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Use of Atipamezole to Reverse Xylazine Tranquilization in Captive Arabian Oryx (*Oryx leucoryx*)

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ABSTRACT: Twenty-seven hand-reared male Arabian oryx (*Oryx leucoryx*), with a mean (±SD) weight of 86.9 (±16.9) kg, were darted in the muscle with xylazine at a mean (±SD) dosage rate of 0.5 (±0.07) mg/kg. This dosage was sufficient to induce recumbency in 24 animals in a mean (±SD) time of 9.4 (±5.6) min. Three animals never became recumbent at this dosage but were mildly sedated and still could be handled. Atipamezole was used as antagonist agent in a mean (±SD) time of 32.1 (±9.6) min after the initial injection of xylazine. Two thirds of the total amount of atipamezole was given intravenously while one third was injected subcutaneously at a mean (±SD) total dosage of 0.087 (±0.014) mg/kg. The mean (±SD) reversal time (time to stand up after the injection of atipamezole) was 87.1 (±43.2) sec for the 24 recumbent oryx. A resedation period (lowering of the ears and the head, unsteady gait and sometimes recumbency), lasting up to two hours, occurred between two and five hours after the injection of atipamezole in 21 animals.

Key words: Tranquilization, xylazine, atipamezole, Arabian oryx, *Oryx leucoryx*.

Xylazine is an alpha-2 adrenergic agonist with sedative, hypnotic, analgesic and skeletal muscle relaxant properties due to autonomic and central nervous depression (Hsu, 1981). Xylazine has also alpha-1 adrenergic effects (Booth, 1988). This drug commonly is used in capturing or handling both wild and captive non-domestic animals (Bauditz, 1972). Xylazine, when used alone, induces various levels of central nervous depression, ranging from excitation to deep sedation; effects vary with inter- and intra-species variation, dosage rates employed, methods of administration, individual animal's excitation and fasting states, external disturbances (Harthoorn, 1973). Cardio-vascular depression, tachypnea, and bradycardia often follow injection of xylazine (Hsu et al., 1987). A major shortcoming of xylazine immobilization is extended alpha-2 effects of the drug and prolonged recumbency which can lead to ruminal tympany, regurgitation and other physiological or environmental hazards associated with these conditions (McKelvey and Simpson, 1985).

Specific alpha-2 antagonists of xylazine such as yohimbine, tolazoline, and idazoxan, and non-specific drugs such as 4-aminopyridine and doxapram already have been administered to many species of ungulates with varied results (Doherty and Tweedie, 1989; Kock et al., 1989). Atipamezole (Antisedan, 5mg/ml, Farmos Group Ltd., Turku, Finland), is chemically defined as 4-(2-ethyl-2,3-dihydro-1H-inden-2-yl)-1H-imidazole-hydrochloride. It is a potent, highly selective antagonist competitive at both central and peripheral alpha-2 adreno-receptors (Virtanen, 1989). Atipamezole has been used extensively to reverse medetomidine or medetomidine-ketamine in several wild species of ungulates (Jalanka and Rueken, 1990; Tyler et al., 1990), including Arabian oryx (*Oryx leucoryx*) (Greth et al., 1993). Using atipamezole to reverse xylazine-induced immobilization has only been reported in moose (*Alces alces*), (Jalanka and Rueken, 1990).

My objective was to evaluate the effectiveness of xylazine hydrochloride as the sole immobilizing agent in captive hand-reared Arabian oryx, and to evaluate its antagonism with atipamezole. This study was performed at the National Wildlife Research Center (21°15'N, 40°41'E), in Taif, Saudi Arabia, during wintertime, at the beginning of 1993. Each male was kept in 2-ha enclosures with one or two females and their calves. They were in good physical and health conditions when darted. Two days before darting, each male was closed alone in a 40 m² capture pen and

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food was removed. Twenty to 50 mg xylazine (Rompun 5% solution, Bayer Ltd; Leverkusen, Germany) was administered to the hindquarter muscles of 27 males using a CO_2-powered dart gun (GUT 50, Telinject, Römerberg, Germany) at a distance of ≤7 m. After handling, animals were weighed on a platform scale (561 SG, GIM, Beaupraut, France) with an accuracy of ±0.1 kg. They weighed a mean (±SD) of 86.9 (±16.9) kg with a range from 30.2 to 104 kg. A mean (±SD) dosage of 0.5 (±0.07) mg/kg xylazine was sufficient to induce recumbency in 24 oryx. Three of them never became recumbent with this dosage but it was still possible to catch them by hand.

First signs occurred 1 to 2 min following darting and included slight lowering of the neck, unsteady gait and loss of balance. In 20 (74%) of 27 cases, there were several lyings before the final recumbency. I recorded audible snorings and molar grindings in 13 (48%) and 18 (66%) of 27 cases, respectively, and I observed tongue paralysis and protrusion in 18 (66%) and excessive salivation in 9 (33%) cases. Mean (±SD) time until final recumbency for 24 oryx was 9.38 (±5.6) min (range, 3.8 to 23 min). Handling began 17.7 (±8) min after darting (27 animals), and 9.3 (±4.5) min after final recumbency (24 animals). Final recumbency time was delayed by external disturbances such as noises or premature attempts to handle the animal. Handling occurred within 5 min following the final recumbency for 12 animals; nine of them were able to stand. When handling was performed at least 10 min after the final recumbency, no defensive reaction was recorded and the animals were easily manually restrained.

Once handled, the 24 recumbent oryx were placed in sternal position and blindfolded. Twenty-one of the 24 oryx experienced good immobilization and relaxation; short manipulations such as blood sampling, weighing, examining teeth, cutting horns, or suturing were easily performed. Three other of the 24 animals were recumbent but responsive during the manual restraint; several attempts to stand up or to kick, as well as defensive movements of head were recorded. In addition to the 24 recumbent oryx, three additional adult oryx received 0.5 mg/kg xylazine but remained ambulatory and were only mildly sedated. They never became recumbent but they still were handled; weighing and blood sampling were performed with a strong manual restraint. The reason for this failure could be the high level state of excitation displayed by these three oryx before and after darting. Stress, fear, or excitation may increase endogenic catecholamine levels interferring with smooth sedation (Short, 1992).

All 27 oryx were reversed with atipamezole; 1 mg of atipamezole was used for every 5.5 mg of xylazine that had been injected. Two-thirds of the reversal dose was administered in the jugular vein and one-third subcutaneously to obtain the best results (Jalanka and Rueken, 1990; Swan, 1993). Mean (±SD) time of atipamezole administration was 32.1 (±9.6) min after initial injection of xylazine in 27 oryx and 24.2 (±4.5) min after final recumbency in 24 animals. I used a mean (±SD) dosage of 0.087 (±0.014) mg/kg atipamezole. Initial signs of arousal in the 24 recumbent oryx were ear movements, increased tension in neck muscles, and increased respiratory rate. Oryx stood after a mean (±SD) of 87 (±43) sec after atipamezole injection (range, 10 to 170 sec). Normal behavior was defined as having no more salivation and protrusion of the tongue, decrease of grunting noises, normal walk and good distance estimation of obstacles like fences or posts; this was usually attained 1 to 5 min after the 27 oryx received injection of atipamezole. Excitation (running into fences, muscular contractions in legs) was recorded on five occasions.

A resedation period appeared 2 to 5 hr following antagonism with atipamezole in 21 oryx and disappeared after 60 to 120 min; this was characterized by lowered head and unsteady gait in the 21 animals,

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and recumbency in seven animals. Oryx were able to escape if approached during this resedation period. Recovery was judged complete 10 hr after darting in all cases (normal position of head and ears, normal walk and no sleep-like effects). This resedation period did not seem to be dose related; it appeared in the whole range of dosages used. Plasma and elimination half-lifes in cattle are longer for atipamezole than xylazine; 10 min and 2.6 hr, respectively for atipamezole (Salonen, 1989), and 5 min and 36 min, respectively, for xylazine (Booth, 1988). On the other hand, long duration of some physiological effects in xylazine-induced tranquilization in cattle involves other physiological processes than alpha-2 adrenergic agonist properties which are still not well known; polyuria can occur for 5 hr, sleep-like effects can occur for ≤ 24 hr, and hypothermia can occur for 24 hr (Booth, 1988). Finally, atipamezole appears to be unable to reverse all the physiological effects of xylazine, as atipamezole is specific for alpha-2 receptors only, while xylazine and its metabolites are acting on alpha-1, alpha-2 and other non-identified receptors (Booth, 1988).

In previous studies (McKintosh and Van Reenen, 1984; Hsu and Shulaw, 1984; Jessup et al., 1985), yohimbine was used as the reversal agent of xylazine-induced tranquilization in different species of ungulates; the mean anesthetic reversal time (injection to standing) appeared to be longer (121 to 260 sec) when compared with the results of my study. Yohimbine was unsuccessful in reviving xylazine-induced sedation in scimitar horned oryx, (*Oryx dammah*), (Pearce and Kock, 1989). Most of these authors also reported that the reversal of xylazine with yohimbine was frequently followed by a slight resedation 30 min to several hours after injection of reversal agent. A similar depression was observed following use of atipamezole to reverse medetomidine in markhors, (*Capra falconeri megaceros*) (Jalanka, 1988), and Arabian oryx (Greth et al., 1993).

I consider xylazine-induced tranquilization and its reversal by atipamezole to be a very good combination for captive hand-reared oryx. Reversal drastically reduced risks associated with extended recumbency and trauma caused by excitation or flight responses during recovery. These two drugs are now widely used in this captive herd for routine manipulations. However, they must be cautiously used in field conditions because the resedation period following administration of atipamezole may place wild oryx at greater risk of predation or intra-specific aggression.

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