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## Light drug sedation/anesthesia for European bison

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**Abstract:** Long involvement in European bison breeding and management allows to make various observations and experiments. The immobilization of European bison is not an easy task. In this paper are presented raw results of immobilization of 24 animals using six different drug combinations. All drugs are available in Spain and have different effects upon the organism. In the paper presented is the time of the sedation and other details. The number of immobilized animals is too small to make any serious conclusions, but obtained results indicate that it is worth to further analyses the mixture No. 6 of Zoletil and Romifidine

**Key words:** European bison, veterinary-conservation, sedation, anesthesia

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### Introduction

European bison management often requires anesthesia, sedation and tranquilization in order to manage individuals for various purposes. Usually veterinary checking before transport, disease diagnosis and also effective veterinary care and treatment, sample collection or capturing of animals are examples of situations requiring immobilization of wisents. Tranquilization also may be needed in mechanical contention. There are several sedation/anesthesia protocols published (Berger and Kock 1988; Bielecki *et al* 2005; Glunz 2009; Krzysiak and Larska 2014), but sometimes these protocols are related to very effective drugs but very expensive or hard to find, or even difficult to get import permissions, (e.g. etorphine or medetomidine in high concentrations like Zalopine 10mg/ml). Also Tiletamine/Zolacepan in high concentrations cannot be found (Zoletil 500), at least in Spain, despite it is common in France.

For most non-specialized in E. bison veterinarians or non-zoo vets, not used to deal with sedation equipment and drugs, it is a big challenge to attend any emergency related to European bison.

### Goal and methods

This aim of this paper is to propose recommendations for light tranquilization, sedation and anesthesia in European bison using common drugs affordable to find



in veterinary pharmacy because they are used with common domestic species like cattle and pets, and have also affordable price because of their widespread use.

This study is based on 24 cases of European bison anesthesia, of animals in different ages and sex, and 3 examples of European bison sedation to avoid stress in squeeze handling.

Drugs considered in this paper are xylacine, ketamine, tiletamine/zolacepan, ronfimidine and detomidine.

In Spain it is possible to obtain as commercial drugs:

- Xylacine (several brands) can be find 200 mg/ml concentration
- Ketamine (several brands) can be found with concentration of 100 mg/ml
- Tiletamine/zolacepan max concentration can be found in “Zoletil 100” (powder with 250 mg Tiletamine + 250 mg Zolacepam)
- Ronfimidine in “Sedivet” at a concentration of 10 mg/ml
- Detomidine in “Domidine” at a concentration of 10mg/ml
- Atipamizol in “Antisedan”, at concentration of 5mg/ml

Sedation/anesthesia or even tranquilization process could be divided into four phases: preparation; injection; waking up; surveillance.

## Preparation

The optimal conditions for the individual preparation are:

***Isolation of animal in known and formerly tested isolation place.*** If we close a wisent in a small enclosure (60 to 100 square meters) hours or even minutes before the action, this animal will be in high stress, but if it is closed and fed, watered and cared in such enclosure for some time, maybe one or 2 days, stress will be at the normal level. To close animal in small enclosure is good to avoid wondering around when darting European bison in large area with the risk of not finding the sedated animal or also to avoid self-damage walking into some obstacle or a hole.

***Avoiding of high ambient temperatures.*** Temperatures over 20°C are risky for complete sedation or anesthesia. Sedation works right, but recovery can lead to increased body temperature which added to stress, low ventilation may cause animal to die, especially if the individual is going to be recovered inside a truck, a box or a carriage. This risk increases if the action is taken with big, adult and heavy wisents.

***Daylight.*** If there is not a case of an emergency, anesthetizing a European bison with one or two hours before the dusk is risky since there leaves no time to survey-its later reactions during sedation or recovery. Wisents under sedation lose their cognition but they can walk for some time before laying down and also during the recovery can make short movements. Without daylight animal may move towards any place where it can fall and get injured.

**Silence and duty.** Every person participating in a European bison sedation process should have a dedicated task and be sure to avoid unnecessary noise. If someone has not such a task (if is supposed to take pictures or simply take a look), it should not be there and can be allowed to approach only after the animal is already asleep and lying down, then such a person should leave before first recovery signs.

**Keeper involved.** If sedated animal has a keeper it knows and trust, this person should be near or participate in whole the process until its end. He also should participate in the European bison weight estimation (leading to drug dose decision), providing information about the animal behavior, excitation capacity and also its position and role in the herd (if known). The data collected and described by Krasieńska and Krasieński (2002) could be helpful as well.

**Material for sedation.** All material, also remote-anesthesia and drug mixture should be ready before the start of the whole procedure, ropes to tie the legs or to pull an animal down, a cloth to cover its eyes, stretchers to move the animal, and also the recovery drugs, serum. If used are remote injection rifle, pistol or a blow-gun, the shooter should have sufficient practice with darts filled with water and be able to estimate properly the distance. Definitely, trying to shoot over longer distances should be avoided. A shot in soft part like abdomen or an eye may have bad consequences.

Also proper selection of the needle is important to assure injection of the whole selected dose. An application of incomplete dose requires repetition of the shot, additional stress for the wisent and lower effective power of an anesthesia.

## Injection

Very important is the proper placement of the injection. The distance and the target area, should be selected depending on shooter skills and ease of approaching the wisent. Two places are the best, back leg (always best) and top chest over shoulder blade. However the latter may be risky because the shoot may go up into hump fat or the syringe can be wiped out by the animal with his head and horns before dart discharge. The advantage of shoot on chest is that the target is big and hard to miss. While shooting in the back leg there is a risk to hit femur with dart rebound. Also in case of the shoot in back leg drug may get directly to blood, and cause faster reaction.

Shooter should try to get near the wisent without eye contact, walking backwards so an animal could think that anything he is doing has nothing to do with him. Then immediately after shooting the shooter should retreat showing to the animal that the distance between the danger (shooter) gets bigger and the threat is decreasing. This should minimise the stress and receptors blocking, but also prevents urination due stress, a situation which may contribute to partial elimination of sedation compounds causing less effective anesthesia.

## Results

The results of immobilization with 6 different mixtures are presented in tables. This was the result of observations in various Spanish breeding centers. Observations were done for six combinations of drugs presented below:

1. Xylazine 2.38 + Ketamine 0.35 + Zoletil 2.23 (both in mg/kg)
2. Xylazine 2.40 + Ketamine 0.6 (mg/kg)
3. Xylazine 1.60 + Zoletil 4 (mg/kg)
4. Ketamine 0.46 + Zoletil 2,54 + Domidine 0.09 (both mg/kg)
5. Zoletil 3.55 + Detomidine 0.1 (all mg/kg)
6. Zoletil 2.5 + Romifidine 0.17 mg/kg

In tables are used abbreviations for all presented data as below:

Name or identification of the individual, its **age**, **sex** and approximate **weight**.

Information about used drug: **Xil** = xylazine, **Ket** = Ketamine, **Zol** = Tiletamine+zolacepam, **Rom** = Romifidine, **Dom** = Detomidine

Number of darts shot,

**Int** = Interval between first dart shooting and second injection (either dart or injection if wisent is laying) in minutes,

**Floor** = time in minutes from last shot to wisent being down on the ground, ready to undertaking further action,

**Sed min** = Minutes action takes place with wisent completely sedated,

**Antid** = amount in mg of Antisedan injected, **Rec min** = Time taken by a wisent to recovery and stand up.

### Combination No 1.

After analyzing the results presented in Table 1, we can conclude that mixture 1 has some advantages and disadvantages:

**Pro:** Drugs available. Cheap, low percentage of Zoletil makes it cheaper. Good for animals with lower body weights

**Against:** Induction problems on big animals, second dose needed. Necessary are large darts up to 10 ml at least. One of the recoveries took long time despite proper weather conditions

### Combination No 2.

This mixture, based on Hellabrunn, did not work (Table 2). This female was not completely sedated so the team had to tie it to a post for blood extraction. Not recommended.

### Combination No 3.

This mixture was used in Russian winter with 4 females to modify radio-collars. One of them died as she got trapped her neck between two branches just in the right moment when she was falling asleep... a very unfortunate happening (Table 3).

Pro: Animals were sedated, sedation time was long enough to change collars, collar batteries but also to take samples and measurements of the animal. Small darts of 5 ml capacity can be used, and these darts are more reliable than large ones.

Against: Induction time was quite long, so if the herd was in open area and they feel threatened, they fled together with injected wisent. which could fall far away and could not be easy to track even in the snow, since its footprints were mixed up with the whole herd. Also high price of Zoletil means a higher price of sedation for adult animals, around 200€ per one dart.

**Very important** is that Zoletil *in substance* is diluted in liquid Xylazine, minimum at a rate of one vial in 1 ml of Xylazine. Therefore the Zoletil is without its excipient and the total size (ml of compound) of the final dose is small, good for small and more reliable darts.

Recommendation: Although Xylazine concentration can be kept, Zoletil comes in 500 mg vial and it is not easy to measure, so mixture start with 1.000 mg (2 vials) for wisents between 1 to 2,5 years old, 1.500 mg (3 vials) for wisents between 2,5 to 4,5 years old and 2.000 mg (4 vials) for adult wisents.

#### Combination No 4.

Pro: This mixture worked well on young wisents, but probably because ketamine was slightly overdosed (Table 4).

Against: The mixture did not work with 2 big males, they could not be sedated and the mixture produced almost immediate urination. Second male receiving higher dose was able to urinate up to 5 times and kept a defensive attitude.

This mixture is not recommended for adult animals.

There is a question about Ketamine compound lasting after opening the vial. Our recommendation is to use small vials and better is to open them when we are going to use them before the warranty period.

#### Combination No 5.

Pro: Reliable mixture, good for animals of all ages, good induction time from 10 to 15 minutes (Table 5).

Against: Expensive because of necessity to use large amounts of Zoletil and also Antisedan. Once recovery time was extremely long, probably due to an individual answer to the mixture, but perhaps also due to the bode size of an animal. Sedation was done on a castrated “extra-large” male, weighting over 1.000 kg. There was one case of dead bison, a young male sedated in November 1<sup>st</sup> in Pyrenees at 1.400 m altitude, when suddenly temperature increased to 24°C, so during the recovery both sedated then animals suffered from an overheating. Only one of them survived.

Overheating was tackled with administration of serum, pouring of cold water upon an animal and a cut in the tail to stimulate bleeding, allowing for adrenaline to

Table 1. Results of using mixture 1: Xylazine 2.38 + Ketamine 0.35 + Zoletil 2.23 (all in mg/kg)

Wisent	Age	Sex	Kg	mg		Ket	Zolet	Rom	Det	Darts int	Floor	Sed min	mg Antid	Rec min	mg/kg		Ket	Zolet	Rom	Det	Anti
				Xil	Xil										Xil	Zolet					
Bro	8	M	900	1400	200	2000				2	5	10	15	75	20	1,56	0,22	2,22			0,083
Han	8	M	850	1600	200	2000				2	30	30	30	100	20	1,88	0,24	2,35			0,118
Jerez	9	H	500	1200	200	1000				2	30	30	45	50	120	2,40	0,40	2,00			0,100
Dustar val	4	M	500	1200	200	1000				1		25	20	60	25	2,40	0,40	2,00			0,120
NL94	4	H	400	1200	200	1000				1		30	20	60	25	3,00	0,50	2,50			0,150
Dustar val	4	M	500	1200	150	1000				1		30	30	50	25	2,40	0,30	2,00			0,100
NL94	4	H	400	1200	150	1000				1		15	40	40	35	3,00	0,38	2,50			0,100
Avg											24,29					2,38	0,35	2,23			0,110

Table 2. Results of using mixture 2: Xylazine 2.40 + Ketamine 0.6 (mg/kg)

Wisent	Age	Sex	Kg	mg		Ket	Zolet	Rom	Det	Darts int	Floor	Sed min	mg Antid	Rec min	mg/kg		Ket	Zolet	Rom	Det	Anti
				Xil	Xil										Xil	Zolet					
Jer san	8	H	500	1200	300					1	0	No!!			2,40	0,60					

Table 3. Result of using mixture 3: Xylazine 1.6 + Zoletil 4 (mg/kg)

Wisent	Age	Sex	Kg	mg		Ket	Zolet	Rom	Det	Darts int	Floor	Sed min	mg Antid	Rec min	mg/kg		Ket	Zolet	Rom	Det	Anti
				Xil	Xil										Xil	Zolet					
Ru	7	H	500	800		2000				1	0	20	40	50	20	1,6					0,100
Ru	8	H	500	800		2000				1	0	25	60	50	30	1,6					0,100
Ru	6	H	500	800		2000				1	0	20	60	50	30	1,6					0,100
Ru	6	M	500	800		2000				1		30	xx			1,6					0,000
Avg																1,6					







start helping peripheral vasoconstriction, and because of blood loose spreading up of heart beat, accelerating blood flow, increasing central hypertension and peripheral compression, improving perfusion.

The Zoletil is available in powder form and is diluted in the Detomidine liquid, minimum at a rate of one vial in 1 ml of detomidine. Therefore the zoletil is without its excipient so the dose size can be small, appropriate for little size, more reliable darts.

### Combination No 6.

Pro: Reliable mixture, good for animals of all ages, very nice and fast induction. Romifidine is a drug for wisents but also cattle (cows) are very sensible to it, so low concentration produces considerable effect. No Antisedan was used, as we did not want to antidote  $\alpha$ -adrenergic receptors and let zoletil remain working, so wisent recovered without antidote in a very positive way. Required dose is of few milliliters so for full dose, small darts can be used (up to 5 ml). Also Romifidine avoids Xylazine secondary effects like salivation, cardiac arrest or panic in induction and stress. Good mixture considering its price (Table 6).

Against: Still only few experiences with this mixture.

### Light sedation/deep tranquilization (Romifidine 0.04 mg/kg)

Romifidine (Sedivet, Romifidine 10mg/ml) is an excellent deep tranquilizer for European bison. Small dose can help in most fast and light actions on wisents, producing calm dissociation (not stimulated from noise or even from movement) but at the same time standing and breathing normally, avoiding risk of complete sedation (Table 7).

It was used in year 2018 three times to help blood extraction for test wisents, inside a cattle squeeze, and results were very good. As it is a light sedation we did not consider the antidote injection.

## Wake up phase

In wake up phase, several recommendations should be taken into consideration.

First, before antidote injection or before we see recovery signs, check whether everything used during sedation process is removed from the wisent: dart needles, surgery material, ropes or tapes, clothes. Such stuff will be difficult to remove when the wisent will start to recover.

Exception can be made with a cloth placed on animal's eyes. This cloth will avoid early eye stimulation while wisent still has no physical (muscle) capacity to answer, so a recovery in which a wisent's eyes are still covered is easier and better.

The wisent position for recovery it is very important. Best way is decubitus prone, or laying on the abdomen with both shoulders in the air and the head between the front legs. Head should **ALWAYS** be higher than abdomen when the

wisent is laying on a slope, even if it is not steep. Second recommended position is sidelong, again with its head higher than the rumen.

When everything is set an animal should be left alone and then the noise; conversations, started cars..shoul be avoided including any stimulation over the usual background of the site if possible.

## Surveillance

As said before, animals should be observed/monitored from reasonable distance. Especially important is breathing but also its body position and movements. Action should be taken if any of these are wrong, but again - team actions to move the animal to correct position, administer more injections or any other treatment should be very quiet. Discussions over what is necessary to do should be performed far from the wisent. Wisent should be approached from behind, which involves lower risk in a situation the animal cannot control its own reactions but also in order to lower the stress.

Water should be available at the range of wisent reach (but in a small vessel, not a pond the animal could fall into) and team should wait until the total recovery especially if sedation took place in open area. Urination and drinking is a good sign that animal is eliminating sedation drugs, and also that the animal starts again to control senses and body movements.

## Conclusions

In the paper was presented results of many immobilizations of European bison using different mixtures. The most interesting is mixture No 6, because it gives good results and the price is reasonable. The presented results can be a part in discussion of methods of European bison immobilization. Many other authors so far presented their own experiences (e.g. Krzysiak and Larska 2014) so there is a wide platform for the discussion.

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#### Immobilizacja żubrów przy użyciu “lekkich” środków

**Streszczenie:** Długoletnie doświadczenie w opiece nad żubrami i ich hodowli , daje możliwość prowadzenia obserwacji a nawet eksperymentów. Usypianie (immobilizacja) żubrów nie jest zadaniem łatwym. W tej pracy przedstawione są surowe wyniki immobilizacji 24 żubrów przy wykorzystaniu sześciu różnych kombinacji leków. Wszystkie użyte środki są powszechnie dostępne w Hiszpanii i mają różne działanie na organizm. W pracy przedstawiono czas potrzebny do unieruchomienia zwierzęcia oraz inne szczegóły. Liczba immobilizowanych żubrów nie jest wystarczająco duża aby można wyciągać poważne wnioski, ale warto zwrócić uwagę na mieszankę nr 6 zawierającą Zoletil i Romifidine.

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