THE USE OF THE STEROID ANAESTHETIC CT 1341 IN BIRDS*

by
J. E. Cooper**
Veterinary Research Laboratory
P.O. Kabete, Kenya
and
L. G. Frank**
Baharini Wildlife Sactuary
P.O. Box 33
Nakuru, Kenya

Introduction

Despite extensive work on mammals there is a shortage of accurate data on the anaesthesia of birds. Those publications which exist frequently fail to supply information on the methods used to assess the depth of anaesthesia, as was emphasized by Jordan, Sanford and Wright (1960). Birds have a high metabolic rate and a specialized respiratory system and hence frequently react poorly or adversely to agents which cause sedation or anaesthesia in mammals (Arnall 1964).

Efficient anaesthesia of birds is frequently of value to the veterinary surgeon. The fowl and other domesticated species are only rarely anaesthetised when kept for commercial purposes, but as laboratory animals they frequently require immobilisation or anaesthesia for experimental techniques.

In small animal practices a number of exotic birds may be presented for surgery and here a suitable anaesthetic is essential. The predatory birds can be particularly difficult and dangerous to handle and an anaesthetic agent may be desirable for even minor procedures.

The various agents available for the anaesthesia of birds of prey were discussed by Cooper (1970) and Houston and Cooper (1973) who concluded that a number were unsuitable for these species. These authors recommended the hypnotic agent metomidate (Janssen Pharmaceutica) by intramuscular injection for predatory birds.

During the course of work in Kenya it was necessary to anaesthetise wild and

*This paper was presented at the Conference on Raptor Conservation Techniques in Fort Collins, Colorado, 22-24 March, 1973. It originally appeared in *The Veterinary Record* of May 5, 1973 (92:474-479), and the authors wish to express their sincere appreciation to the Editor of that journal for permission to reproduce the article in part.

**Present addresses: [JEC] Clinical Research Centre, Watford Road, Harrow, Middlesex, HA1 3UJ, England; [LGF] 101 Reservoir Road, Hillsborough, California 94010.

captive birds of prey for veterinary purposes and also to perform pectoral muscle biopsies for chlorinated hydrocarbon insecticide analysis as described by Siedensticker (1970). Initially, the biopsies were carried out using intramuscular metomidate, but the recovery period with this drug frequently proved too long and the anaesthetised birds often salivated excessively, even if atropine was administered. As a result of these disadvantages, another, shorter-acting drug was investigated.

This was CT 1341, a steroid anaesthetic which has been successfully used in humans and which is available commercially for use in cats (Evans, Aspinall and Hendy 1972). The pharmacological properties of CT 1341 were described by Child *et al.* (1971) who investigated its anaesthetic activity in a number of mammals including rodents, cat, dog, and monkey. These authors drew attention to the rapid and uncomplicated induction and recovery in all species investigated using the drug. It had a high therapeutic index and could be used safely in conjunction with premedicants, volatile anaesthetics and muscle relaxants. One very significant advantage of CT 1341 was that, unlike thiopentone sodium, intra-arterial injection was not associated with severe oedema and necrosis. Use of CT 1341 is not, however, recommended in the dog, as it can produce undesirable "allergic" responses such as erythema and urticaria.

CT 1341 is a clear, slightly viscous solution. Each ml contains 12 mg of total steroids, composed of 9 mg alphaxolone and 3 mg alphadolone acetate.

Methods

After initial testing in domestic poultry (Cooper and Frank 1973) CT 1341 was used in 26 captive and recently caught birds of prey of 16 species and varying weights. The drug was injected undiluted (12 mg/ml active ingredient) into the brachial vein with a 25 or 26 gauge needle while the hooded bird was held supine with one wing extended by an assistant. The injection site was first cleaned with 70% methanol.

Depth of anaesthesia was assessed by the response to pressure (squeezing of the foot) and pain (pricking of the skin of the face with a narrow gauge needle). As was the case with Jordan, Sanford and Wright's (1960) work, the corneal reflex proved unsatisfactory.

Results

The results obtained with raptors are summarized in Table 1.

In each case the bird's weight is given, together with the dosage of CT 1341. The latter is expressed both in terms of volume and mg/kg body weight. The weight was assumed constant in cases where a bird was injected more than once.

In the results, "hypnosis" is defined as a stage where the bird was unable to stand, but responded to pressure and pain. In the case of "deep hypnosis" the response was only slight, while "anaesthesia" implies that there was no response at all to these stimuli.

The "duration" of action is the interval between the giving of the injection and the bird's being able to stand and respond to stimuli. In all cases the period

Table 1. Use of CT 1341 in birds of prey.

Species and weight (g)	No.	Dosage	Route	Result	Duration	Purposes and Comments
(1) Harrier Hawk (*Polyboroides typus*) 860	1	0.55 ml (8 mg/kg)	i-v	Immediate anaesthesia	8½ mins.	Routine examination of plumage.
	1	0.5 ml (6.9 mg/kg)	i-v	Immediate anaesthesia	10 mins.	As above.
(2) Harrier Hawk 690	1	0.4 ml (7 mg/kg)	i-v	Immediate anaesthesia	11 mins.	As above.
	1	0.3 ml (5 mg/kg)	i-v	Immediate anaesthesia	8 mins.	As above.
(3) Tawny Eagle (*Aquila rapax*) 2800	1	1.5 ml (7 mg/kg)	i-v	Immediate anaesthesia	Approx. 12 mins.	Examination of leg injuries.
	1	1.5 ml (7 mg/kg)	i-v	Immediate anaesthesia	Approx. 12 mins.	X-ray of fractured leg. Bird in poor condition.
	1	1.75 ml (8 mg/kg)	i-v	Immediate anaesthesia	14 mins.	Taking of biopsy from pectoral muscle.
	1	1.75 ml (8 mg/kg)	i-v	Immediate anaesthesia	9 mins.	Fracture of tibia broken down and plastered.
(4) African Hawk Eagle (*Hieraaetus fasciatus spilogaster*) 1310	1	1.0 ml (9 mg/kg)	i-v	Immediate anaesthesia	7 mins.	Examination of biopsy wound.

Table 1. (continued)

Species and weight (g)	No.	Dosage	Route	Result	Duration	Purposes and comments
(5) Lizard Buzzard (*Kaupifalco monogrammicus*) 290	1	0.2 ml (8 mg/kg)	i-v	Immediate anaesthesia	8 mins.	Examination of biopsy wound.
	1	2.0 ml (82 mg/kg)	i-p	Anaesthesia within 15 secs., dead within 8 mins.	–	Injection entered air sac. Bird died.
(6) Lizard Buzzard 260	1	1.0 ml (46 mg/kg)	i-p	No effect.	–	Routine examination. No effect.
	1	0.5 ml (23 mg/kg)	i-p	No effect.	–	Routine examination. No effect.
	1	0.25 ml (11.5 mg/kg)	i-v	Immediate anaesthesia	5 mins.	Fracture of radius ulna broken down and splinted.
	1	1.0 ml (46 mg/kg)	i-m	Light hypnosis within 15 mins.	50 mins.	Removal of splint from wing.
(7) White-backed Vulture (*Gyps africanus*) 4970	1	1.4 ml (3.3 mg/kg)	i-v	Immediate anaesthesia	19 mins.	Examination and taking of blood sample.
(8) Spotted Eagle Owl (*Bubo africanus*) 620	1	0.3 ml (5.8 mg/kg)	i-v	Immediate anaesthesia	11 mins.	X-ray of wing fractures, trembling apparent.
	1	0.35 ml 6.7 mg/kg)	i-v	Immediate anaesthesia.	Approx. 13 mins.	X-ray of wing fractures, trembling apparent.

Table 1. (continued)

Species and weight (g)	No.	Dosage	Route	Result	Duration	Purpose and comments
(9) African Goshawk (*Accipiter tachiro*) 330	1	0.25 ml (9 mg/kg)	i-v	Immediate anaesthesia	8 mins.	Routine examination and x-ray of leg.
(10) Barn Owl (*Tyto alba*) 300	1	0.18 ml (7.2 mg/kg)	i-v	Immediate anaesthesia	13½ mins.	X-ray of wing fracture.
(11) Hooded Vulture (*Necrosyrtes monachus*) 1800	1	0.8 ml (5.3 mg/kg) followed by 0.5 ml (3.3 mg/kg) after 4 mins.	i-v	Immediate hypnosis after first injection but soon began to lighten. Similar hypnosis after second injection	10 mins. from first injection	X-ray of leg fracture.
	1	1.3 ml (8.6 mg/kg)	i-v	Immediate anaesthesia	6 mins.	Taking of blood samples. Compare result with divided doses above.
(12) African Fish Eagle (*Haliaeetus vocifer*) 2000	1	1.0 ml (6 mg/kg)	i-v	Immediate anaesthesia	5 mins.	Removal of ectoparasites. Wing trembling apparent.
(13) Pale Chanting Goshawk (*Melierax canorus*) 500	1	0.4 ml (9.6 mg/kg)	i-v	Apnoea for one min. Anaesthesia.	30 mins.	Routine examination and removal of ectoparasites. Freshly caught bird.

Table 1. (continued)

Species and weight (g)	No.	Dosage	Route	Result	Duration	Purposes and comments
(14) Lanner (*Falco biarmicus*) 650	1	0.4 ml (7.3 mg/kg)	i-v	Immediate anaesthesia	31½ mins.	Pectoral muscle biopsy. Freshly caught bird.
(15) Black Kite (*Milvus migrans*) 590	1	0.3 ml (6 mg/kg)	i-v	Immediate anaesthesia	5 mins.	X-ray of body.
(16) Dark Chanting Goshawk (*Melierax metabates*). Not weighed (adult).	1	0.4 ml (?)	i-v	Immediate anaesthesia	25 mins.	Pectoral muscle biopsy. Freshly caught bird.
(17) Augur Buzzard (*Buteo rufofuscus*) 1325	1	0.9 ml (8.1 mg/kg)	i-v	Immediate anaesthesia	15 mins.	Pectoral muscle biopsy. Freshly caught bird.

of apparent analgesia was considerably less.

The only predatory birds injected by intramuscular or intraperitoneal routes, Lizard Buzzards (5 and 6) showed similar results to poultry by the former, but 23 mg/kg produced only slight sedation and incoordination lasting 35 minutes. Neither 23 mg/kg nor 46 mg/kg had any effect by the intraperitoneal route in one of the Lizard Buzzards (6) and this is possibly because the bird was very fat and the CT 1341 may have entered abdominal fat, rather than the body cavity, and been absorbed slowly.

In the case of the other Lizard Buzzard (5) which was equally fat, a dose of 2 ml (82 mg/kg) killed the bird, this being the only fatality among the birds of prey. Death was due to the needle inadvertently entering an abdominal air sac. The bird spluttered immediately, lost consciousness within 15 seconds, and brought up fluid (probably the drug) through the trachea. Despite attempts to revive it, the bird deteriorated and died within three minutes. This accident emphasizes the importance of care when giving CT 1341 by the intraperitoneal route: in the case of the Lizard Buzzard the injection was given single-handed and hence positioning of the needle was not perfect.

Intravenous administration in birds of prey produced rapid loss of consciousness and apparent analgesia which usually lasted less than five minutes. Such analgesia was sufficient to permit considerable painful manipulation including, in the case of the Tawny Eagle (3), Lanner (14), Dark Chanting Goshawk (16) and Augur Buzzard (17) the taking of a biopsy from the pectoral muscles. The prime advantage of the intervenous route was the rapid recovery, the bird usually showing the return of pedal reflexes within four minutes. The speed at which CT 1341 is metabolized in birds is indicated by the different responses in the Hooded Vulture (11) when 1.3 ml were given in single and divided doses.

The Tawny Eagle received four intravenous injections of CT 1341 in 13 days with no obvious ill effects. The Spotted Eagle Owl (8) and African Fish Eagle (12) both showed wing trembling while anaesthetised, but this did not hamper work and was not seen in other species.

The administration of intravenous doses of 14 mg/kg or over in chickens usually resulted in deaths; no fatalities occurred at less than this dosage. In birds of prey, doses of up to 10 mg/kg produced satisfactory anaesthesia.

In most cases the bird had fully recovered within 15 minutes and was feeding soon afterwards (within 20 minutes in the case of the African Goshawk (9)). This was in contradistinction to the effect of metomidate under which birds took several hours to recover and, in the case of some wild-caught specimens, were still very dazed and anorectic 18 hours later. The Pale Chanting Goshawk (13), Lanner, Dark Chanting Goshawk and Augur Buzzard were all injected with CT 1341 within 36 hours of capture. Recovery was prolonged and this was attributed to their not having eaten during this time. All fed readily within one hour of the injection.

The small dose used to anaesthetise the White-backed Vulture (7) and the bird's slower recovery suggest that, as with metomidate (Houston and Cooper 1973), the larger vultures may require smaller doses than other predatory birds,

but further investigation is needed. The Hooded Vulture, a small species, needed a comparable does to other non-vulturine species.

Discussion

The results indicate that CT 1341 has a place in avian anaesthesia. It is suggested that, used intravenously, it offers a suitable alternative to metomidate, particularly when an ultra-short-acting agent with a rapid recovery is required. Examples of its use are the taking of a biopsy, radiography and, possibly, induction of anaesthesia prior to maintenance with a volatile agent. CT 1341 appears to be a safe drug, even in recently captured birds of prey unaccustomed to handling. Administration of the drug by the intravenous route necessitates manual restraint of the bird, but the brachial vein is easily found and the injection rarely poses problems if a narrow gauge needle is used. In the case of birds of prey the use of a hood considerably facilitates handling. The suggested intravenous dose of 10 mg/kg for birds is comparable with that of 9 mg/kg recommended for intravenous anaesthesia in the cat.

By intraperitoneal or intramuscular routes, CT 1341 produces immobilisation, but analgesia is poor. The duration of such immobilisation is proportional to dosage. By such routes CT 1341 has certain advantages over metomidate; a larger volume of the former must be given to produce similar results, but recovery is smoother and quicker. Intraperitoneal CT 1341 is probably of value for use in small birds, for non-painful procedures such as the examination of plumage and removal of ectoparasites.

Care should be taken, however, to avoid injecting into the abdominal air sac and it is probable that absorption of the drug is retarded if it enters abdominal fat. The failure of an intramuscular dose of 30 mg/kg to affect one chick suggests that, as in cats (Evans, Aspinall and Hendy 1972), injection of the drug between the fascial planes of a muscle may render it inactive.

Acknowledgments

We wish to thank Mr. Isaac Ating'a for his able assistance with the work in poultry, Mr. P. D. Sayer, B.V.M.S., F.R.C.V.S. and his colleagues for radiological facilities and Mrs. Margaret Cooper for her help with surgery and post-operative care. Glaxo Laboratories Ltd. kindly provided samples of CT 1341. This report is published with permission of the Director of Veterinary Services, Kenya.

References Cited

Arnall, L. 1964. Aspects of anaesthesia in cage birds. In *Small Animal Anaesthesia*. O. Graham-Jones, ed. Proceedings of a Symposium organized by the B.S.A.V.A./U.F.A.W., London, July, 1963. Pergamon Press, Oxford.

Child, K. J., J. P. Currie, B. David, M. G. Dodds, D. R. Pearce, and D. J. Twissell. 1971. The pharmacological properties in animals of CT 1341—a new steroid anaesthetic agent. *Brit. J. Anaesth.* 43:2-13.

Cooper, J. E. 1970. Use of the hypnotic agent "Methoxymol" in birds of prey. *Vet. Rec.* 87:751-752.

Cooper, J. E and L. G. Frank. 1973. Use of the steroid anaesthetic CT 1341 in birds. *Vet. Rec.* 92:474-479.

Evans, J. M., K. W. Aspinall, and P. G. Hendy. 1972. Clinical evaluation in cats of a new anaesthetic, CT 1341. *J. Small Anim. Pract.* 13:479-486.

Houston, D. C. and J. E. Cooper. 1973. Use of the drug metomidate to facilitate the handling of vultures. *International Zoo Yearbook* 13:269-270.

Jordan, F. T. W., J. Sanford and A. Wright. 1960. Anaesthesia in the fowl. *J. Comp. Path.* 70:437-449.

Siedensticker, J. C. 1970. A biopsy technique to obtain tissue for pesticide residue analysis for falconiform birds. *Bull. of Environ. Contam. and Tox.* 5: 443.