ANESTHESIA OF MOOSE FOR VASECTOMY USING CARFENTANIL/XYLAZINE AND REVERSAL WITH NALOXONE/YOHIMBINE

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Abstract: We report on the use of a mixture of carfentanil hydrochloride and xylazine hydrochloride to anesthetize 2 adult male moose (*Alces alces*) for surgical vasectomy and the subsequent reversal of these drugs with a mixture of naloxone hydrochloride and yohimbine hydrochloride. Induction, relaxation, reversal, and recovery were considered ideal. With minor downward dosage adjustment, we recommend the outlined methodology for surgical procedures in moose.

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For surgical anesthesia on moose (*Alces alces*) we have previously relied on the drug xylazine hydrochloride (Rompun, Bayvet Div., Miles Laboratories, Shawnee, KS) which

was not reversible, or etorphine hydrochloride (M-99, Lemmon Co., Sellersville, PA) which lacked good muscle relaxing qualities and required large volumes of drug for adult moose (Franzmann 1982). Combining these 2 drugs lowered the volume of etorphine hydrochloride needed and provided muscle relaxation, but required lengthly recovery from the effects of xylazine hydrochloride (Franzmann et al. 1982). Carfentanil hydrochloride (Wildnil, Wildlife Laboratories, Fort Collins, CO) was recently introduced and became the immobilizing drug of choice for moose; primarily because of its low volume dosage (Meuleman et al. 1984, Franzmann et al. 1984, Seal et al. 1985). Carfentanil hydrochloride is reversible with naloxone hydrochloride and naltrexone hydrochloride (DuPont Pharmaceuticals, Wilmington, DE, through Wildlife Laboratories, Fort Collins, CO). Naltrexone hydrochloride (half-life = 24 hr) is preferred over naloxone hydrochloride (half-life = 30 min) because of less chance for narcotic recycling (W. R. Lance, pers. comm.). Yohimbine hydrochloride (Antagonil, Wildlife Laboratories, Fort Collins, CO) was also recently inroduced as an effective reversing agent for xylazine hydrochloride in cervids (Hsu and Shulaw 1984, Seal et al. 1985). This report outlines our experiences using these drugs to anesthetize and reverse 2 male moose at the Moose Research Center (MRC), Alaska.

MATERIALS AND METHODS

Two adult male moose (Hugo, Joker) that were hand-reared as calves (Regelin et al. 1979), and maintained as experimental animals on a pelleted ration (Schwartz et al. 1985) at the MRC were selected for vasectomy. These vasectomized males were then used to detect and mark, but not fertilize estrus females for a reproduction study. On 5 September 1986 Hugo was weighed on a platform scale (514 kg) and injected IM with 5.5 mg carfentanil hydrochloride (0.011 mg/kg) and immediately turned into a 25 X 25 m outside pen. Induction time was 3 minutes. Four minutes after induction, 300 mg xylazine hydrochloride (0.58 mg/kg) was injected IV. We deantlered the bull, trimmed his feet, prepared for surgery, performed a vasectomy, and prepared for reversal of the drugs 46 minutes following induction. We injected 500 mg naloxone hydrochloride IM and 100 mg IV (1.2 mg/kg, 109 mg/each mg carfentanil hydrochloride) followed by 200 mg yohimbine hydrochloride IV and 200 mg IM (0.78 mg/kg). The larger dosage of naloxone hydrochloride was given IM for slower absorption and longer effect. The animal became alert in 4 minutes and was easily pushed to sternal recumbency from lateral recumbency. He was up and mobile in 15 minutes following the last injection of the antagonists. Naltrexone hydrochloride was not available as an antagonist during this procedure.

On 11 September 1986 the same procedure was followed for Joker who weighed 490 kg. He was given 5 mg carfentanil

hydrochloride (0.01 mg/kg) IM and induction time was also 3 minutes. We decided to decrease the xylazine hydrochloride dosage to 200 mg IV, but after 5 minutes it became apparent that more was indicated and we gave an additional 100 mg IV (0.61 mg/kg total). Excellent relaxation followed and we completed the processing and surgery in 32 minutes. We then injected 500 mg naloxone hydrochloride IM and 100 mg IV (1.2 mg/kg, 120 mg/each mg carfentanil) followed by 150 mg IV and 50 mg IM (0.41 mg/kg) of yohimbine hydrochloride. The bull was alert in 5 minutes and up and mobile in 17 minutes.

DISCUSSION

Dosage for induction (0.011 and 0.010 mg/kg carfentanil hydrochloride), response time to induction dosage (3 minutes), relaxation dosage (0.58 and 0.61 mg/kg xylazine), and the antagonist dosage for carfentanil hydrochloride (1.2 mg/kg naloxone hydrochloride) were similar for both animals. We decreased the antagonist dosage for xylazine hydrochloride for Joker to 0.41 mg/kg of yohimbine hydrochloride from 0.78 mg/kg on Hugo. We detected no difference in response to the lower dosage of yohimbine hydrochloride.

The rapid 3 minute induction times indicate that a slightly lesser dosage of carfentanil hydrochloride may be considered when administered to tame, non-stressed, and non-excited moose. The mean induction time for 75 free-ranging Alaskan moose immobilized with carfentanil was 5 minutes

with the same dosage of carfentanil hydrochloride (0.010 - 0.011 mg/kg) (Franzmann et al. 1984). The dosage of 0.6 mg/kg of xylazine hydrochloride provided better muscle relaxation than did 0.4 mg/kg.

The naloxone hydrochloride dosage for Hugo was 109 mg/each mg carfentanil hydrochloride, and 120 for Joker. Both dosages were higher than the 100 mg we have used when antagonizing moose that have received only carfentanil (MRC records). We observed both moose for 24 hours following reversal and neither experienced narcotic recycling. We may have used a lesser dosage of naloxone hydrochloride for these moose, and suggest that as a future possibility. However, naltrexone hydrochloride is now available and will replace naloxone hydrochloride in most instances.

Induction, relaxation, reversal, and recovery were considered ideal, and other than some minor downward dosage adjustments, we recommend the outlined methodology for surgical procedures in moose.

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