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Ketamine-medetomidine regimen for chemical immobilisation of free-ranging chimpanzees (*Pan troglodytes schweinfurthii*) in Uganda

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Short Communications

Ketamine-medetomidine regimen for chemical immobilisation of free-ranging chimpanzees (*Pan troglodytes schweinfurthii*) in Uganda

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AN increasing human population in Uganda has had consequences for free-ranging chimpanzees (*Pan troglodytes schweinfurthii*), including habitat destruction and antagonistic interaction with humans. This situation has led to increasing numbers of human-induced chimpanzee injuries, as well as elevated risks of pathogen transmission between these species. As a result, the need for veterinary intervention has increased commensurately.

The most common form of human-induced injury in chimpanzees in Uganda is from snaring (Waller and Reynolds 2001). Other situations that may require intervention are disease outbreaks and orphaned individuals. For example, respiratory disease outbreaks of human metapneumovirus and respiratory syncytial virus have occurred in chimpanzees in West Africa and have had devastating effects (Köndgen and others 2008). Interventions in such cases may be justified to provide treatment to the affected individuals and to obtain diagnostic specimens.

In deciding whether to intervene, veterinarians consult with wildlife authorities and consider the risk of intervention to the affected chimpanzee and field personnel, the resources available, the extent of injury or illness, and finally the potential benefit of the intervention to the individual chimpanzee and the population. Once the decision is made to intervene, the next challenge is choosing an appropriate anaesthetic regimen. The ideal regimen would be fast-acting, safe and reversible. Regimens exist for chemical immobilisation of captive chimpanzees but, to our knowledge, no similar protocols have been published for free-ranging chimpanzees. This study expands upon data from a previous intervention (Hyeroba and others 2011) and, on the basis of a series of subsequent cases, suggests a safe and partially reversible ketamine-medetomidine regimen for chemical immobilisations of free-ranging chimpanzees in Uganda.

Rapid induction of anaesthesia after intramuscular injection, a wide safety margin, and minimal cardiopulmonary depression have made ketamine popular for anaesthesia of non-human primates. Ketamine, used alone, has been associated with side effects, such as seizures, brief sedation and ptyalism in captive apes (Sleeman 2007, Naples and others 2010). Medetomidine is an α-2 adrenergic receptor agonist that affects both noradrenergic and serotonergic pathways of the CNS. Through the presynaptic inhibition of norepinephrine release, it affects nociception to provide analgesia and the limbic neurons causing sedation (Cullen 1996, Horne 2001). Medetomidine, however, does affect the cardiovascular system both centrally and peripherally. Centrally, by increasing vagal tone and sympathetic depression, it causes hypotension and bradycardia, and peripherally by vasoconstriction, it can cause hypertension (Horne and others 1998). However, because medetomidine is more specific than other α-2 adrenergic receptor agonists such as xylazine and detomidine, it produces less pronounced adverse effects. The effects of medetomidine can be reversed by the use of an α-2 receptor antagonist such as yohimbine or atipamezole. Using a combination of ketamine and medetomidine reduces the dose for each drug required to achieve the desired effect, providing a partially reversible anaesthesia with less individual adverse drug effects.

This study was conducted in Uganda, where chimpanzees are found mainly in forested areas in the western part of the country, including the small fragments between the main forest blocks (Plumptre and others 2003). Ketamine hydrochloride (Kyron laboratories)-medetomidine hydrochloride (Domitor, Orion Pharma) regimens used for chemical immobilisation of nine free-ranging chimpanzees in Uganda were compiled from 2006 to 2011. The nine interventions performed included two cases of snare injuries, five trap injuries, one spear injury and one case of a respiratory disease outbreak investigation.

Each intervention involved weight estimation, based on visualisation of the target chimpanzee and prior experience. Actual weights of the animals were not recorded, given the short duration of the interventions, which was designed to minimise possible injury to the animals and personnel.

Drugs were delivered using 1.5–3.0 ml darts with 1.5 mm×25 mm collared needles projected by a pneumatic pistol (Dan-inject) at distances of 5–15 m. The preferred sites for darting were muscles of the thighs and sacrolumbar region. During each anaesthetic event, vital signs (respiratory rate, heart rate and temperature) were monitored and recorded. Each animal received a physical examination and was treated, and clinical samples were collected. The effects of medetomidine were reversed using atipamezole hydrochloride (Antisedan, Orion Pharma) delivered intramuscularly.

During anaesthesia, the amount of ketamine, medetomidine and atipamezole used were recorded, as were induction time, tolerance time and recovery time. Induction time in minutes was defined as the interval between darting and recumbence, tolerance time in minutes was the duration between recumbence and administration of atipamezole, and recovery time in minutes was the interval between administration of atipamezole and the animal standing. First contact with the animals was made after recumbence and when it was deemed safe for personnel to approach the target animals. Data from the nine chimpanzees are summarised in Table 1. By using an average dosage rate of 4.74±2.19 and 0.04±0.02 mg/kg of ketamine and medetomidine, respectively, induction was achieved in all nine individuals. The effects of medetomidine were reversed using atipamezol (0.21 mg/kg±0.10).

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TABLE 1: Physiologic values, induction and recovery times for free-ranging chimpanzees (n=9) anesthetised using ketamine-medetomidine in Uganda from 2006 to 2011

Variable	Mean (SD)	Range	Median (IQR)
Estimated body weight (kg)	40.56 (15.70)	(15.00–60.00)	45.00 (35.00, 55.00)
Medetomidine (mg/kg)	0.04 (0.02)	(0.01–0.09)	0.04 (0.03, 0.04)
Ketamine (mg/kg)	4.74 (2.19)	(1.36–8.89)	4.45 (3.75, 5.00)
Atipamezole (mg/kg)	0.21 (0.10)	(0.07–0.44)	0.21 (0.17, 0.23)
Induction time (minute)	9.22 (3.99)	(5.00–16.00)	8.00 (6.00, 11.00)
Rectal temperature (°C), 0–20 minutes	36.96 (1.76)	(32.90–38.60)	36.70 (36.70, 38.40)
(°F)	98.53 (35.17)	(91.22 –101.48)	98.06 (98.06, 101.12)
Rectal temperature (°C), 20–40 minutes	37.50 (1.53)	(33.70–38.70)	38.00 (37.30, 38.30)
(°F)	99.50 (34.7)	(92.66–101.66)	100.40 (99.14, 3.5)
Heart rate (beats/minute), 0–20 minutes	74.78 (15.89)	(56.00–99.00)	74.0 (60.00, 80.00)
Heart rate (beats/minute), 20–40 minutes	77.77 (13.43)	(60.00–102.00)	77.00 (68.00, 82.00)
Respiratory rate (cycles/minute), 0–20 minutes	22.44 (8.93)	(8.00–37.00)	24.00 (17.00, 27.00)
Respiratory rate (cycles/minute), 20–40 minutes	24.11 (3.98)	(20.00–29.00)	22.00 (21.00, 28.00)
Tolerance time (minute)	41.11 (11.36)	(24.00–60.00)	40.00 (32.5, 51.00)
Recovery time (minute)	10.00 (4.69)	(4.00–18.00)	8.00 (7.00, 11.00)

Good muscle relaxation was achieved and recoveries were uneventful in all cases. In general, the interventions provided relief from pain, reduced the chances of infection, provided important samples for disease investigation, and improved animal welfare.

Doses for ketamine and medetomidine described in this report are higher in some cases than doses recommended for captive settings (Loomis 2003). During these interventions, rapid induction and reversibility were desired to minimise social stress in non-target animals. The anaesthetic regimen described in this report produced good muscle relaxation and smooth recovery with no complications. In addition, several months of postintervention monitoring revealed no discernible behavioural changes in the individuals that were anesthetised or the communities to which they belonged.

These experiences suggest that ketamine-meditomidine regimen is a safe and partially reversible chemical immobilisation combination that can be applied in veterinary interventions of free-ranging chimpanzees. Despite this high rate of success, additional information to help optimise anaesthetic regimens for free-ranging chimpanzees is needed. Future immobilisations of free-ranging chimpanzees should involve collecting data on a broader array of physiological parameters, such as colour of mucosa, capillary refill times, and oxygen saturation by pulse oxymetery.

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Competing interests None.

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