum glutamic-oxaloacetic transaminase values (SGOT) were above the normal ranges. Seventy-three hours of starvation in pigeons induces hyperglycaemia rather than starvation hypoglycaemia (Lumeij and DeBruijne 1985). In addition, glucose plasma levels are higher in juveniles than in adults and important variations occur with environmental stress (Lewandowski and others 1986). Because pesticide intoxication is not typically associated with hyperglycaemia, it was assumed that the increase could have indicated a state of prolonged starvation, as shown by the decreased body mass. The distribution of SGOT in avian tissues varies

TABLE 1: Results of biochemical analysis carried out on a pesticide-poisoned immature lappet-faced vulture (*Torgos tracheliotus*)

Biochemistry	Results	Reference range <sup>1,2,3</sup>
Glucose (mmol/litre)	37.5	13.8-22.2
Triglycerides (mmol/litre)	0.63	0.62-3.16
Uric acid (mmol/litre)	0.62	0.12-1.27
Creatinine (µmol/litre)	60	50-150
Total protein (g/dl)	8.9	2.5-8.2
GOT (U/litre)	680	36-370
GPT (U/litre)	41	32-160
Cholinesterase (U/litre)*		
Lappet-faced vulture (day 1)	692	-
Griffon vulture (control)	2012	-
Lappet-faced vulture (day 8)	1408	-
Lappet-faced vulture (day 20)	1698	-

\* Unit is defined as the quantity of enzyme which converts a µmol of substrate per minute at 25°C

<sup>1</sup> Leonard 1969

<sup>2</sup> Smith and Bush 1978

<sup>3</sup> Ivins and others 1986

GOT Glutamic-oxaloacetic transaminase, GPT Glutamic-pyruvic transaminase

among species. In general, SGOT activity in raptors with values greater than 350 iu/litre is considered abnormal (Ivins and others 1986). Abnormal activity has been linked to vitamin E, selenium or methionine deficiencies, liver damage, muscle damage, or pesticide and carbon tetrachloride intoxications (Lewandowski and others 1986, Hochleithner 1994).

Because of a low ChE activity (Table 1), intoxication with an organophosphorus or carbamate pesticide was suspected. On day 2, the bird was given 5 mg of atropine sulphate (Atropine Sulfate 1 per cent; Aguetant) (1.03 mg/kg) by intramuscular injection, 60 ml lactated Ringer's solution intravenously, and 5 ml of kaolin/pectin orally. It showed immediate improvement. On day 3 it was reinjected with 2.5 mg of atropine sulphate (0.51 mg/kg) intramuscularly and 60 ml lactated Ringer's solution intravenously. One day after the first injection of atropine sulphate the neck was held upright, and ataxia progressively disappeared. Two days later the bird was able to stand up, and although still imbalanced, could walk. Total recovery was concluded six days after its arrival. It was held in captivity for two more weeks before being released 4 km west of its nesting site. It weighed 6950 g.

ChE inhibiting pesticide poisoning in raptors appears clinically different than is typically described for mammals. Clinical signs include ataxia, spastic nictitans, a detached attitude, inability to fly and, occasionally, convulsions (Dumoncaux and Harrison 1994). Birds are 10 to 20 times more susceptible to ChE inhibitors than mammals, and young individuals appear to be even more susceptible (Humphreys 1988).

Organophosphate and carbamate insecticides affect animals by reducing the levels of the ChE. Measurement of ChE activity in the brain and blood can indicate the intensity of exposure of animals to the insecticide, and a reduction of 80 per cent or more in brain levels is considered diagnostic of sublethal poisoning (Hill and Fleming 1982). A decrease in plasma ChE activity of 50 per cent from normal is considered diagnostic (LaBonde 1991). Although there were no reference values for a lappet-faced vulture, the increase in ChE plasma activity as the bird recovered, confirmed the initial diagnosis (Table 1). Blood ChE levels of tawny eagles (*Aquila rapax*) exposed to fenthion, an organophosphate insecticide similar to fenitrothion, have been shown to drop from an average of 1423 mU/ml to 586 mU/ml (Bruggers and others 1989). The ChE blood level found in the lappet-faced vulture was within the range described for raptors exposed to fenthion (136 to 840) (Bruggers and others 1989).

Two organophosphorus pesticides, fenitrothion and chlorpyrifos, had been used to control outbreaks of locusts. The

Veterinary Record (2001)  
149, 396-397

S. Ostrowski, DVM,  
M. Shobrak, PhD,  
National Commission for  
Wildlife Conservation  
and Development,  
National Wildlife  
Research Center, PO Box  
1086, Taif, Saudi Arabia

recommended rate of fenitrothion application (250 to 300 g/ha) was near that shown to cause mortality in birds (Steedman 1988). Chlorpyrifos, at a rate of 250 g/ha, might also pose a hazard to migrating birds (Smith 1987).

In Saudi Arabia, there are regular irruptions of locusts, representing a major threat to agricultural development. Thus, insecticide spraying is carried out on a very large scale. Scavenger and opportunistic raptors are useful sentinels in agricultural habitats. Being among the species likely to ingest pesticide-contaminated meat, they are much more likely to detect acutely toxic ChE-inhibiting pesticide contaminations than humans (Elliott and others 1997). In Saudi Arabia, the normal diet of lappet-faced vultures consists of sheep, goat and camel carcasses which are thrown away and only rarely buried or burnt (Shobrak 1996); therefore, secondary exposure to insecticide residues through feeding on contaminated carcasses is likely to be the major threat for this species.

With approximately 500 breeding pairs, Saudi Arabia holds the largest lappet-faced vulture population in the Middle East (Newton and Shobrak 1993). Although the population seems healthy, the importance of poisoning relative to other sources of mortality should not be underestimated in the case of this rare and globally threatened species.

#### ACKNOWLEDGEMENTS

The authors would like to thank the Director of the National Commission for Wildlife Conservation and Development, HRH Saud Al Faisal, and the Secretary General, Dr A. Abuzinada, for their support. They also thank J. Renaud and A. R. Khoja, NWRC General Manager and Administrative Director, respectively.

#### References

- BALCOMB, R. (1983) Secondary poisoning of red-shouldered hawks with carbofuran. *Journal of Wildlife Management* **47**, 1129-1132
- BRUGGERS, R. L., JAEGER, M. M., KEITH, J. O., HEGDAL, P. L., BOURASSA, J. B., LATIGO, A. A. & GILLIS, J. N. (1989) Impact of fenthion on nontarget birds during quelea control in Kenya. *Wildlife Society Bulletin* **17**, 149-160
- DUMONCEAUX, G. & HARRISON, G. J. (1994) Toxins. In *Avian Medicine: Principles and Applications*. Eds B. W. Ritchie, G. J. Harrison, L. R. Harrison. Lake Worth, Wingers Publishing. pp 1049-1051
- ELLIOTT, J. E., WILSON, L. K., LANGELIER, K. M., MINEAU, P. & SINCLAIR, P. H. (1997) Secondary poisoning of birds of prey by the organophosphorus insecticide, phorate. *Ecotoxicology* **6**, 219-231
- GOLDSTEIN, M. I., WOODBRIDGE, B., ZACCAGNIGNI, M. E., CANAVELLI, S. B. & LANUSSE, A. (1996) An assessment of mortality of Swainson's hawk on wintering grounds in Argentina. *Journal of Raptor Research* **30**, 106-107
- HENNY, C. J., KOLBE, E. J., HILLS, E. F. & BLUS, L. J. (1987) Case histories of bald eagles and other raptors killed by organophosphorus insecticides topically applied to livestock. *Journal of Wildlife Disease* **23**, 292-295
- HILL, E. F. & FLEMING, W. J. (1982) Anticholinesterase poisoning of birds: field monitoring and diagnosis of acute poisoning. *Environmental Toxicology and Chemistry* **1**, 27-38
- HOCHLEITHNER, M. (1994) Biochemistries. In *Avian Medicine: Principles and Application*. Eds B. W. Ritchie, G. J. Harrison, L. R. Harrison. Lake Worth, Wingers Publishing. pp 223-245
- HUMPHREYS, D. J. (1988) *Veterinary Toxicology*. 3rd edn. London. Baillière Tindall. pp 129-182
- IVINS, G. K., WEDDLE, G. D. & HALIWELL, W. H. (1986) Haematology and serum chemistries in birds of prey. In *Zoo and Wildlife Medicine*. 2nd edn. Ed M. E. Fowler. Philadelphia, W. B. Saunders. pp 286-290
- LABONDE, J. (1991) Avian toxicology. *Veterinary Clinics of North America - Small Animal Practice* **21**, 1329-1342
- LEONARD, J. L. (1969) Clinical laboratory examinations. In *Diseases of Cage and Aviary Birds*. Ed M. Petrak. Philadelphia, Lea & Febiger. pp 189-215
- LEWANDOWSKI, A. H., CAMPBELL, T. W. & HARRISON, G. J. (1986) Clinical chemistries. In *Clinical Avian Medicine and Surgery*. Eds G. J. Harrison, L. R. Harrison. Philadelphia, W. B. Saunders. pp 192-200
- LUMEIJ, J. T. & DEBRUIJNE, J. J. (1985) Blood chemistry reference values in racing pigeons (*Columba livia domestica*). *Avian Pathology* **14**, 401-408
- MENDELSSOHN, H. (1972) The impact of pesticides on birdlife in Israel. *Bulletin of the International Council for Bird Preservation* **11**, 75-104
- MINEAU, P., FLETCHER, M. R., GLASER, L. C., THOMAS, N. J., BRASSARD, C., WILSON, L. K., ELLIOTT, J. E., LYON, L. A., HENNY, C. J., BOLLINGER, T. & PORTER, S. L. (1999) Poisoning of raptors with organophosphorus and carbamate pesticides with emphasis on Canada, US and UK. *Journal of Raptor Research* **33**, 1-37
- NEWTON, S. F. & SHOBRACK, M. (1993) The lappet-faced vulture *Torgos tracheliotus* in Saudi Arabia. Proceedings of the Eighth Pan-African Ornithological Congress: Birds and the African Environment. Ed R. T. Wilson. Tervueren. Musée Royal de l'Afrique Centrale. pp 111-117
- SHOBRACK, M. (1996) Ecology of the lappet-faced vulture *Torgos tracheliotus* in Saudi Arabia. PhD thesis. Glasgow University, Glasgow
- SMITH, G. J. (1987) Pesticide use and toxicity in relation to wildlife: organophosphorus and carbamate compounds. Fish and Wildlife Services Resource Publication 170. Washington DC, USDI
- SMITH, E. & BUSH, M. (1978) Haematologic parameters on various species of strigiformes and falconiformes. *Journal of Wildlife Diseases* **14**, 447-450
- STEEDMAN, A. (1988) Locust handbook. Ed A. Steedman. London, Overseas Development Natural Resources Institute
- JELINEK, P. D., DEPIAZZI, L. J., GALVIN, D. A., SPICER, I. T., PALMER, M. A. & PITMAN, D. R. (2001) Eradication of ovine footrot by repeated daily footbathing in a solution of zinc sulphate with surfactant. *Australian Veterinary Journal* **79**, 431-434

## ABSTRACTS

### Eradication of ovine footrot with a zinc sulphate footbath

TWO hundred and thirty-eight merino sheep with a history of S1, U1, T and/or U6 types of *Dichelobacter nodosus* in interdigital and underrunning footrot lesions were allocated at random to two groups. One group was made to stand for 10 minutes on five successive days in a footbath containing 15 to 18 per cent zinc sulphate and a surfactant; their feet were not pared before treatment. The other group was left untreated, and the feet of all the sheep were inspected fortnightly for a year. After footbathing there were no lesions in any of the treated sheep throughout the year. In the control sheep the percentage of lesions increased from 9 per cent between weeks 20 and 36, to 14 per cent between weeks 36 and 52.

### Effect of a tongue-tie on exercising horses

MANY racehorses with a poor racing performance are run with their tongues tied in an attempt to improve the function of their upper airways. In this study the respiratory mechanics of five standardbred horses were measured while they were running on a treadmill either with or without a tongue-tie, at speeds corresponding to 50, 75, 90 and 100 per cent of their maximal heart rate. There were no significant differences between the two series of measurements in terms of the horses' peak inspiratory or expiratory tracheal or pharyngeal resistance, peak pressure, peak expiratory flow, tidal volume, respiratory rate or minute ventilation. However, when the horses ran with a tongue-tie they had significantly higher peak inspiratory flows at 50 per cent of their maximal heart rate.

CORNELISSE, C. J., HOLCOMBE, S. J., DERKSEN, F. J., BERNEY, C. & JACKSON, C. A. (2001) Effect of a tongue-tie on upper airway mechanics in horses during exercise. *American Journal of Veterinary Research* **62**, 775-778