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Immobilization of polar bears with Telazol[R] on the western coast of Hudson Bay during summer 1984

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Abstract

Fifty-one polar bears were immobilized with Telazol[R] along the western coast of Hudson Bay during summer. The bears had just come on to land from the annual ice and were very fat. Ambient temperatures ranged from about 5 to 20°C. Polar bears immobilized with a single dart received 8.06 ± 2.96 mg Telazol[R]/kg. This was about 40% more than was required to immobilize polar bears in the fall, when they were much thinner. The drug acted quickly and, from the behaviour of a bear being induced, it was easy to determine when it was safe to approach. Heart and breathing rates were not depressed. Bears could thermoregulate while drugged, did not have convulsions, recovered quickly, and were not aggressive.

We conclude that Telazol[R] is an outstanding drug for immobilizing polar bears.

Introduction

Up to about 1980, most polar bears (*Ursus maritimus*) captured during large-scale population studies were immobilized with Sernylan[R] (phencyclidine hydrochloride) (Lentfer 1968, Larsen 1971). Several thousand polar bears were drugged with Sernylan[R] in the North American Arctic alone (Stirling *et al.* 1975, 1977, 1980, 1984; Schweinsburg *et al.* 1982; Lentfer *et al.* 1980; Furnell and Schweinsburg 1984). The advantages of the drug were that it was fast acting, had a wide safety margin for error relative to heavy doses and, from the behaviour of the bear after receiving the drug, it was easy to know how safe it was to approach. The bears were not aggressive when they woke up, a characteristic that made it a safe drug for both the bears and the biologists.

One of the most characteristic behavioural effects of Sernylan[R] was that in the latter stages of induction the bear waved its head from side to side and lifted it up and down, while sitting or lying. An advantage of this behaviour was that usually a bear would not put its head down in a pool of water (and risk drowning) before the biologist could see that it was safe to approach. A disadvantage of Sernylan[R] was that drugged bears often had convulsions. A few fat pregnant females died in the autumn after being immobilized with Sernylan[R]. The cause was never determined but overheating was suspected.

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After 1980, when Sernylan[R] became unavailable, most researchers bgan to use a mixture of Ketaset[R] (ketamine hydrochloride) and Rompun[R] (xylazine hydrochloride) to immobilize wild bears in North America, including polar bears. Addison and Kolenosky (1979) used about a 1.5:1 ratio while Lee *et al.* (1981) used a 1:1 ratio. This drug works reasonably well but has two major disadvantages. First, it is more difficult, from observing the behaviour of the bear, to evaluate from a distance when it is safe to approach. The bear may be recumbent but be capable of getting up quickly. The head often goes down before the animal is safe to approach so there is an increased risk of drowning if its nose goes into water, or alternatively, of the bear getting up when approached. Second, the breathing rate is depressed, usually to 4–5 breaths/min from a normal rate of 10–15 breaths/min. The heart beat may also be depressed to 10–20 beats/min from a normal rate of about 55–70 beats/min, depending on the size of the bear. In cool weather this is not a problem, but in warm weather an animal may overheat, be unable to increase its respiration and heart beat rates in order to thermoregulate, and die of hyperthermia. This aspect can be aggravated by the fact that the bear may continue to walk for 10–15 min before it goes down, which may accelerate a potential overheating problem.

Polar bear researchers have been able to continue their work by using Rompun[R] and Ketaset[R] but it has not been completely satisfactory. This has resulted in a continuing search for a replacement drug. M99 and Carfentanil citrate have been used with mixed success (Miller and Will 1974, Haigh *et al.* 1983) but their use has not become widespread in Canada because of strict legal restrictions on the use of the drugs, the risk to humans in the case of spillage, and the high cost.

Meanwhile, interest has increased in the experimental drug Telazol[R] (tiletamine hydrochloride and zolazepam hydrochloride in a 1:1 mixture). From the limited amount of published data (e.g. Gray *et al.* 1974, Bush *et al.* 1980) and the unpublished observations of veterinarians working in zoos, Telazol[R] was reported to be particularly good for ursids.

In the fall of 1983, the Warner-Lambert Company provided 50 g of Telazol[R] for experimental use on polar bears at Churchill, Manitoba (Haigh *et al.* 1985). Churchill was selected for these tests because there was a large-scale research project continuing there, in which many bears were being immobilized. Several bears were held in captivity so that the initial immobilizations could be done under controlled conditions and without causing them to run before being darted. Apparently unstressed free-ranging bears could be drugged while foraging at a nearby dump and bears away from Churchill could be drugged from a helicopter, during which they were stressed by being chased.

Overall, the tests were very successful (Haigh *et al.* 1985). The bears were induced quickly. From their behaviour it

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was easy to interpret how safe they were to approach. They held their heads up during the latter stages of induction, did not have convulsions, had a high degree of tolerance to heavier doses than were required, recovered more quickly than with other drugs for which there is no antagonist, and appeared to be able to thermoregulate while under the influence of the drug. This latter important point could not be fully evaluated because ambient temperatures on the western coast of Hudson Bay during October are fairly cool, making it easier for bears to lose excess heat. Another aspect that needed to be examined was the response of very fat polar bears to Telazol^R.

Several of the polar bear population studies now starting in Canada, and those projected to begin soon, will involve large-scale tagging of individual bears during the summer and early fall when air temperatures are relatively warm and bodies of open water are widespread. Thus we wished to continue experimentation with Telazol^R, particularly to determine its suitability for use during warm weather. In response to a request from the Canadian Wildlife Service, the Warner-Lambert Company generously consented to provide 150 g of Telazol^R for testing on polar bears along the Manitoba and Ontario coasts of Hudson Bay during July and August 1984. This report summarizes the results of those tests.

Materials and methods

The Telazol^R was received in powdered form, hydrated to a 30% solution (i.e. 300 mg/ml), and sterilized. The dissolved drug did not recrystallize or vary in colour with time. It was used for up to about 3 weeks after being put into solution.

Injections were delivered in 5, 7, and 10 ml darts fitted with 4-cm needles, fired from a helicopter, using Cap-chur^R equipment. We tried to place all shots in the muscle masses of the neck or front shoulder with the needles perpendicular to the body surface. These tissues have the least amount of subcutaneous fat, and are well vascularized, thus maximizing the absorption of drugs injected there. Supplementary darts, when needed, were aimed at the same area. Bears that were sufficiently immobilized to be safe to approach, but which were still too active to be worked on, were given supplementary injections with a jab pole.

We recorded the number of minutes from the time the first dart hit to when the first ataxia was observed. Similarly, we recorded the number of minutes that passed before the bear was fully immobilized and safe to work on, and the time that passed before the first signs of recovery were noted. We defined the first unstimulated movement of the head after complete recumbency as the first sign of recovery. If a bear showed no ataxia 15 min after the first dart hit, a second dart was delivered. Subsequent delivery if required was usually given from the ground with a jab stick.

Once immobilized, body temperature, breathing rate, and heart beat were recorded approximately every 20 min. Body weight was estimated from axillary girth measured with a cattle weight tape (Stirling *et al.* 1977). Each bear was individually tagged and routine specimen measurements were collected (Stirling *et al.* 1980).

Two bears were kept immobilized, by using small booster injections, for 6–8 h to facilitate physiological experiments. A plywood screen was erected to protect them from direct sunlight.

Results and discussion

Fifty-one polar bears were successfully drugged with Telazol^R and one bear escaped (Table 1). The data from polar bears that required only one dart to fully immobilize them were analysed separately because we felt they would have the fewest confounding variables (Table 2).

Dosage rates

Polar bears immobilized with a single dart received 8.06 ± 2.96 mg Telazol^R per kilogram of body weight (Table 2). This is 40% more than the mean dosage reported from similar tests (5.1 mg/kg) done on polar bears in the fall of 1983 (Haigh *et al.* 1985). In the autumn, all bears have less subcutaneous fat than they do during the summer, due to metabolic weight losses incurred during summer and fall. In addition, in 1983, polar bears were about 15% lighter than usual when they first came ashore in August (unpublished data) so they were even thinner than usual by October.

The mean dosages for 2-dart bears were not significantly different from those of 1-dart bears or of 3- and 4-dart bears (Table 2). However, the mean value for 1-dart bears was significantly lower ($p<0.05$) than that for 3- and 4-dart bears.

During the summer of 1984, many of the bears captured were large and almost all of them were very fat. From the mean dosages required to immobilize polar bears with a single dart (Table 2), it appears that heavier bears require more Telazol^R per kg of body weight than is necessary for lighter bears. The mean weight of 3- and 4-dart bears (but not 2-dart bears) was significantly greater than that of 1-dart bears (339 ± 155 kg vs. 272 ± 140 kg; $t = 2.16$, $p<0.05$) (Table 2). Equivalent amounts of Telazol^R in single darts that hit bears at low angles or in poor locations were not sufficient to immobilize bears in the summer. We suspected this occurred in part because a greater thickness of subcutaneous fat may preclude injection of the drug into the deeper and more vascularized muscle areas and possibly because of unknown physiological factors related to their being fat. Many of these poorer shots in the summer would probably have resulted in successful immobilizations in the fall when the bears are thinner.

In autumn 1983, much of the drug used had been in solution for over a month and in the summer of 1984 some had been in solution for up to about 3 weeks. No differences were noted in the efficacy of the drug within this time period.

Induction and recovery times

Despite the larger mean doses of Telazol^R administered to polar bears in summer, the time to first ataxia was significantly longer than in the fall (3.36 ± 2.68 min vs. 2.80 ± 2.09 min; $t = 11.55$, $p<0.05$) as was the time to full immobilization (11.35 ± 9.78 min vs. 6.90 ± 5.06 min; $t = 2.16$, $p<0.05$). In the fall, the mean time for a bear to be able to move its head after being hit by the first dart was 52.15 ± 18.76 min. In the summer, a similar mean time of 55 ± 21 min passed before bears could move their heads independently. In the fall, the mean time to being able to stand when prodded was 126.5 ± 33.9 min. In the summer, we did not monitor bears until they could stand but we suspect the times would not be much longer than required in the fall. Thus it appears that although it took more Telazol^R per kilogram to immobilize a polar bear during the summer, and a longer time for the drug to take effect, the recovery times were similar. These recovery times are less than half as long as bears require when immobilized with Sernylan^R or Rompun^R and Ketaset^R (unpublished observations).

Although we did not remain with most bears until they were fully recovered, we checked on and resighted most bears a few days or weeks later. All were fully recovered. One bear was not immobilized after being hit with a 10 ml dart of Telazol^R. He showed no sign of being influenced by the drug, and because he went into the ocean, was allowed to escape.

Physiological responses

Some brief but relevant comments can be made about the physiological responses of polar bears immobilized with Telazol^R (Table 1) in comparison to the responses of bears drugged with Rompun^R and Ketaset^R. Bears immobilized with Rompun^R and Ketaset^R experience depressed breathing rates, often down to 4-6 breaths/min (Ramsay *et al.*, unpublished), or less than half the normal rate of 10-20 breaths/min (Best 1975). The heart beat rate of bears immobilized with Rompun^R and Ketaset^R is about 50-60 beats/min (Lee *et al.* 1981; Ramsay *et al.*, in press) which is similar to the range reported for non-drugged sleeping bears of 40–65 beats/min (Øritsland, 1970, Folk *et al.* 1978). In comparison, bears immobilized with Telazol^R had breathing rates ranging from normal up to five or six times normal and heart rates of up to about double the published normal range (Table 1). The body temperatures of most bears drugged with Rompun^R and Ketaset^R reached or exceeded 40°C (unpublished data), while bears immobilized with Telazol^R rarely did. Bears immobilized on Telazol^R that had body temperatures of 39–40°C cooled down to 37–38°C within an hour or so. There was one exception which should be noted. Pregnant females are exceptionally fat during the summer and hyperventilation was not adequate to cool them off when the air temperature was 15–20°C. One such female, which weighed almost 500 kg, panted at about 120 breaths/min for 3 to 4 h but was unable to lower her body temperature from 40°C. During this period, she was capable of standing but was completely non-aggressive. She was resighted several days later and appeared fully recovered. Another very fat pregnant adult female panted for several hours, then spent 2–3 days by the edge of a lake. She would go into the lake and stand in water up to her shoulders for up to half a day at a time, and appeared to drink regularly. We interpreted this behaviour as indicating she had lost excessive body water from panting and needed to replace it. She was later relocated, many kilometres away, behaving normally, at an earth den. We concluded she had recovered.

No other age or sex-class of bears had problems similar to those experienced by pregnant females. For this reason, we recommend caution in the use of Telazol^R on suspected pregnant females, especially when the ambient temperature exceeds 10°C.

Conclusions

On the basis of our past experiences with other drugs, and these recent tests, Telazol^R is clearly the best drug that we have used for immobilizing polar bears. It acts quickly, which means the bears have a reduced time in which to become overheated and stressed. The short induction time also reduces the amount of helicopter time required to continuously monitor a darted animal to ensure it is experiencing no difficulties. This saves considerable money. The recovery period was relatively quick in comparison to other immobilizing drugs for which there are no antagonists. The bears regained their co-ordination gently and were not aggressive when fully mobile. The difficulty in accurately estimating the weight of an animal from a helicopter resulted in some bears receiving relatively large amounts of Telazol^R. In spite of these high dosages no convulsions or mortalities were caused by the drug, indicating that there is a wide margin of safety when using Telazol^R.

Possibly because of the short induction times, the bears do not tend to become overheated. The heart beat and breathing rate do not become depressed as they do when the bear is immobilized with Rompun^R and Ketaset^R. In fact, one of the most significant results of these tests is the clear demonstration of the bears' ability to thermoregulate while immobilized. This gives the drug a very promising potential for safe use during the summer.

The induction period was short and, from the behaviour of the bears, it was easy to interpret when it was safe to approach them. They usually held their heads up in the last stages of induction so that the biologist could get to them in time, if necessary, to ensure the nose didn't go into the water. This is a significant safety consideration for both biologists and polar bears.

The only cautionary note is that Telazol^R should probably not be used on exceptionally fat females, suspected to be pregnant, when the air temperature exceeds 10°C.

In summary, the tests done during the summer of 1984 were similar to the preliminary results obtained during the autumn of 1983, and confirm our opinion that Telazol^R is an excellent drug for immobilizing polar bears. We recommend it be released commercially at the earliest possible time.

Acknowledgements

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References

Addison, E.M.; Kolenosky, G.B. 1979. Use of ketamine hydrochloride and xylazine hydrochloride to immobilize black bears (*Ursus americanus*). J. Wildl. Dis. 15:253–258.

Best, R.C. 1975. Biological energetics of the polar bear (*Ursus maritimus*). Univ. of Guelph, M.Sc. thesis. 134 pp.

Bush, M.; Custer, R.S.; Smith, E.A. 1980. Use of dissociative anesthetics for the immobilization of captive bears: blood gas, hematology and biochemistry values. J. Wildl. Dis. 16:481–489.

Gray, C.W.; Bush, M.; Beck, C.C. 1974. Clinical experience using CI-744 in chemical restraint and anesthesia of exotic specimens. J. Wildl. Dis. 10:12–21.

Folk, G.E., Jr.; Simmonds, R.C.; Folk, M.A. 1978. The EKG of small hibernators and bears. J. Thermal Biol. 3:89.

Furnell, D.J.; Schweinsburg, R.W. 1984. Population dynamics of central Canadian Arctic Island polar bears. J. Wildl. Manage. 48:722–728.

Haigh, J.C.; Lee; L.J.; Schweinsburg, R.E. 1983. Immobilization of polar bears with Carfentanil. J. Wild. Dis. 19:140–144.

Haigh, J.C.; Stirling, I.; Broughton, E. 1985. Immobilization of polar bears (*Ursus maritimus* Phipps) with Tiletamine HCl and Zolazepam HCl. J. Wildl. Dis. 21:43–47.

Larsen, T. 1971. Capturing, handling, and marking polar bears in Svalbard. J. Wildl. Manage. 35:27–36.

Lee, J.; Schweinsburg, R.; Kernan, F.; Haigh, J. 1981. Immobilization of polar bears (*Ursus maritimus* Phipps) with ketamine hydrochloride and xylazine hydrochloride. J. Wildl. Dis. 17:331–336.

Lentfer, J.W. 1968. A technique for immobilizing and marking polar bears. J. Wildl. Manage. 32:317–321.

Lentfer, J.W.; Hensel, R.J.; Gilbert, J.R.; Sorensen, F.E. 1980. Population characteristics of Alaskan polar bears. Pages 109–116 *in* Martinka, C.J.; MacArthur, K.L. Eds. Bears — Their biology and management. Bear Biology Association Conf. Series No. 3. U.S. Govt. Printing Office, Washington.

Miller, R.L.; Will, G.B. 1974. Use of M99, etorphine and antagonists to immobilize and handle black bears. Pages 225–234 *in* Pelton, M.R.; Lentfer, J.W.; Folk, G.E. Eds. Bears — Their biology and management. IUCN Publication N.S. No. 40, Morges, Switzerland.

Øritsland, N.A. 1970. Temperature regulation of the polar bear (*Thalarctos maritimus*). Comp. Biochem. Physiol. 37:225–233.

Ramsay, M.; Stirling, I.; Knutsen, L.; Broughton, E. In press. Reversal of Ketamine and Rompun immobilization in wild polar bears using Yohimbine. J. Wildl. Dis.

Schweinsburg, R.E.; Lee, L.J.; Latour, P.B. 1982. Distribution, movement and abundance of polar bears in Lancaster Sound, Northwest Territories. Arctic 35:159–169.

Stirling, I.; Andriashek, D.; Latour, P.; Calvert, W. 1975. The distribution and abundance of polar bears in the eastern Beaufort Sea. A final report to the Beaufort Sea Project. Fisheries and Marine Serv., Dep. Environ. Victoria, B.C. 59 pp.

Stirling, I.; Calvert, W.; Andriashek, D. 1984. Polar bear (*Ursus maritimus*) ecology and environmental considerations in the Canadian High Arctic. Pages 201–222 *in* Olson, R.; Geddes, F.; Hastings, R. Eds. Northern Ecol. and Resour. Manage. Univ. of Alberta Press, Edmonton.

Stirling, I.; Calvert, W.; Andriashek, D. 1980. Population ecology studies of the polar bear in the area of southeastern Baffin Island. Can. Wildl. Serv. Occas. Pap. No. 44. 31 pp.

Stirling, I.; Jonkel, C.; Smith, P.; Robertson, R.; Cross, D. 1977. The ecology of the polar bear (*Ursus maritimus*) along the western coast of Hudson Bay. Can. Wildl. Serv. Occas. Pap. No. 33. 64 pp.

Table 1
Summary of data on polar bears immobilized with Telazol[R]

Date 1984	Age/sex category	Tag no.	Tape weight (kg)	No. of injections	No. mg of Telazol[R]	Time (min) for effects: First ataxia	Full immobilization	First recovery	Physiological measurements*: Body temp. (°C) Min.	Max.	Breaths/min Min.	Max.	Heart beat/min Min.	Max.
27/7	Ad/M	X04176	456	1	2100	5	–	99	37.1		19		–	
				2	300									
27/7	Ad/M	X09588	471	1	2100	14	68	90	38.3	39.5	19	25	–	
				2	2100									
				3	600									
				4	300									
28/7	Ad/F	X09742	201	1	2100	5	11	–	37.6		18		118	
28/7	COY/M†	X09743	72	1	300	–	3	40	38.4		33		–	
28/7	COY/F	X09744	60	1	300	–	3	39	38.7		36		–	
28/7	Ad/M	X03025	426	1	2550	3	5	63	37.0		8	12	–	
28/7	SA/M	X09741	176	1	2100	2	–	49	37.2	37.4	16	18	110	120
28/7	Ad/M	X09646	388	1	2100	7	45	–	37.8	38.0	22		–	
				2	750									
				3	900									
28/7	Ad/F	X09171	358	1	2100	–	19	43	37.0	38.0	8	17	110	130
				2	1800									
28/7	Ad/M	X09121	316	1	2100	3	5	36	36.7	37.2	12	18	90	100
28/7	Ad/M	X05530	433	1	1500	8	–	–	38.8	39.0	19	80	–	
				2	1200									
				3	300									
				4	300									
28/7	Ad/M	X09740	580	1	2100	8	–	–	38.0	38.5	20	42	120	
				2	450									
				3	600									
28/7	Ad/M	X09247	307	1	2100	3	–	–	37.0	37.5	12		116	
28/7	Ad/M	X09584	300	1	1500	2	14	24	37.0	37.2	18	22	110	
				2	300									
				3	150									
29/7	Ad/M	X09659	471	1	2700	3	11	39	36.6	36.8	–		–	
29/7	Ad/F	X09746	223	1	2100	2	74	121	39.0	39.5	6	86	114	125
				2	1200									
				3	900									
1/8	Ad/M	X09648	400	1	2550	9	19	28	35.8	35.9	8	11	60	
				2	450									
1/8	Ad/F	X09213	232	1	2850	–	60	124	38.9	39.5	6	72	100	120
				2	1500									
				3	900									
2/8	SA/M	X16048	180	1	1050	8	47	77	37.8	39.4	9	10	92	96
				2	300									
				3	300									
2/8	2 YR/M	X09222	176	1	1200	2	3	40	37.9	38.0	18	23	75	100
2/8	Ad/F	X16049	205	1	1500	5	28	78	39.7	40.0	23	104	96	98
				2	450									

(cont'd)

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Date 1984	Age/sex category	Tag no.	Tape weight (kg)	No. of injections	No. mg of Telazol[R]	Time (min) for effects: First ataxia	Full immobilization	First recovery	Physiological measurements*: Body temp. (°C) Min.	Max.	Breaths/min Min.	Max.	Heart beat/min Min.	Max.
2/8	SA/M	X16052	223	1	2010	1	3	42	36.0 - 37.1		5 - 16		96 - 112	
4/8	Ad/F	X09667	188	1 2	2550 750	8	-	-	38.7		14		-	
4/8	SA/F	X09665	232	1	2400	3	-	-	37.5 - 38.0		8 - 19		123 - 134	
4/8	Ad/F	X09750	492	1 2 3 4	2550 900 1200 900	9	37	73	39.8 - 40.4		33 - 113		125	
4/8	SA/M	X09496	210	1	2550	2	-	-	36.2 - 36.6		10 - 14		92 - 96	
4/8	2 YR/M	X09530	184	1	2100	1	12	-	38.9 - 39.0		15 - 22		127	
4/8	Ad/F	X03040	92	1 2 3	2550 1500 750	24	57	114	39.7 - 40.1		23 - 115		110 - 128	
4/8	Ad/M	X00605	500	1 2 3	2400 900 750	12	-	-	37.4 - 37.8		11 - 18		104	
4/8	SA/F	Pen #1	168	1	1200	-	7	-	-		-		-	
4/8	Ad/M	X09248	373	1	2100	4	14	82	39.1 - 39.8		15 - 40		90 - 96	
4/8	Ad/M	X09288	388	1	1950	4	7	50	38.9 - 38.9		15 - 20		80 - 104	
4/8	Ad/M	X16054	396	1 2 3	1500 660 300	12	54	86	40.1 - 40.1		23 - 28		80 - 104	
4/8	SA/M	X16055	275	1 2 3	1200 600 300	16	37	62	40.1 - 40.2		13 - 30		102	
5/8	Ad/F	X16060	316	1 2 3 4	1650 600 300 300	9	61	82	36		7 - 10		70	
11/8	Ad/M	-	Very large	1	2100	None		Had no effect						
15/8	2 YR/F	X09691	154	1 2	2100 300	3	16	-	37.7 - 39.0		6 - 100		76 - 123	
15/8	Ad/M	X04159	332	1 2 3	2850 600 360	12	74	-	38.3 - 40.0		4.5 - 120		73 - 117	
15/8	Ad/F	X09681	223	1	1700	4	19	106	37.6 - 38.4		9 - 13		87 - 118	
15/8	YRLG/M	X09683	161	1 2	900 900	14	39	-	37.7 - 38.5		12 - 17		87 - 110	
15/8	Ad/M	X09684	310	1	1800	2	6	-	36.7 - 37.5		7 - 13		94 - 116	
15/8	Ad/M	X09685	280	1	1800	1	-	-	37.2 - 39.2		7 - 31		107 - 137	

(cont'd)

Table 1 (cont'd)
Summary of data on polar bears immobilized with Telazol[R]

Date 1984	Age/sex category	Tag no.	Tape weight (kg)	No. of injections	No. mg of Telazol[R]	Time (min) for effects: First ataxia	Full immobilization	First recovery	Physiological measurements*: Body temp. (°C) Min.	Max.	Breaths/min Min.	Max.	Heart beat/min Min.	Max.
16/8	Ad/F	X04199	157	1	2550	2	-	-	38.6		9		-	
16/8	Ad/M	X09688	305	1	2400	3	-	58	39.1 - 39.6		15 - 35		90 - 100	
16/8	Ad/F	X09454	157	1	2100	6	9	-	38.2 - 38.4		15 - 19		110 - 126	
16/8	COY/M	X09675	58	1 2	240 180	6	13	70	37.9 - 38.1		11 - 16		69 - 94	
16/8	Ad/M	X09508	373	1 2	2700 600	14	-	-	39.0 - 39.2		6 - 19		113 - 121	
16/8	Ad/M	X09670	410	1	2850	3	6	-	37.3 - 37.5		12 - 15		105	
17/8	2 YR/F	X09676	117	1 2 3 4	2100 2100 300 450	6	-	-	-		-		-	
17/8	Ad/M	X09240	260	1	2550	3	33	84	39.9 - 42.0		30 - 116		85 - 120	
19/8	Ad/M	X09693	344	1 2 3	2550 600 375	7	-	-	37.1 - 37.6		8 - 13		113	
24/8	Ad/M	X00683	351	1	2700	-	12	-	36.7 - 36.8		8 - 15		62 - 70	

*A single number indicates that only one measurement was taken.
†COY, cub-of-the-year; SA, sub-adult.

Table 2
Summary of Telazol[R] used on polar bears on the western coast of Hudson Bay in August 1984

	No. darts required for immobilization		
	1	2	3
Mean body wt.	257.6	272.2	339.2
SD	106.7	139.8	133.3
n	27	8	16
Total no. mg Telazol[R] used	53 310	19 695	56 220
Mean mg Telazol[R]/kg body weight needed	8.06	10.00	11.99
SD	2.96	4.28	6.74
n	27	8	16
Misses and misfired darts	18 775 mg		
Total	150 g		

t-tests of mean values	*t*	df	Significance level
1 vs. 2 injections	1.35	33	>0.05
2 vs. 3 + 4 injections	0.73	22	>0.05
1 vs. 3 + 4 injections	2.57	41	<0.05

DUE DATE