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IMMOBILIZATION OF COASTAL GRIZZLY BEARS WITH ETORPHINE HYDROCHLORIDE

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Abstract: Seventeen coastal grizzly bears *(Ursus arctos horribilis)* from southwestern British Columbia were captured and immobilized a total of 27 times with etorphine hydrochloride (M99). Effective dosages administered ranged from 0.011 to 0.132 mg/kg. Drug dosages (on a body weight basis) were not significantly related to induction times (R=-.040); however, it appeared that induction could be reduced with an increased dosage. At higher dosage levels respiratory rate was reduced to 2/minute.

INTRODUCTION

For several years etorphine hydrochloride (M99)[1] has been used for immobilization of wild animals. It has been useful for immobilization because of a wide range of dosage levels, potency and length of immobilization period. In addition, M99 is effectively antagonized with diprenorphine (M50-50).[1]

M99 was initially used by Wallach *et al.*[4] on black bear *(Ursus americanus)* and by Larsen[3] on polar bear *(Thalarctos maritimus)*. In recent years, additional studies have been conducted involving the use of M99 on black bear,[1] as well as brown bear *(Ursus arctos)*.[2] To date, however, few reports have been published on the immobilization of grizzly bear *(Ursus arctos horribilis)*.

In 1975, the British Columbia Fish and Wildlife Branch initiated a habitat study in Knight Inlet (50° 55′ N, 125° 42′ E), along the southwestern British Columbia coastline, which required capture and immobilization of coastal grizzly bear. Branch personnel also snared, immobilized, and then transplanted several grizzlies in Wakeman Sound (51° 05′ N, 126° 30′ E) in response to nuisance bear complaints.

This paper reports on the M99 dosages required to immobilize grizzly bears and the induction times observed. Previous studies have indicated that M99 dosages of 0.0198 mg/kg for black bear[1] and 0.0275 mg/kg for brown bear[2] produced the desired effects of immobilization.

MATERIALS AND METHODS

Grizzly bear were captured by means of modified Aldrich snares or were immobilized while free roaming. M99, in a concentration of one mg/cc, was used for immobilization. The antagonist, M50-50, at a concentration of two mg/cc, was used in several cases for reversal of the immobilizing effects. Intramuscular injections of M99 were made with a projectile syringe or by hand where possible. In general, cubs were given 1 mg; yearlings, 3 mg; and adults, 5 mg. For the purpose of this project, a bear was considered immobilized when movement capable of hindering handling procedures did not exist and when the respiratory rate was reduced. Recovery time was the length of time between injection of M50-50 and the time the bear gained normal muscle control and its respiratory rate increased.

[1] M99, M50-55 — Canadian Cyanamid Company, Scarborough, Ontario.

Weight of bears was estimated before immobilization. Several individual animals were weighed when a spring scale was available. Any animal that was not fully immobilized by the initial injection was not included in the summary calculation of dosages. Incomplete immobilization usually resulted from failure of the projectile syringe to function properly.

RESULTS

From 29 May 1975, to 3 August 1977, 17 different grizzly bears were immobilized a total of 27 times. As the bears were trapped randomly or were encountered in a problem situation, there was a wide range in age, condition and body weight. Considerable variation in dosages of M99 were administered depending on field circumstances, but all animals were successfully immobilized with either the first injection (Table 1) or a second injection. No bears died from the effects of the drug.

In general, cubs received higher dosages (0.073 - 0.132 mg/kg, n=2) producing lower induction times (3.0 - 4.0 minutes). Yearlings received 0.031 - 0.101 mg/kg (n=11) producing induction times which varied from 1 - 10 min. On a body weight basis, adult bears (n=11) received lower dosages (0.011 - 0.036 mg/kg), yet induction time did not appear to differ significantly (3.0 - 11.0 min.) from the younger age classes. Overall, effective dosages administered ranged from 0.011 - 0.132 mg/kg. Table 1 indicates variation in dosage for individual bears due to age, sex, weight, and the problem situation encountered. During peak immobilization, average respiratory rates were about 2-4/minute. Heart rate ranged from 32 - 64 beats/min. and appeared less related to dosage than to age. Bears not given the antidote, remained immobilized for up to 5.5 hours (n=4), apparently regardless of the dosage administered. The relationship between drug dosage (mg/kg) and induction time

TABLE 1. Sex, age, weight, respiratory and heart rate and drug dosages used in the immobilization of the coastal grizzly bear, 1975-1977.

Animal Number	Date	Sex	Age	Est. Wt. (Kg)	M99 Mg.	M99 Mg/Kg	Inj. Site	Ind. (Min.)	Resp. Rt./ (Min.)	Ht. Rt./ (Min.)	Nat.+ Rec. (Min.)	M50-50 Mg.	M50-50 Mg/Kg	Inj. Site	Recov. (Min.)
1a	29/5/75	F	1.5	79.5	5.0	.062	Rump	10.0				5.0	.062	IM	5.0
												5.0	.062	IV	
1b	29/5/75	F	1.5	79.5	5.0	.062	Rump	7.0			30.0 P*	10.0	.125	IM	9.0
					3.5	.037		0.0							
1c	29/5/75	F	1.5	79.5	5.0	.062	Rump	7.0				4.0	.048	IM	4.0
												6.0	.075	IV	
1a	13/6/75	F	1.5	79.5	5.0	.062	Shldr.	5.0				10.0	.125	IM	7.0
1b	13/6/75	F	1.5	79.5	5.0	.062	Shldr.	5.0				10.0	.125	IM	8.0
1c	13/6/75	F	1.5	79.5	5.0	.062	Rump	3.0				10.0	.125	IM	10.0
1a	20/6/75	F	1.5	75.0	5.0	.066	Died	P*							
					1.5	.020	in Sling								
1b	20/6/75	F	1.5	68.2	5.0	.073	Rump	1.0				10.0	.145	IM	10.0
1b	19/7/75	F	1.5	68.2	3.0	.044	Rump - Drowned	Unknown							

TABLE 1. (continued)

2	13/8/75	F	0.5	22.7	2.0	.132	Rump	3.0				4.0		IM	7.0
3	8/7/76	F	1.5	27.3-31.8	3.0	.101	Rump	5.0	2.0	64.0	300				
4	8/7/76	M	1.5	34.1-	3.0	.084		P	2.0	62.0					
				36.4	3.0	.084	Rump	3.0			300				
5	8/7/76	F	Ad.	159.1	5.0	.031	Rump	3.0-5.0	4.0		330				
4	9/7/76	M	1.5	34.1-	2.0	.055		P							
				36.4	2.0	.055	Rump	3.0				7.0	.198	IM	30-40
5	9/7/76	F	Ad.	159.1	2.5	.015	Rump	3.0				6.5	.040	IM	30-40
6	9/7/76	M	Ad.	375	5.0	.013	Rump	4.0	2.0	32.0	300 P	6.0	.020	IM	20-30
					2.0	.002	H. Leg	27.0 P							
					1.0	.004	F. Leg	5.0						Rump	
7	24/6/76	M	Ad.	227.3-318.2	5.0	.020	Frt. Shldr.	6.0	1-2			No Effect			246
8	5/8/76	M	Ad.	341	4.0	.011	Frt. Shldr.	4.0	2.0	38.0	30 P				
					3.0	.009	Frt. Shldr.	4.0							
8	6/8/76	M	Ad.	341	4.0	.011	Frt. Shldr.	7.0	2.0	38.0					
7	19/8/76	M	Ad.	227.3-318.2	4.8	.019	Rump	11.0	1.0	44.0					120+
9	28/6/77	M	5+	286.8	5.0	.018	Neck	5.0							Destroyed
10	4/7/77	F	1.5	75.5	3.0	.040	Rump	5.0			630				
11	4/7/77	M	1.5	95.0	3.0	.031	Rump	4.0	1/50 sec.		600				
12(7P)	10/6/77	F	Ad.	110	4.0	.036	Ft. Shldr.	5.0			66				
13(21-A)	28/7/77	M	0.5	13.6	1.0	.073	Rump	4.0			45				
14(7Wc)	3/8/77	F	Ad.	144.1	4.0	.029	Ft. Shldr.	4.0			150				
15	28/8/77	M	Ad.	272.7	5.0	.018	Ft. Shldr.	4.0							

Est. Wt.: Estimated weight
Ind. Min.: Induction time
Nat. Rec. Hrs.: Natural recovery time
Inj. Site: Injection
Recov. Min.: Recovery time
Resp. Rt. Min.: Respiratory rate
Ht. Rt. Min.: Heart rate

\+ - Recovery time without antagonist
*P - Partial

was not significant (R=-.04) over the range of dosages administered. Similarly, there appeared to be no significant relationship between drug dosage and induction time for specific age or sex components (R=-.035).

DISCUSSION

M99 is suitable as an immobilizing agent for grizzly bears. It has a rapid induction period, a wide range of tolerance and produces extended periods of anesthesia if no antidote is given. However, it produces significant declines in respiratory rate. Extreme caution must also be used where hypothermia may be induced in cold climates. Several bears showed various degrees of catatonia during immobilization as was reported by Glenn.[2]

Since M99 was mainly applied on an absolute basis (number of milligrams/bear) rather than a weight specific basis, cubs received the most drug (Table 1) and adult males and females the least. All dosages were similar to those used by Knight *et al.* (pers. comm.) for immobilizing grizzly bears in Idaho and Wyoming. Those researchers used approximately 0.097 mg/kg (range: 0.064 - 0.141 mg/kg), the average dosage administered to cubs and yearlings in this study.

Induction is an important attribute when working with free ranging animals. Although induction times for free ranging bears were not consistent with dosage, it appeared that induction could be reduced with increased dosages. The lack of statistical significance was probably due to the variety of personnel involved with determining induction times, the wide range of dosages used, and the difficulty in precisely determining rapid induction times when working with free ranging animals in thick coastal brush.

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