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REVERSIBLE ANESTHESIA OF THE BLUE DUIKER (*CEPHALOPHUS MONTICOLA*) WITH MEDETOMIDINE AND KETAMINE

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Abstract: Ten blue duiker (*Cephalophus monticola*) were blowdarted with a combination of ketamine and medetomidine, resulting in a level of sedation adequate for minor procedures in eight of the duikers (mean dosages: ketamine, 2.2 mg/kg; medetomidine, 190 μg/kg). Two duikers required an additional dose. Atipamezole (mean dosage: 0.95 mg/kg) given as a split dose i.v. and i.m. in all duikers, resulted in complete reversal of sedation. No anesthetic complications were seen in any of the duikers.

Key words: Blue duiker, *Cephalophus monticola,* sedation, ketamine, medetomidine, atipamezole.

INTRODUCTION

The blue duiker (*Cephalophus monticola*) is the smallest of the duikers in the genus *Cephalophus* and stands approximately 30 cm high at the shoulder, with a weight of 3–6 kg. They are found in densely wooded country in Africa, and the wild populations are threatened by habitat loss and overhunting. Blue duiker, like other miniature antelope species, are often caught in nets or by hand, although this method is not without risk to the operator and the animal.[2] Protocols for the anesthesia of blue duiker (*Cephalophus monticola*) are poorly developed. Reports of chemical restraint of blue duiker describe the use of etorphine or fentanyl with xylazine. Dosages of 0.3–0.5 mg/kg fentanyl with 0.4–0.8 mg/kg xylazine or 0.03 mg/kg etorphine with 0.4–0.8 mg/kg xylazine have been described (Namibian game capture unit, unpubl. data). In this paper, we describe the use of medetomidine and ketamine, with reversal by atipamezole, for the collection of blood samples at Chipangali Wildlife Trust in Bulawayo, Zimbabwe, as part of the Pan-African Decade of Duiker Research.[8] The duikers form part of a collection held at the Trust's duiker research and breeding center. This drug combination was chosen because etorphine presents a risk to the handler and is associated with significant adverse effects, including respiratory depression, in many species.[3,4] The combination of ketamine with medetomidine has been used with success in a variety of species.[5]

MATERIALS AND METHODS

Between 22 and 30 October 1991, 10 captive blue duiker of mixed ages and sexes (Table 1) were anesthetized with combinations of ketamine (ketamine hydrochloride, Vetalar, Parke-Davis and Co., Usk Road, Pontypool, Gwent NP4 0YH, U.K.) and medetomidine (medetomidine hydrochloride, Domitor, Smith-Kline Beecham Animal Health, Walton Oaks, Dorking Road, Tadworth, Surrey, KT20 7NT, U.K.). The drugs were mixed in the same blowdart and administered into the hind limb musculature of the duikers using a blowpipe (Telinject UK, Littleborough, Lancashire, U.K.).

The blue duikers were darted in 5- × 3-m enclosures and had been habituated to the presence of their daily attendants. The time taken to obtain lateral recumbency was noted, and the duikers were carried to a small laboratory room near the pens when adequately sedated. The animals were weighed

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Table 1. Blue duiker anesthesia data.

Animal no.	Sex	Age (mo)	Weight (kg)	Medetomidine (μg/kg)	Ketamine (mg/kg)	Time to lateral (min)	Atipamizole		Sedation duration (min)	Time to standing (min)
							Dosage (mg/kg)	Dose ratio (i.v.:i.m.)		
BD1	M	12	4.0	126	1.89	6	0.63	3:2	32	2.0
BD2	M	>84	4.0	156[a]	2.38	8	0.78	1:1	34	7.0
BD3	M	9	3.1	206	3.1	6	1.03	1:1	30	1.5
BD4	M	16	3.2	200	2.97	5	1.0	1:1	37	1.5
BD5	F[b]	20	4.3	186	1.86	11	1.02	3:1	41	1.0
BD6	M	52	4.1	204	1.95	6	1.01	1:1	41	1.0
BD7	M[c]	>61	4.1	204	1.95	9	1.02	1:1	42	1.0
BD8	M	13	4.3	195	1.86	8	0.98	1:1	34	1.5
BD9	F[d]	51	4.3	148	1.86		1.05	1:1	54	1.0
BD10	F	5	3.5	200	2.0	8	1.0	1:1	22	1.0

[a] Needed additional 77.5 μg/kg medetomidine, given i.m. 17 min after initial dose.
[b] Pregnant.
[c] Dart penetrated caudal abdomen; possible intraperitoneal injection.
[d] Lactating. Additional 32.2 μg/kg medetomidine given i.v. 42 min after initial dose.

once sedated. The depth of sedation was determined from the response to visual, acoustic, and tactile stimuli. Heart rate, respiratory rate, and body temperature were recorded every 5 min where possible. When sedation was inadequate, supplementary medetomidine was given i.m. When handling was complete, sedation was reversed by the injection of atipamezole (atipamezole hydrochloride, Antisedan, Smith-Kline Beecham Animal Health) with the dose split between i.v. and i.m. routes (Table 1). The duikers were allowed to recover in individual darkened recovery crates with rubber floors. The time of administration of the antagonist and the time when the duikers first stood were recorded.

RESULTS

Drug dosages for each sedation and sedation reversal are given in Table 1. An average dosage of 2.2 mg/kg of ketamine combined with 190 μg/kg of medetomidine given i.m. resulted in adequate sedation. Some of the blue duikers responded to darting with a short period of running, sometimes retreating into their darkened sleeping areas. One sedated animal was butted by its cage mate. Typically, 15 min were allowed to elapse before duikers were approached. Two duikers, BD2 and BD9, needed additional doses of medetomidine. The level of sedation achieved was adequate for handling, blood collection, collection of feces per rectum, and topical treatment of minor wounds. The mean time to lateral recumbency was 7.4 min.

The mean (±SD) respiratory rate for sedated duikers was 36.3 ± 14.0 breaths/min, heart rate was 83.3 ± 18.8 beats/min, and body temperature was 39.4°C ± 0.9°C. The interval between delivery of the blowdart and administration of atipamezole ranged from 22 to 42 min and represents the time taken to collect necessary samples.

Atipamezole at all dosage rates ($\bar{x}$ = 0.95 mg/kg) resulted in apparent complete anesthetic reversal when given as a split dose (i.v. and i.m.). Induction was generally calm, although a few duikers were excited during recovery. All duikers were given atipamezole at the end of the sedation period. One pregnant female and one lactating female were anesthetized with no adverse effects. All animals appeared healthy 4 wk after darting.

DISCUSSION

A mixture of medetomidine (190 μg/kg) and ketamine (2.2 mg/kg) produced a level

of sedation adequate for capture and minor procedures such as blood sampling in eight of 10 blue duikers in this study. This dosage is slightly higher than that used in klipspringers (*Oreotragus oreotragus*), in which a mixture of 159 μg/kg medetomidine and 2.1 mg/kg ketamine was adequate (Bailey, Baker, Nicholls, Wilson, unpubl. data). The routes of administration of atipamezole may have been responsible for the occasional excited recovery. A dose split with a greater fraction i.m. or s.c. rather than i.v. might have been preferable. There were no relapses after atipamezole administration. Failure of adequate sedation in two animals may have been due to inaccurate estimation of weight, with consequent underdosing, or too early an approach after darting. Data for heart and respiratory rates in undisturbed blue duiker are not available, although estimates based on allometric scaling equations can be calculated from body weights:[6] heart rate = 241 × (body weight)$kg^{-0.25}$ and respiratory rate = 53.5 × (body weight)$kg^{-0.26}$. The estimated values for blue duiker are a heart rate of 172 beats/min and a respiratory rate of 39 breaths/min. These calculations are based upon a mean body weight of 3.8 kg. The mean recorded heart rate during sedation was 83.3 beats/min, which is significantly lower than the calculated value of 172 beats/min in the unsedated animal. The mean respiratory rate during sedation was 36.3 breaths/min, which is similar to the calculated value of 38 breaths/min. Bradycardia is a common finding in animals sedated with medetomidine and is associated with inhibition of sympathetic tone.[7] Other complications with medetomidine and ketamine include ruminal tympany[5] and regurgitation.[1] Neither of these complications were observed in this study. In conclusion, medetomidine plus ketamine, with sedation reversal by atipamezole, appears to be a useful combination of drugs for chemical restraint of the blue duiker. Further trials would be useful to evaluate the feasibility of higher dosages of this drug combination to achieve deeper levels of sedation.

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