ALTERNATIVE CHEMICAL IMMOBILISATION IN A GROUP OF CAPTIVE FERAL HORSES USING A HOMEMADE REMOTE DELIVERY SYSTEM

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Summary

During a 6 months period, we managed to safely perform 102 remote chemical immobilisations on a group of 50 recently captured feral horses. For all procedures a standard combination of 25 mg detomidine, 62.5 mg tiletamine, 62.5 mg zolazepam and 10 mg butorphanol per delivered dart was used and repeated when necessary. We used 3.5 ml handmade darts delivered by an 11 mm wide improvised blowpipe. For better darting and anaesthesia induction results an additional smaller no-eye contact enclosure, was built which reduced the stress of the immobilisation procedures. Bigger and highly temperamental horses needed more than one dart to get recumbent. In most cases (78.4%) the horses had a smooth induction and awakening. The 19.6% rougher awakenings were attributed to longer anaesthesia onset and duration or to the individual horses temperament

Introduction

A group of 50 recently captured feral horses from the Danube Delta had to be chemically immobilised for different procedures.
There are several methods described for wild equid immobilisation and anaesthesia. One of them suggests the use of the potent opiate ethorphine as a single drug to immobilise horses (WEST et al. 2007). Walzer et al. (2000) suggests for the chemical immobilisation of non-domesticated equids a combination of ethorphine, detomidine and butorphanol. For Przewalski's horse immobilisation the use of ethorphine in combination with acepromazine, topped by aditional detomidine and butorphanol is more specific described (WALZER et al., 2000). Medetomidine with ketamine (WALZER et al., 2006) or romfidine and tiletamine/zolazepam (TZ) have also been suggested (WALZER, Unpublished data 2002).
Unfortunately, ethorphine is not available in Romania, so the feral horse immobilisation procedure had to be adjusted to available drugs in Romania, such as: the α2-agonist detomidine, the mixed antagonist-agonist opioid butorphanol and the combination of the dissociative agent tiletamine with the benzodiazepine zolazepam.
Because direct drug administration was not possible in feral horses we had to consider a way of remote drug deliverance. Considering the fact that the use of dart guns or pistols may present some degree of trauma (BURROUGHS, 1993) and that the horses felt comfortable within a 10 m range distance of human presence, it was decided that blowpipe delivery would be the best option for this particular situation.

Materials and methods

The 50 horses were gathered in a 5000 m² squared enclosure. The weight of the horses estimated to be around 300 kg (+/-50 kg) per animal.

Several homemade dart and projector systems have been described in literature (HAIGH and HOPF, 1976; WARREN et al., 1979; BARNARD and DOBS, 1980). Due to the intense use of the darts and their low resistance that would raise the overall costs, it was decided to manufacture the darts ourselves. The darts were handmade from 3 ml luer lock normal syringes (Demotek®, Demophorius UK, Cambridge, UK). The manufacturing of one dart required the use of two syringe chambers melted together at the basis, after the pistons were sectioned underneath the rubber head. One of the rubber heads was clipped to alter the diameter, allowing the air to pass trough, thereby creating the air chamber [1]. It resulted in a 14.5 cm long, 11 mm thick dart syringe with a maximum liquid chamber capacity of 3.5 ml. The needles were made from normal 18 G, 1.2X40 mm needles (BD Microlance 3®, BD, Drogheda, Ireland), blocked at the tip with a metal epoxy glue (Bison Epoxy Metal®, Bison International, Goes, The Netherlands). They were punctured 1 cm below the tip with the help of a metal file [2]. The blowpipe used was a 11 mm, 120 cm iron pipe bought from a local hardware store, to which we attached an improvised conic mouthpiece. We used conventional marketed shortened stabilisers and needle sleeves.

Taking into account the incapacity to deliver a big amount of drug with a blowpipe due to the darts limited volume, we tried to find available anaesthetic agents with high concentration per ml that could be used I.M. in horses. Consequently we came up with the following cocktail: 25 mg detomidine (Domosedan®, Orion Pharma, Espoo, Finland), 62.5 mg tiletamine, 62.5 mg zolazepam (Zoletil®, Virbac S.A., Carros, France) and 10 mg butorphanol (Butomidor®, Richterpharma Ag, Wels, Austria). The volume of the resulted mixture would be (3.5 ml) able to fill an entire homemade dart.

Zoletil® is presented as a whitish powder and it's solvent. We removed the solvent and added one whole vile of 5 ml Domosedan® and another 2 ml of Butomidor®. The resulted mixture would be 7 ml of 125 mg tiletamine/125 mg zolazepam, 50 mg detomidine and 20 mg butorphanol. This mixture could fill two 3.5 ml dart syringes. The mixture presented itself as a transparent, aqueous liquid. No physical interaction was seen between the mixed substances.

The 3.5 ml dart syringes were filled with the above-mentioned solution and delivered with the blowpipe in the rump musculature whenever the animal was relaxed and close enough for a good aim. The distance varied between 5 and 10 meters. The procedures took place during a large variety of time conditions, in a temperate climate, from -7ºC up to 38ºC, both day and night.

From the total of 102 procedures, 71 were made for blood sampling to test for Equine Infectious Anaemia (EIA). Those procedures were divided on two separate occasions, three months apart (August 2011- 35 procedures and October 2011 -36 procedures). Seven of the procedures were made for the euthanasia of EIA seropositive individuals; eight procedures were made for male castration and the other 15 for miscellaneous treatments: 7 cases of infected wounds, 3 cases of lameness, 3 of vulvar miazis, 2 colic cases and 1 scrotal infection.

Results

Initial effects of the anaesthetics were seen after 6-8 minutes when the horses started to exhibit a stiff, high-stepping gait and became atactic. In case the horses did not show proper signs of induction after 15 minutes it was decided to administer additional darts. In 28 cases (27.4%) one fully discharged dart syringe induced horses to lateral recumbency in less than 15 minutes. In 37 (36.2%) of the cases another dart needed to be administered for the horses to become recumbent. These procedures took 15 to 20 minutes. There were also 29 (28.4%) procedures that required a total of three delivered darts and 8 (7.8 %) procedures that required 4 darts for the animal to become recumbent (See Table 1). In those particular cases it took up to 40 minutes to immobilise the animals.

Better results were achieved when an additional 10x50 m^2, 1.50 m high paddock inside the enclosure was build, divided in the middle. All paddock fences were covered with banners to limit eye contact between horses and humans. The horses where lured inside this additional paddock with food. Because of the shorter distance for darting and decreased horse restlessness due to the lack of direct eye contact, the darting procedure was easier to undertake. The whole

immobilisation process was done in as much silence as possible.
Under these conditions, it was managed to immobilise and take blood samplings from 37 horses in four and a half hours. 15 horses (40.5%) were induced with one 3.5 ml dart syringe and took less than 12 minutes to achieve lateral recumbency. 17 horses (46%) required an additional dart and took around 15 minutes for lateral recumbency and three fully discharged darts were necessary for 5 horses (13.5%) (See Table 1).

	Darts needed for induction				**Total of inductions**
	1 dart	**2 darts**	**3 darts**	**4 darts**	
No. of procedures done without the inside paddock/ time to induction	*n*= 13 (20%) <15 min	*n*= 20 (30.7%) 15-20 min	*n*= 24 (36,9%) 20-30 min	*n*= 8 (12,3%) 30-40 min	*n*=65
No. of procedures done within the inside paddock / time to induction	*n*= 15 (40,5%) < 12min	*n*=17 (46%) 12-15min	*n*=5(13,5%) 15-25min	-	*n*= 37
Average	*n*= 28 (27,4%)	*n*=37 (36,2%)	*n*=29 (28,4%)	*n*=8 (7,8%)	*n*=102

Table 1. Number of procedures (*n*) in relation with the number of darts used and the time needed for induction of the anaesthesia

Once a horse laid in lateral recumbency we waited another 5 minutes to make sure the animal was profoundly sleeping. The laying animals were slowly approached from behind, gently touched with a stick to see any reaction. The immobilised head was positioned on the ground and eyes were covered with a blanket. At this point the anaesthesia monitoring started. An average of 20 breaths per minute and around 35 heartbeats per minute were recorded.
In average the anaesthetic effect of the combined drugs lasted around 35 to 45 minutes, offering a good anaesthetic depth with proper muscle relaxation, suitable for short soft tissue surgery. In case of longer procedures we added 2 mg/kg ketamine and 0.5 mg/kg xylazine intravenously.
After finishing the procedure, the horses, with the blankets in place, were left to recover from the anaesthesia by themselves without any disturbance. In 78.4% of the cases the horses had a smooth awakening, starting with the adaptation to a sternal position for a couple of minutes and than standing up straight succeeding to balance themselves. In the other 19.6% of the cases the horses had a rough awakening. While trying to stand they tripped and fell a couple of times before they were able to balance themselves properly. Those hard awakenings were seen secondarily to receiving more anaesthetic (more darts or/and top ups), or when the animals tried to stand up too fast. In these cases it took another 10 to 20 minutes to achieve a normal gait and balance.
On average the whole procedure from the first delivered dart until the horse was able to raise himself on his feet, took around one hour.
There were 10 injuries recorded during the induction and awakening. Two skin lacerations that required suturing (one on the head and one on the neck), one neck haematoma and seven superficial lip injuries. All horses recovered well from the immobilisation procedures and started to eat and drink after a couple of hours.

Discussion

Despite the horses normal preference when they tend to form groups of 4 to 7 individuals, once a disturbance took place, all horses gathered together, became extremely cautious of the surroundings and galloped away as a herd, making the darting process much more difficult. Aiming correctly an animal is always a tricky procedure. Ideally the horse has to be close enough (around 5 m in range), not moving and relaxed. Many times the target moved or ran away from sight, right when the blowpipe was being raised. If the dart was delivered while the animal was moving, it bounced or deflected. There were also cases when the target was missed. Theoretically, the quantity of drugs contained in one dart should have easily covered the sedation of two adult 300 kg horses if given intravenous. Intra-muscular injections take longer for the effect to install (5-15 min) in comparison with the IV administration (max 1 minute), and it requires higher amounts of drugs for IM injections to have a similar effect as with the IV administration.

The need to re-dart the horses could be explained by the fact that when the animals felt threatened they became agitated and continued to pase or trot for a long period, bypassing the sedative effect. Given the high concentration of the cocktail used, the additional darts were delivered only if the effect of the previous dart did not seem to install. This time gap, combined with the agitated state of the horses, and sometimes the time lost while trying to correctly aim and shoot the target, would explain the necessity to use additional darts.

Once the inside enclosure was built, and the horses lured in, it was much easier to safely dart them. The visual barrier significantly decreased the stress factor, and because of this, the horses did not move much, giving the possibility for the drugs to act faster.
Using a remote drug delivery system such as the blowpipe and the tranquilization darts raised some other technical difficulties that affected the overall procedures. During the handling, some darts lost pressure, pistons got stuck or got blocked in the blowpipe. All these factors have to be considered as a source of overall loss (drugs, darts).
Anaesthesia-related complications are significantly more common in horses than in small animals, with reported fatality rates reaching on average 1% for elective equine surgeries (YOUNG and TAYLOR, 1993). Consequently every time a chemical immobilisation in equids is made, complications should be expected and prepared for.

Conclusions

The cocktail used (25 mg detomidine, 62.5 mg tiletamine, 62.5 mg zolazepam and 10 mg butorphanol) for immobilisation proved to be a reliable and relatively safe drug mixture that was able to induce and maintain a good anaesthesia depth for a minimum of 35 minutes. Bigger and highly temperamental horses needed more than one dart to get recumbent. In most of the cases (78.4%) the horses had a smooth induction and awakening while the 19.6% rough awakenings were attributed to longer anaesthesia onset and duration or horse individuality. Restricting the enclosure and minimizing the eye contact and noise helped achieve better darting and anaesthesia induction.

The homemade darts and blowpipe had shown to be as efficient as the commercial ones, providing a cheap and easy way to remote delivery of the anaesthetic agents.

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[1]http://www.youtube.com/watch?v=KI1dWFjYVgU&feature=gall&context=G26d496cFAAAAAAAABAA
[2]http://www.youtube.com/watch?v=CAfRvh8am3U&context=C35ddf6eADOEgsToPDskLO0IMacTxC1rjszNnEYAji