A Safe Method for Repeatedly Immobilizing Seals

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SUMMARY

Phocid seals were immobilized safely and repeatedly, using a combination of ketamine and diazepam at mean IM or IV dosages of 1.5 mg/kg and 0.05 mg/kg, respectively. Induction and recovery were smoother than with ketamine used alone. Experimentally induced pneumonia did not alter the effects of the drugs, thus attesting to the safety of the ketamine-diazepam combination.

Phocid seals can be immobilized with a variety of tranquilizing and anesthetic agents. Ketamine is one of the safer drugs\(^1\) but has some undesirable effects. In seals, it causes muscle tremors and, rarely, convulsions and death.\(^2\) It is contraindicated in seals that have respiratory problems.\(^3\)

During a study on the experimental transmission of an influenza A virus suspected of causing pneumonia in harbor seals (Phoca vitulina) and gray seals (Halichoerus grypus), the need arose to immobilize seals repeatedly, sometimes daily, to obtain specimens of blood and other body fluids. Because of the respiratory nature of the research project, low dosages of ketamine were combined with diazepam, in the hope that the combination would be safer than the higher dosages of ketamine traditionally used. The method proved successful and is reported here.

Materials and Methods

One 6-month-old male, a 6-month-old female, and two 18-month-old (1 male, 1 female) harbor seals were captured as 3-week-old pups and reared at the aquarium at Hafnarfjordur, Iceland. They were transported 20 km to the Laboratory of Experimental Pathology at Keldur for the purpose of this study. After the seals were acclimatized for 24 hours, both 6-month-old seals (seals A and B) and one of the 18-month-old seals (seal C) were given ketamine\(^*\) IM at a dosage of 3 to 3.2 mg/kg of body weight. The 4th harbor seal (seal D) was given 2.1 mg/kg, IV (in the extradural vein). While immobilized, the seals were inoculated intratracheally with a suspension containing influenza A virus. At various intervals over the next 10 days, the seals were immobilized repeatedly, using lower dosages of ketamine, ranging from 1.4 to 1.9 mg/kg, combined with 0.04 to 0.06 mg of diazepam\(^*\)/kg. The intramuscular injections were given twice in 4 days to seals A and B, and once daily for 6 days and 5 days to seals C and D, respectively. One weaned 4-week-old male gray seal pup (seal E) was captured on Sable Island, Nova Scotia, and placed in a dry enclosure. Beginning 8 hours after capture, the seal was given 10 doses of ketamine-diazepam at intervals of 7–19 hours over a 6-day period. All drug doses were based on the weights of each seal recorded on the day of immobilization.

Results and Discussion

Initially, harbor seals A, B, and C were given ketamine alone, IM, at a dosage of 3 to 3.2 mg/kg (Table 1). They began to tremble slightly within 10 minutes. By 20 minutes, they could be easily manipulated and restrained. Seal D was given 2.1 mg of ketamine/kg, IV, only because there was not enough available to administer an effective IM dose. The results were equivalent but the effect was more rapid. The seals maintained stiff muscle tone but could be handled to the extent that the head could be held rigidly while a needle was inserted percutaneously into the trachea.

Following the initial procedure, smaller doses of ketamine were combined with diazepam (Table 1). In all cases, induction was quiet, and there was an obvious relaxation of muscle tone. Within 10 to 15 minutes of an IM injection and within 1 to 3 minutes of an IV injection, the seals could be manipulated with modest physical restraint, though they remained alert and might even utter a challenging snarl when approached. The calming effect lasted up to 45 minutes. At no time did the seals appear to be hyperactive or hypersensitive to touch, nor was there the quivering or violent shaking that has been observed when giving ketamine alone (IM) in seals.\(^1\) Recovery was similarly quiet and within 45 to 60 minutes the behavior of the seals had returned to normal.

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\(^*\)Ketaset, Roger STB, London, Ontario, Canada.
\(^1\)Valium Roche, Roche, Vaudreuil, Quebec, Canada.
We have used the same low dosages of combined ketamine and diazepam to immobilize 8 gray seal and 13 harp seal (*Phoca groenlandicus*) pups on single occasions. Two of the harp seal pups died, one within 15 minutes and the other 4 hours after apparently recovering from the effects of the drugs. Slightly higher dosages, in the range of 2.4 to 4.2 mg of ketamine/kg, combined with 0.06 to 0.09 mg of diazepam/kg in gray and ringed seals (*Phoca hispida*) have resulted in dangerously deep and prolonged immobilization for up to 75 minutes, and in the death of 2 seals while immobilized. Despite our successful use of these drugs on over 50 occasions in 4 species of phocid seals, we still recognize the risk of an adverse reaction. As a precaution, higher dosages should be used only when respiratory support can be provided.

There are 4 essential features of this study that emerge as distinct advantages for handling seals. The combination of ketamine and diazepam at IM or IV dosages of 1.5 mg/kg and 0.05 mg/kg, respectively, can be used repeatedly. Few other drugs can be used as safely and effectively in phocid seals. Blood collection from the flipper veins of even the most uncooperative seals is facilitated, since the seal often loses voluntary control over peripheral circulation immediately after induction. Since induction and recovery are quiet, core body temperature changes are less likely to occur, as observed in the more excitable state induced by ketamine alone.

Respiratory disease and general debilitation, which have been offered as contraindications to the use of ketamine in seals, seem not to be as great a cause for concern when using these low dosages of ketamine-diazepam. In 3 of the 4 harbor seals, pneumonitis developed within 3 days after the seals were inoculated with the influenza virus. They were immobilized between 2 and 6 times during the course of the illness, each time effectively and without adverse effects. This in itself may be a strong indication for using the ketamine-diazepam combination in clinical situations.

**References**