

MONITORING THE EFFICACY OF NEWBORN TREATMENTS IN RUMINANTS AT AL WABRA WILDLIFE PRESERVATION (AWWP), QATAR

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Summary

*In 2003 a newborn treatment protocol consisting of paramunity inducers, vaccinations as well as mineral and vitamin supplements was introduced at AWWP, with the aim to minimise neonatal mortality. In this retrospective study the objective was to evaluate the efficacy of this treatment. The survival rate and main causes of death were investigated in 5 ruminant species. Results differed greatly between species, but in no species did survival differ significantly between treatments. The survival rate of the Addax antelope (*Addax nasomaculatus*) increased by 9 %. Deaths due to bacterial infection decreased in this species but the incidence of maternal neglect increased. There was no significant change of survival rate of the Beisa oryx (*Oryx beisa*) but deaths caused by bacterial infections were reduced whereas losses due to maternal neglects increased. The survival rate of the Gerenuk (*Litocranius walleri*) increased by 4 %. Incidences of bacterial infection remained unchanged whereas deSaths caused by trauma increased and maternal neglect appeared as a new category. The survival rate of the Nilgai (*Boselaphus tragocamelus*) decreased by 7 %. Whereas bacterial infections decreased significantly, maternal neglect as well as trauma appeared as new categories. The survival rate of the Speke's gazelle (*Gazella spekei*) increased by 4 % and bacterial infections appeared as the new main cause of death. AWWP has a known problem with pneumonia in this species; therefore this case has to be considered separately. Although the incidence of bacterial infection seems to be decreasing overall, maternal neglect must be considered an emerging problem potentially triggered by the newborn treatment.*

Introduction

The neonatology of wild ungulates is an area in which little research has been done, and of which there has been little systematic review. Common diseases of neonatal ungulates are hypoglycaemia, hypothermia, pneumonia, coccidiosis, diarrhoea, gastroenteritis and septicaemia due to infections following inadequate or late colostrum intake, parasites and malnutrition (WALLACH and BOEVER, 1983; HEWUSCHELE et al., 1986; SEIDEL, 1995). In captivity, the risk of infection is especially high, and diagnostic tests are often difficult to perform (HINSHAW et al., 1996). Therefore, disease management should ideally be achieved by a preventive medical programme.

The methods used for the prophylactic treatment of neonates differ greatly between zoos. While some institutions use a detailed medical protocol including the application of vaccinations, paramunity inducers and mineral and vitamin supplements, others confine themselves to a brief physical examination, taking a blood sample, applying a permanent identification and determining the sex of the neonate. Some zoo veterinarians choose to give only vitamin E/selenium as a prophylactic

medication. Many zoo veterinarians assert that these treatments should only be given where indicated and any prophylactic protocol should therefore be based on the history of disease in the facility and also on the problems seen in the species concerned (CRAWSHAW et al., pers. comm., 2008). Recommendations cited in the literature include physical examination within the first 24 - 48 hours after birth (ENSLEY and MEIER, 1978), the administration of a selenium-vitamin E injection (SEIDEL, 1995) and a health programme tailored to the needs and history of the respective facility (HEWUSCHELE, 1978; HINSHAW et al., 1996).

The Al Wabra Wildlife Preservation (AWWP) is the domicile of many threatened species such as the Arabian oryx (*Oryx leucoryx*) and the Beira antelope (*Dorcatragus megalotis*) or sensitive species such as the Gerenuk (*Litocranius walleri*). With the intention to keep neonatal mortality as low as possible, the veterinary staff at AWWP has developed a substantial neonatal treatment protocol consisting of paramunity inducers, vaccinations as well as mineral and vitamin supplements. The purpose of this paper is to evaluate the efficacy of these newborn treatments in five gazelle and antelope species. Such an evaluation is possible at AWWP because newborn treatment protocols varied over time, allowing a comparison between different treatment regimes in certain species in which sufficient data had been generated in the past years.

Methods

In this retrospective study the neonatal mortality of five ruminant species has been evaluated - the Addax antelope (*Addax nasomaculatus*), the Beisa oryx (*Oryx beisa*), the Gerenuk (*Litocranius walleri*), the Nilgai (*Boselaphus tragocamelus*) and the Speke's gazelle (*Gazella spekei*). All species were kept in single-species enclosures with daily visual checks of all animals.

The newborn treatment protocol was introduced in June 2003. Data was available from before this introduction, when neonates did not receive any prophylactic medication, and from June 2003 until 2007. Species were divided into two treatment groups. Group 1 received a 1-day newborn treatment and Group 2 a 2-day newborn treatment (table 1). Group 1, included the Addax antelope, the Beisa oryx, the Nilgai and the Speke's gazelle and group 2 included the Gerenuk. Treatments were applied either orally or by injection after separating the other animals of the group and catching the neonate by hand. No gloves were used in the handling of the neonates.

Results of the gross post mortem examination were available for all the study animals that died (n = 177) in this study. According to findings of the examination, the cause of death was classified as bacterial infection (either systemic or lung infection - when pathological changes were localised in lung tissue), trauma - possibly a result of aggression from a conspecific or from running into fences, and maternal neglect - usually detected in animals that died in the first few days of life with no evidence of being cleaned or fed or both. Apart from these dominant findings, when other causes of death including euthanasia, congenital defects or the discovery of an autolysed carcass were reported, the cause of death was included in this study as "others".

The data from the stock list program was encoded into Excel spreadsheets. The prophylactic neonatal treatment protocols were postulated to have an effect up to the age of weaning. For the purpose of this study six months was considered to be a suitable endpoint. If neonates did not survive to this age, the cause of death was additionally evaluated by consulting the necropsy reports. Chi-square test (SPSS 16.0, SPSS Inc., Chicago, IL) was used to test for significant differences in survival between treatment regimes within species.

Table 1: Newborn treatment protocols at AWWP.

Group 1	1-day newborn treatment			
Day 2 after birth	Biofakt® 1 ml/kg, sc	Biofakt® 1 ml/kg, oral	Bio-Weyxin® 1 ml/kg, oral	Heptavac® 2 ml/kg, sc
	Vitaselen® 0.2 ml/kg, sc			
Group 2	2-day newborn treatment			
Day 2 after birth	Biofakt® 1 ml/kg, sc	Biofakt® 1 ml/kg, oral	Heptavac® 2 ml/kg, sc	
Day 3 after birth	Biofakt® 1 ml/kg, oral	Copavet® 0.1 ml/kg, sc	Vitaselen® 0.2 ml/kg, sc	Bio-Weyxin® 1 ml/kg, oral

Biofakt® orinject (ALBRECHT, Aulendorf, Germany): colostral immunoglobulin against *E.coli*, Rotavirus and Coronavirus.

Bio-Weyxin® 700K (VEYX, Schwarzenborn, Germany) oral vitamin supplement.

Copavet® Injection (C-VET, Lancashire, United Kingdom) injectable copper suspension.

Heptavac® Ovilis P ad us. vet. (INTERVET, Zürich, Switzerland) Clostridium and Pasteurella vaccine.

Vitaselen® (SELECTAVET, Weyarn/Holzolling, Germany) injectable vitamin E and selenium suspension.

Results

Addax antelope (table 2)

The survival rate of newborn Addax antelopes increased numerically after the introduction of newborn treatment to 84 % as compared to 75 % prior to treatment introduction in 2003 (the difference was not significant). One of the main causes of death remains bacterial infection (37 % of all deaths) but has decreased compared to before 2003 (58 % of all deaths). The incidence of lung infection reduced to zero as compared to 63 % of all bacterial infections among the untreated neonates before 2003. However, starvation due to maternal neglect occurred more frequently (38 % of all deaths) than before the treatment introduction (7 % of all deaths).

Table 2: Juvenile survival and causes of death in Addax antelope (*Addax nasomaculatus*) before and after the initiation of newborn treatment.

	no newborn treatment	newborn treatment
Survivals¹	41	42
Deaths¹	14	8
Total	55	50
Survival rate	75 %	84 %
Death rate	25 %	16 %
Death due to ...		
Bacterial infection (of which lung infections)	58 % (63 %)	37 % (0 %)
Trauma	14 %	0 %
Maternal neglect	7 %	38 %
Other	21 %	25 %

¹ The difference in survival between treatments was not significant.

Beisa oryx (table 3)

The survival rate stagnated at 67 % compared to 69 % before treatment introduction in 2003 (the difference was not significant). The main cause of death of neonatal Beisa oryx remains bacterial infection with 30 % of all deaths, but has decreased compared to 45 % before 2003. The main kind of infection is still pneumonia. 25 % of the neonates that underwent newborn treatment died of starvation due to maternal neglect. This cause of death was not diagnosed prior to treatment introduction in 2003. Death due to trauma was constant with 11 % and 10 %, respectively.

Table 3: Juvenile survival and causes of death in Beisa oryx (*Oryx beisa*) before and after the initiation of newborn treatment.

	no newborn treatment	newborn treatment
Survivals¹	20	41
Deaths¹	9	20
Total	29	61
Survival rate	69 %	67 %
Death rate	31 %	33 %
Death due to ...		
Bacterial infection (of which lung infections)	45 % (50 %)	30 % (66 %)
Trauma	11 %	10 %
Maternal neglect	0 %	25 %
Other	44 %	35 %

¹ The difference in survival between treatments was not significant.

Gerenuk (table 4)

With 61 % the survival rate increased numerically compared to 57 % before the introduction of newborn treatment (the difference was not significant). The main cause of death is still bacterial infection. Death due to trauma has not been diagnosed as often as before treatment introduction (12 % vs. 23 %), but starvation due to maternal neglect has appeared as a new category (18 % vs. 0 % before treatment).

Table 4: Juvenile survival and causes of death in Gerenuk (*Litocranius walleri*) before and after the initiation of newborn treatment.

	no newborn treatment	newborn treatment
Survivals¹	17	27
Deaths¹	13	17
Total	30	44
Survival rate	57 %	61 %
Death rate	43 %	39 %
Death due to ...		
Bacterial infection (of which lung infections)	46 % (17 %)	46 % (25 %)
Trauma	23 %	12 %
Maternal neglect	0 %	18 %
Other	31 %	24 %

¹ The difference in survival between treatments was not significant.

Nilgai (table 5)

77 % of the treated neonatal Nilgais survived the first six months of life. This is a numerical decrease compared to 84 % before newborn treatments were performed (the difference was not significant). The main cause of death has changed. Before treatment introduction, 38 % of the dead neonates were found to have bacterial infections. These have significantly decreased to 8 %. New findings were death through trauma (17 % vs. 0 %) and starvation due to maternal neglect (42 % vs. 0 %).

Table 5: Juvenile survival and causes of death in Nilgai (*Boselaphus tragocamelus*) before and after the initiation of newborn treatment.

	no newborn treatment	newborn treatment
Survivals¹	42	41
Deaths¹	8	12
Total	50	53
Survival rate	84 %	77 %
Death rate	16 %	23 %
Death due to ...		
Bacterial infection	38 %	8 %
Trauma	0 %	17 %
Maternal neglect	13 %	42 %
Other	49 %	33 %

¹ The difference in survival between treatments was not significant.

Speke's gazelle (table 6)

The survival rate of the neonatal Speke's gazelles increased numerically from 56 % to 60 % (the difference was not significant). The main cause of death is new bacterial infection (52 % vs. 20 % before treatment). Pneumonia stayed the main type of infectious disease with 80 % of all bacterial infections. Maternal neglect (30 % vs. 33 % before treatment) and trauma (11 % vs. 14 % before treatment) as cause of death did not show a relevant change.

Table 6: Juvenile survival and causes of death in Speke's gazelle (*Gazella spekei*) before and after the initiation of newborn treatment.

	no newborn treatment	newborn treatment
Survivals¹	62	40
Deaths¹	49	27
Total	111	67
Survival rate	56 %	60 %
Death rate	44 %	40 %
Death due to ...		
Bacterial infection (of which lung infections)	20 % (80 %)	52 % (79 %)
Trauma	14 %	11 %
Maternal neglect	33 %	30 %
Other	33 %	7 %

¹ The difference in survival between treatments was not significant.

Discussion

The efficacy of prophylactic newborn treatments seems to be controversial, and to differ depending on the species. The fact that we did not find significant differences in survival between the treatment groups in this study either indicates that neonate mortality was not reduced, or that it was only affected to such a low extent that sample size was not sufficient to prove an effect. The survival rate increased numerically in one species (Addax antelope), very slightly so in two species (Gerenuk, Speke's gazelle), and even decreased numerically in two other species (Nilgai, Beisa oryx). But even when overall survival hardly changed, a change in the causes of death appeared evident. Before treatment introduction in 2003, bacterial infections were dominant. Although the diagnostic abilities at AWWP have been drastically improved since the beginning of the surveillance, there were fewer findings of bacterial infections among the dead neonates after the initiation of newborn treatment. The only exception to this pattern are the Speke's gazelles; in this particular species, the bacterial infection rate increased dramatically, and deaths due to pneumonia have been common throughout the past few years in all age groups and are a known problem at AWWP (SCHENK et al., 2009). Therefore, this species needs to be considered separately.

Neonatal deaths due to starvation after maternal neglect or trauma appear to be emerging main causes of death after the introduction of newborn treatment. This will most likely be an effect of the human interference with, and handling of, the newborn while administering treatment. Sensitive mothers may reject their baby if it was handled by keepers or vets. It should be noted that husbandry practices for the species investigated here did not change during the investigation period. Admittedly, maternal neglect may be a consequence of any negative circumstances, such as overcrowding, or an (undiagnosed) illness of the newborn. If the causes for maternal neglect are to be evaluated in more detail, a control group with the same amount of handling but placebo medication, as well as an untreated group, would be necessary, along with behavioural monitoring.

Taking these factors into account, the zoo veterinarian must make individual decisions on whether, and what kind of treatment is indicated. From an epidemiological point of view it can be advisable to concentrate on reducing infections to a minimum while accepting the fact that possibly more neonates might be lost to trauma or maternal neglect. Another approach to minimising stress due to human interference could be to focus on the development of alternative methods of drug administration such as herd-specific vaccines. These are administered to the females during pregnancy inducing them to pass on the antibodies with the colostrum. The improvements in management, such as optimising the herd size and nutrition, have been shown to possibly be more effective than administering medications to neonates (BESSELMANN et. al., 2008). Based on the results of this retrospective study, the veterinarians at AWWP have already made changes to the management. Prophylactic treatment of newborn ruminants is now only administered, if at all, 48 hours or more post partum, to allow the mother and her baby to strengthen their bond. These measures are expected to lead to a reduction of the incidence of starvation and trauma. The efficacy of these management changes will have to be evaluated over the coming years.

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References

- BESSELMANN D, SCHAUB D, WENKER C, VÖLLM J, ROBERT N, SCHELLING C, STEINMETZ H, CLAUSS M (2008): Juvenile mortality in captive lesser kudu (*Tragelaphus imberbis*) at Basle Zoo and its relation to nutrition and husbandry. *Journal of Zoo and Wildlife Medicine* **39**, 86 - 91.
- CRAWSHAW G, EULENBERGER K, HATT JM, OCHS A, WENKER C (2008): Personal communication.
- ENSLEY PK, MEIER JE (1978): Neonatology and the monitoring of neonates. *Proceedings of the American Association of Zoo Veterinarians*, 10 - 15.
- HEWUSCHELE WP (1978): Preventive medicine. In: FOWLER ME (Ed.), *Zoo and Wild Animal Medicine*. Philadelphia, London, Toronto, WB Saunders Company, 17 - 19.
- HEWUSCHELE WP, OOSTERHUIS J, JANSSEN D, ROBINSON PT (1986): Cryptosporidial infections in captive wild animals. *Journal of Wildlife Diseases* **22**, 493 - 496.
- HINSHAW KC, AMAND WB, TINKELMAN CL (1996): Preventive medicine. In: KLEIMANN DG, ALLEN ME, THOMPSON KV, LUMPKIN S (Eds.), *Wild Mammals in Captivity*. Chicago, University of Chicago Press, 16 - 23.
- SCHENK F, DEB A, ARIF A, TAHA A, HAMMER S (2009): Causes of mortality in captive Speke's gazelle (*Gazella spekei*) at Al Wabra Wildlife Preservation (AWWP) Qatar from 2001 – 2007. *Proc Int Conf Dis Zoo Wild Anim*, 320 - 326.
- SEIDEL B (1995) Antilopen. In: GÖLTENBOTH R, KLÖS HG (Eds.), *Krankheiten der Zoo- und Wildtiere*. Berlin, Blackwell, 330 - 350.
- WALLACH JD, BOEVER WJ (1983). *Diseases of Exotic Animals: Medical and Surgical Management*. WB Saunders Company, Philadelphia.