EXPERIENCES OF RESTRAINING ELEPHANTS IN 'MUSTH'

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Introduction

Adult male Asian elephants *(Elephas maximus)* during sexually active period exhibit a phase of altered behaviour known as 'musth'. This is discernable through two physical attributes – secretions from temporal glands and dribbling of urine. There are several other subtle changes in behaviour resulting in rise of aggression (Kahl and Armstrong, 2002), restlessness and reduced feeding activities (Poole, 1987). Physiologically elevated serum androgen levels have also been reported (Hall-Martin, 1987; Rasmussen and Schulte, 1998).

Elephants in 'musth' in captivity are well known for aggression and non-responding to the commands of their keepers. Early detection of 'musth' through physical signs/altered behavior is essential for keeping such elephants restrained during the period. Non-detection of 'musth' symptoms and keepers' negligence often risks the public safety and leads to loss of life and property. The author has come across three such cases of 'musth' incidences wherein it was essential to restrain the animal for the public safety. Chemical immobilization technique for restraining such animals and subsequent management of 'musth' in post-restraint period was resorted to. The present paper deals with drug choices, their efficacy and management experiences for handling such elephants in three different stages of 'musth' at three different sites.

Case Studies

Case 1 : A captive 'Makhana' (Tuskless bull elephant) 29 yrs of age at Jaldapara Wildlife Sanctuary was reported to be in 'musth' and had run into the forest. The elephant was not responsive to it's Mahout's command and was aggressive. The animal had dried discharge marks around the temporals. It was decided to chemically restrain and tether the elephant. A total dose of 250 mg of Xylazine hydrochloride and 150 mg of Ketamine hydrochloride were used to sedate the elephant. The elephant achieved standing sedation and could be easily handled. The limbs were tied and the elephant was tethered on to a tree. The elephant was revived using 50 mg yohimbine hydrochloride given intravenously. The elephant was monitored till full recovery from the drug effect. Micturation and initiation of feeding were indicative of its recovery and self care. The ration provided to the elephant was restricted and the elephant was allowed abundant intake of water and was kept cool by frequent spraying of water. The elephant regained his normal temperament within a week.

Case 2 : A captive 'makhana' elephant

around 40 years of age was brought to Haridwar from Meerut to participate in an annual festival. The elephant was having slight temporal discharge since last two months that was gradually diminishing. The elephant had never shown any signs of 'musth' except for temporal discharge throughout his life. It was reported that the elephant was exhibiting prolonged periods of penile erection along with stereotypic movements of head and whip like trunk movements and behavioral alteration since a week. Two days prior to veterinary intervention the elephant was aggressive and had charged it's Mahout. The elephant turned violent and chased and bashed Mahout and also broke adjacent structures. The elephant was successfully restrained using 400 mg of xylazine hydrochloride and 100 mg of ketamine hydrochloride. The elephant ran for about 100 meters and came to a halt. Reduced ear, tail and trunk movements along with relaxation of penis and snoring were indicative of desired level of sedation. The elephant was chained and rehabilitated similar to the previous case. The elephant regained normal temperament within 10 days. The situation could thus be mitigated.

Case 3 : A 32 year old captive 'makhana' elephant was reported to be in 'musth' and had become a threat to life and property. The elephant had been temporarily kept in a compound along with a cow elephant within the heart of Saharanpur city. The animal was exhibiting slight temporal discharge since a week, frequent penile erection, dribbling of urine, stereotypic movements of head three days prior to veterinary intervention. The elephant had also tried mounting the cow elephant on three different occasions since morning, however it failed to establish sexual congress. The animal was also not responsive to it's Mahout's commands and had charged the mahout a day prior to the veterinary intervention. The elephant was chemically restrained using 600 mg of xylazine hydrochloride and 150 mg of ketamine hydrochloride and secured to a tree. The above mentioned rehabilitation procedures were followed and the elephant regained normal temperament within 15 days.

In all the three cases the drugs were remotely injected using Dist-inject aluminum dart with 63 mm long collared needle and employing Dist Inject model 60 N projectors. Yohimbine hydrochloride and Atipamezole hydrochloride was used as an antidote for xylazine. This technique of chemical immobilization was not used as treatment for musth in elephant but was used as one of the methods of mitigating the problem by securing the animal so that it does not become a threat to life and property. The details of induction time, sedation time and recovery are given in Table 1.

Discussion

The phenomenon of 'Musth' has been recognized for centuries as a natural behavior among healthy adult male elephants between 15-60 yrs of age. The duration and severity of musth varies with individuals and may last from few days to several months. It is characterized by episodes of aggressive behaviour and heightened sexual activity; however bulls can breed in and out of musth. In all the three cases presented, the elephants were *makhanas* between age group of 30-40 yrs and in the later stages of musth ranging from mid-musth to post-musth period. This period seems to be a critical period which

Table 1

Drug dosages used in managing elephants in musth on different occasions

Sr. No.	Location/ Estimated wt./ age	Month/ year	State of Musth	Xylazine HCl (mg) (mg)	Ketamine HCl (mg)	Induction time (min)	Sedation time (min)	Anti-dote	Recovery time (min)
1	Jaldapara/ Makhana 3000 kg/ 29 yrs	Dec. 2002	Almost dried up temporal discharge, animal not responsive to commands and showing some degree of aggression (Post-musth period)	250 (0.08 mg/ kg)	15 (0.05 mg/ kg)	17	50	Yohim-bine 50 mg	3
2	Jwalapur/ Makhana 3000 kg/ 40 yrs	July 2004	Diminishing temporal discharge, exhibiting prolonged periods of penile erection along with stereo-typic movements of head, ear and whip like trunk movements, behaviuoral alteration (End of mid-musth).	400 (0.13 mg/ kg)	100 (0.03 mg/ kg)	7	27	Yohim-bine 40 mg	8
3	Saharanpur/ Makhana 3500 kg/ 32 yrs	Nov. 2004	Slight temporal discharge, frequent penile erection, dribbling of urine, stereo-typic movements of head and non-responsive to Mahout's commands. (Mid-musth period)	600 (0.17 mg/ kg)	150 (0.04 mg/ kg)	8	40	Atipam-ezol 30 mg	2

Induction time : Time of darting to time animal showed first signs of sedation
Sedation time : Time when animal showed first time of sedation to giving of the antidote
Recovery time : Time when animal injected antidote till it regained consciousness

needs to be handled with care. All the three elephants exhibited varied signs indicative of musth. (Table 1)

Managing musth in elephants has been one of the most important challenges in captivity. Elephants in musth have been successfully immobilized employing narcotics like etorphine (M-99) or Immobilon (Jainudeen, 1970; Jainudeen *et al.,* 1971; Cheeran *et al.,* 2002; Sabapara and Raval, 1993; Sarma and Dutta, 1996). On three occasions, Thakuria and Barthakur (1994) controlled a captive African elephant coming into musth using diazepam and lorazepam.

Xylazine HCl, due to its high therapeutic index, smooth induction and smooth recovery, ability to induce trunk immobilization and excellent analgesic and sedative properties has become a useful drug in elephant practice (Bongso, 1980; Schmidt, 1983; Fowler, 1986; Nayar *et al.,* 1992; Pathak, 1991; Sarma and Pathak, 2001; Nayar *et al.,* 2002). The drug has been generally used only as a supportive drug to prolong the period of tranquilization following recovery from initial immobilization employing etorphine hydrochloride (Sabapara and Raval, 1993; Sarma and Dutta, 1996).

Xylazine has almost similar action as etorphine except for a delayed induction time which has relevance in difficult terrain, dense habitat and personal safety. The drug has been found to be suitable in immobilizing musth elephant as the elephant retain the standing posture enabling satisfactory chaining operation. Dutta and Pathak (1997) successfully used xylazine for immobilizing elephant in musth using a total dose of 700 mg for a 3-tonne elephant. Cheeran (1994) commented using Xylazine alone in controlling captive rogues employing 100-120 mg/tonne of the drug. Sarma and Dutta (1996) successfully used 500 mg xylazine alone on three different occasions for immobilizing elephants in musth.

Xylazine alone has been reported to have depressant effect on cardiac and respiratory function (Pathak, 1991; Sarma and Pathak, 2001). Ketamine does not have any depressant effect on the cardio-vascular and respiratory system but produces muscular tremor and stiffness of the skeletal muscle. Combination of Xylazine and Ketamine minimizes the undesirable effects of both the drugs and has been shown to produce a balanced anesthesia. However, Cheeran *et al.* (2002), reported photosensitization in Asian elephant sedated with Ketamine-Xylazine and did not observe as much synergism as has been observed in carnivores.

Sarma and Pathak (2001) in their study also inferred that ketamine could mildly mitigate the hypotension brought about by xylazine, while potentiating its sedative action, hence recommended their use as a combination in elephants. Pathak (1991) tried 100-150 xylazine and 50-100 gm ketamine intravascularly to laterally recumbent elephant in 53 clinical cases and reported that the combination could produce quick, safe and dependable analgesia, anesthesia and muscular relaxation when given intravenously in different surgical conditions affecting elephants. They have also reported recovery without excitement and untoward effect. Similar findings were reported by Nayar *et al.* (1992).

In all the three cases presented,

combination of Xylazine hydrochloride and Ketamine hydrochloride were used at an average dose of 0.13 mg/kg and 0.04 mg/kg body weight respectively to achieve effective standing sedation. No adverse effects were noticed. The advantage of using both the drugs in the present case was that the elephants could be handled and chained in a standing posture and the overall dosage of both the drugs could be considerably reduced.

Though the present approach of chemically restraining the elephant was not a remedy for 'musth', it provided effective means of mitigating the problem by securing the animal to avoid any untoward incident.

Conclusion

The present study highlights successful restraint of elephant in 'musth' on three different occasions using xylazine hydrochloride and ketamine hydrochloride at a dose rate of 0.13 mg/kg and 0.04 mg/kg body weight and its subsequent rehabilitation.

SUMMARY

'Musth' has implications for maintenance in captive elephants as management of these animals is quite cumbersome and involves considerable risk. The present study highlights successful restraint of elephants in musth on three different occasions employing sedative/ analgesics. Effective levels of standing sedation could be achieved using xylazine hydrochloride and ketamine hydrochloride at a dose rate of 0.13 mg/kg and 0.04 mg/kg body weight respectively for immediate restraint. The subsequent actions following sedation till complete recovery from musth events are documented.

Key words **: Elephant, 'Musth' management, Xylazine hydrochloride, Ketamine hydrochloride, Yohimbine hydrochloride.**

मस्त हाथियों को नियन्त्रित करने के अनुभव

पराग निगम

सारांश

बन्दी बनाए हाथियों का प्रबन्ध करने में उनके मस्त हो जाने पर उनका प्रबन्धन करना काफी मुश्किलों भरा काम है और इसमें काफी जोखिम भी है। प्रस्तुत अध्ययन में तीन विभिन्न अवसरों पर शमनकारी/वेदनाहर औषधियां उपयोग कर मस्त हाथियों को सफलतापूर्वक नियन्त्रित करने पर प्रकाश डाला गया है। जायलीन हाइड्रोक्लोराइड और केटामीन हाइड्रोक्लोराइड को 0.13 मिग्रा/किग्रा और 0.04 मिग्रा/किग्रा की दरों की मात्रा में क्रमशः हाथी के भार के अनुसार उपयोग में लाकर खड़े प्रशमन का प्रभावी स्तर पाने हेतु उन्हें तुरन्त नियन्त्रित करने को किया जा सकता है। प्रशमक उपयोग के बाद मस्त हाथियों के पूर्णतया स्वास्थ्य लाभ करने तक उसके बाद किया जाने वाला कार्य भी प्रलेखित किया गया है।

References

Bongso, T.A. (1980). Sedation of the Asian elephant with xylazine. *J. Amer. Vet. Med. Assn.,* **177** (9) :783.

Cheeran, J.V. (1994). Note on Controlling Musth in Elephants. *Zoo's Print*, **9** (12): 27-28.

Cheeran, J.V., K. Radhakrishnan and K.Chandrasekharan (2002). *Musth. J Indian Vet. Assn.,* Kerala, **7**:(3):28-30.

Cheeran, J.V., K.C. Panicker, R.K Kaimal and P.B. Giridas (2003). Tranquillization and translocation of captive bulls. *Giants on Our Hands*: *Proc. Intl. Workshop on the Domesticated Asian Elephant*. Food and Agriculture Organization of the United Nations Bangkok, Thailand. 5-10 Feb., 2001.

Dutta, B. and S.C. Pathak (1997). Capturing Musth Elephant (A Case Report). *Zoo's Print,* **12** (4) :12.

Fowler, M.E. (1986). *Zoo & Wild Animal Medicine*. W.B. Saunders Company, USA, 2nd edn. pp. 892-893.

Hall-Martin, A.J. (1987). Role of musth in the reproductive strategy of the African elephant (*Loxodonta africana*). *S. Afr. J. Sci*., **83** : 616-620.

Jainudeen, M.R. (1970). The use of etorphine hydrochloride for restraint of a domesticated elephant (*Elephas maximus*). *J. Amer. Vet. Med. Assn.,* **157**:(5):624-626.

Jainudeen, M.R., T.A. Bongso and B.M.O.A. Perera (1971). Immobilization of aggressive working elephants (*Elephas maximus*). *Veterinary Record,* **89**:(26):686-688.

Kahl, M.P. and B.D. Armstrong (2002). Visual displays of wild African elephants during musth. *Mammalia,* **66** : 159-171.

Nayar, K.N.M., K. Radhakrishnan, K. Chandrasekharan, J.V. Cheeran, S. Ravindran and P.O George (1992). Anaesthesia for surgical manipulations in the elephant. *The Asian Elephant: Ecology, Biology, Diseases, Conservation and Management – Proc. Nat. Symp. on the Asian Elephant* (Silas, E.G., M.K. Nair and G. Nirmalan, eds.), held at the Kerala Agricultural University, Trichur, India, Jan. 1989. Kerala Agricultural University, Trichur, India. pp. 156-158.

Nayar, K.N.M., K Chandrasekharan and K. Radhakrishnan (2002). Management of surgical affections in captive elephants. *J. Indian Vet. Assn.,* Kerala **7** (3) : 55-59.

Pathak, S.C. (1991). Xyalzine-ketamine anesthesia in Indian elephant (*Elephas maximus indicus*) – Trial on 53 clinical cases. *Intl. Seminar on Veterinary Medicine in Wild and Captive Animals*, Nov. 8-10, Bangalore, India. pp. 21.

Poole, J.H. (1987). Rutting behaviour in African elephants: the phenomenon of musth. *Behaviour*, **102**: 283-316.

Rasmussen, L.E.L. and B.A. Schulte (1998). Chemical signals in the reproduction of Asian (*Elephas maximus*) and African (*Loxodonta africana*) elephants. *Anim. Reprod. Sci*., **53** : 19-34.

Sabapara, R.H. and P.P. Raval (1993). Controlling musth elephants by tranquilzation: two contrasting cases. *Zoo's Print*, Nov. :26-27.

Sharma, K.K. and B Dutta (1996). Musth and its Management in Asian Elephant: A Discussion Based on Four Clinical Cases. *Zoo's Print*, **11**(4):21-22.

Sarma, K.K. and S.C Pathak (2001). Cardio vascular response to xylazine and Hellabrunn mixture with Yohimbine as reversal agent in Asian elephants. *Indian Vet. J.,* **78** (5):400-492.

Schmidt, M.J. (1983). Antagonism of xylazine sedation by yohimbine and 4-aminopyridine in an adult Asian elephant (*Elephas maximus*). *J. Zoo Animal Medicine,* **14** : 94-97.

Thakuria, D.B. and T. Barthakur, (1994). Management of musth in a male African elephant by chemical sedative in the Assam State Zoo, Guwahati. *Zoo's Print*, Sept. : 120.