



الأمانة العامة لصون  
المها العربي  
General Secretariat for  
the Conservation of the  
ARABIAN ORYX



# MIDDLE EAST ARABIAN ORYX DISEASE SURVEY REPORT 2011



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The General Secretariat for the Conservation of the Arabian oryx was established in 2000 as a regional initiative with a key role of supporting all efforts to protect and conserve the Arabian oryx, to agree regional criteria and standards, and to coordinate efforts between range states.

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## Abbreviations

- AO: Arabian Oryx  
BTV: Blue Tongue Virus  
CCPP: Contagious Caprine Pleuro Pneumonia  
EHDV: Epizootic Hemorrhagic Disease Virus  
FMD: Foot and Mouth Disease  
NWRC: National Wildlife Research Center, Saudi Arabia  
PPR: Peste des Petits Ruminants  
TB: Tuberculosis  
UAE: United Arab Emirates









## Summary

- The response rate for the 2011 Middle East Arabian Oryx Disease Questionnaire was 90%. The survey was sent to Middle East collection managers based in the Middle East.
- The collection managers surveyed in this study manage a combined total of 7,124 individual Arabian oryx throughout the Middle East. The population of Arabian oryx in the UAE represents 58% of the total Middle Eastern population. The UAE and Qatar are home to combined total of 77% of the total Arabian oryx population represented in this survey.
- About 3 quarters of this population is categorized as captive bred, and a little less than 10% are categorised as reintroduced into the wild.
- Most of the Arabian oryx collections in the Middle East hold other ungulate species which are in direct contact with the Arabian oryx. In other words, as a general practice, Arabian oryx herds are not isolated from other ungulate species and are being kept in the same enclosures.
- A minority of Arabian oryx collection managers carry out regular annual prophylactic procedures.
- Collections representing about half of the sites declare doing regular vaccination against FMD, PPR and Clostridium and regular internal parasites treatment.
- A very small minority of the collections carry out systematic screening tests for important veterinary diseases, among them zoonotic diseases.
- Most reported infectious and non-infectious pathological problems refer to accidental traumas (out of 228 deaths, 131 were due to traumas) and subcutaneous abscesses subsequent to intraspecific aggression.
- Few scientific and veterinary resources have been published about the Arabian Oryx.





## Introduction

The most recent Middle East Arabian oryx disease survey was conducted in 2002 by the National Wildlife Research Center, Taif, Saudi Arabia (Ostrowski & Anajariyah, 2003). It marked only the third time a disease survey had been conducted on regional Arabian oryx populations.

In that 2002 survey, 13 Arabian oryx collection managers in the Middle East were contacted and 10 returned the questionnaire. The collection managers surveyed at that time managed a combined total of 3,948 Arabian oryx.

In October 2011, a regional workshop entitled “Veterinary Management of Arabian oryx in the Range States” was held in Al Ain, UAE and organized by the General Secretariat for the Conservation of the Arabian Oryx.

The survey discussed in this report is the result of one of the recommendations from that 2011 conference in Al Ain. The report, though an outcome of that meeting, is greatly inspired by the previous surveys and dedicated work of collection managers across the region.

## Objectives

The Arabian Oryx Disease Survey was conducted for several reasons:

- Contribute to improving the health of the Arabian oryx
- Make recommendations for preventative medicine
- Evaluate the epidemiological risk to Arabian Oryx
- Understand better the diseases which can affect the species
- Record the demographic parameters (age, sex, number, etc.) of the species in the range states
- Understand the severity and geographic distribution of pathogens affecting the Arabian oryx
- Record the veterinary tests and routine procedures conducted on Arabian oryx
- Measure the relative proximity of managed herds of Arabian oryx to other ungulate species





## Results

### Response rate

Twenty Arabian oryx collections managers responsible for collections located throughout the Middle East were contacted to answer the questionnaire. The collection managers were specifically asked to report on disease occurrence in 2011 (January 2011 to December 2011). These 20 collection managers represent 37 different sites where Arabian oryx are held.

The response rate of this survey was high. Eighteen of 20 collection managers responded to the survey resulting in a 90% response rate. Compared to disease surveys targeting Arabian oryx in the Middle East, that participation and response rates were very good.

Table 1: A list of collections and sites which participated at the 2011 Arabian Oryx Disease Survey.

Country	Collection	Site
Bahrain	Public Commission for the Protection of Marine Resources, Environment & Wildlife	Al Areen Wildlife Park 1
		Al Areen Wildlife Park 2
		Hawar Island
Jordan	Wadi Rum Protected area - Project of HH Sheikh Mohammed bin Zayed Al Nahyan	Wadi Rum
	Shaumari Wildlife Reserve	Shaumari
Oman	Office for Conservation of Environment-Diwan of Royal Court	Jaaluni (enclosures)
		The fenced Reserve
	Omani Mammals Breeding Center. Royal Court Affairs	Breeding Center
Qatar	Ministry of Environment	Shahanyah
		Mazhabyah
		Doha Zoo
		Alwajbah
		U.Th, U.Qr, U.Ma, RL
		Farm 279
Saudi Arabia	Saudi Wildlife Authority	Natonaal Wildlife Research Center NWRC
		King Khalid Wildlife Research Center KKWRC
		Mahazat as-Sayd Protected Area
		Uruq Bani maarid Protected Area



Country	Collection	Site
United Arab Emirates	Management of Nature Conservation	Rawdah
		Al Wathba
		Abu Al Abyad
		Seih Al Bin Ammar
	Al Ain Zoo	Al Ain Zoo
	Environment Agency - Abu Dhabi (EAD)	Arabian Oryx Protected Area Um Az Zumoul
	Arabian oryx collection of HH Sheikh Mansour bin Zayed	Bu Deep
	Endangered Species Breeding Centre-Sharjah	Arabian Wildlife Centre
		Museum Camp
		Dhuleiman
	Dubai Desert Conservation Reserve	Dubai Desert
	Wadi Al Safa Wildlife Centre-Dubai	Wadi Al Safa
		Al Awir
		Al Qudara
	Sir Bani Yas Island	Bani Yas
	Al Ajban Desert Safaris	Al Ajban
		Al Khazna
Yemen	Sanaa Zoo	Zoo
	Taiz Zoo	Zoo
TOTAL	18	37

## Total number of oryx

This current survey of collection managers represents a total number of 7,124 Arabian Oryx located throughout the Middle East. Compared to the survey reported in 2002 (Ostrowski & Anajariyah, 2003) where 3,948 Arabian oryx were represented by 13 collection managers, the current survey of 18 collection managers and more than 7,000 Arabian oryx is significantly more comprehensive.

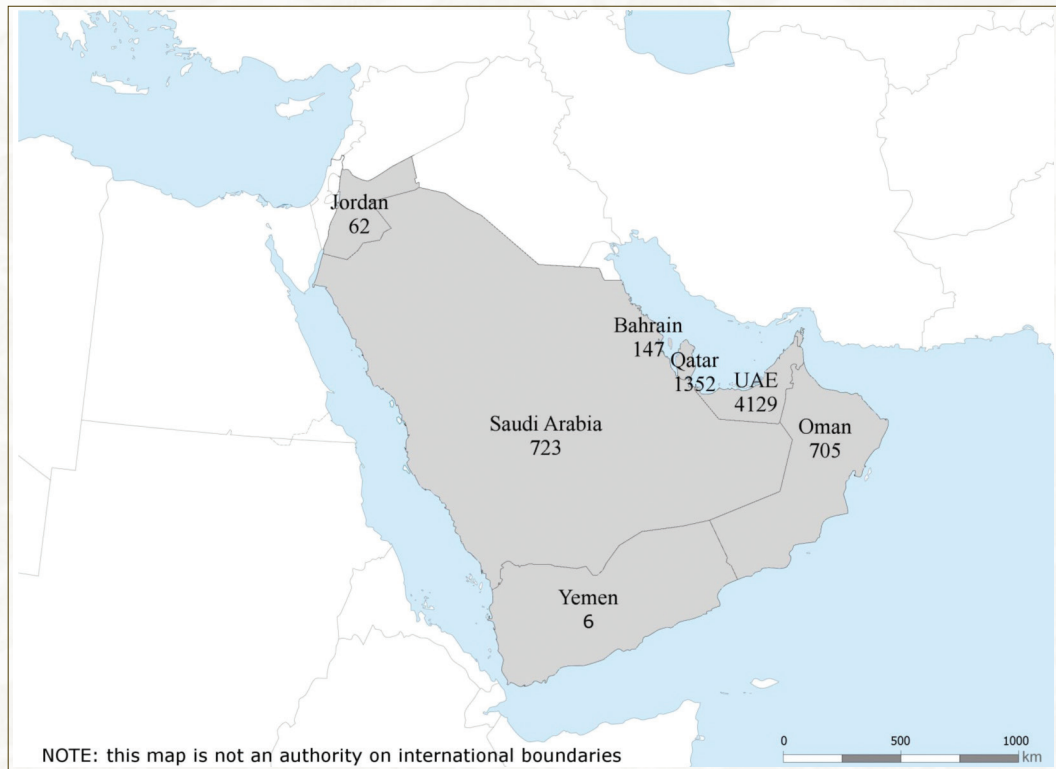


Figure 1. Distribution of Arabian oryx surveyed in the 2011 Middle East Arabian Oryx Disease Survey.



## Distribution of the Arabian oryx throughout the range states.

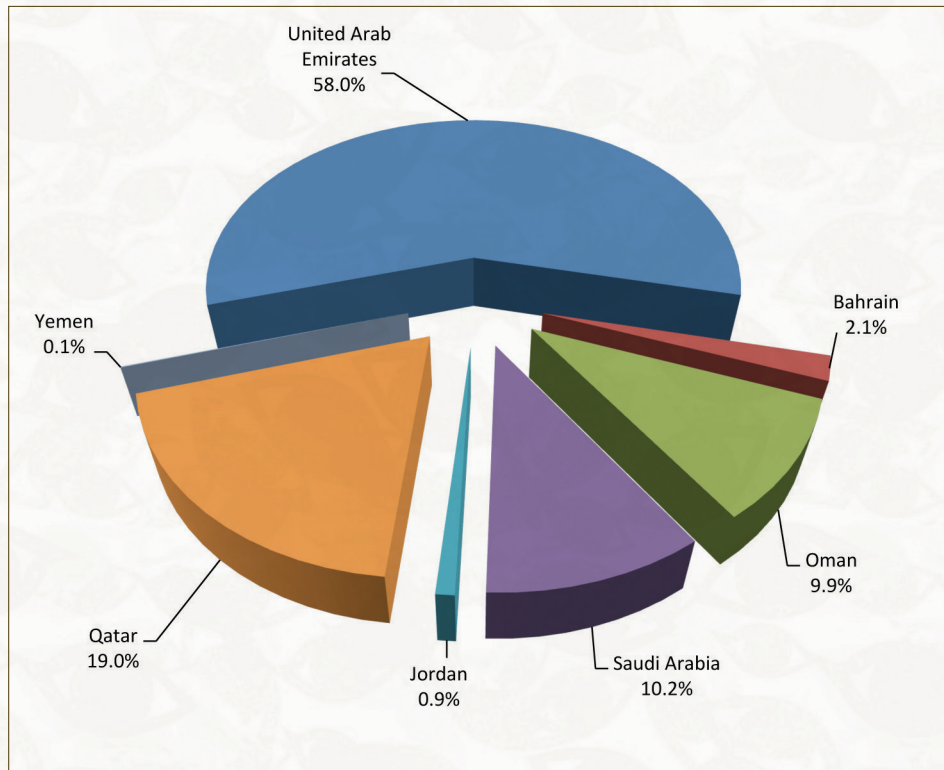


Figure 2. Percentage of Arabian oryx reported in the Middle East by country (n = 7,124).

## Population Categories

The collection managers responded to the questionnaire using the following definitions:

### RH: Reintroduced Herd into the wild:

- The herd is free-ranging
- The herd lives on natural resources and does not require supplementation
- The herd's diet is not supplemented with food artificially
- It occurs in its natural habitat within the historical distribution range of the particular species,
- The particular species' social requirements are met at all times.

Arabian Oryx Protected Area in the UAE, the fenced reserve of Al Wusta Wildlife Reserve in Oman, and Uruq Bani Ma'arid Protected Area in Saudi Arabia are categorized as herds released into the wild. These reserves represent 9% of the overall Arabian oryx population covered by this study.

### MP: Managed Population:

- It is free ranging (managed wild population) or semi free ranging
- It lives on food from natural resources which may require supplementation
- It occurs in its natural habitat within the historical distribution range of the particular species, and
- The particular species' social requirements are met at all times.

The Dubai Desert Conservation Reserve in the UAE, Al Areen Wildlife Park 1 and Hawar Island in Bahrain, Mahazat as Sayd protected area in Saudi Arabia, Wadi Rum protected area and Shaumari Wildlife Reserve in Jordan are categorized as Managed Populations. These reserves represent 15% of the overall Arabian oryx population covered by this study.

### CB: Captive-bred:

A population bred under controlled unnatural conditions is considered to be captive-bred.

A vast majority (76%) of the overall Arabian oryx population covered by this study are kept and bred in captivity.

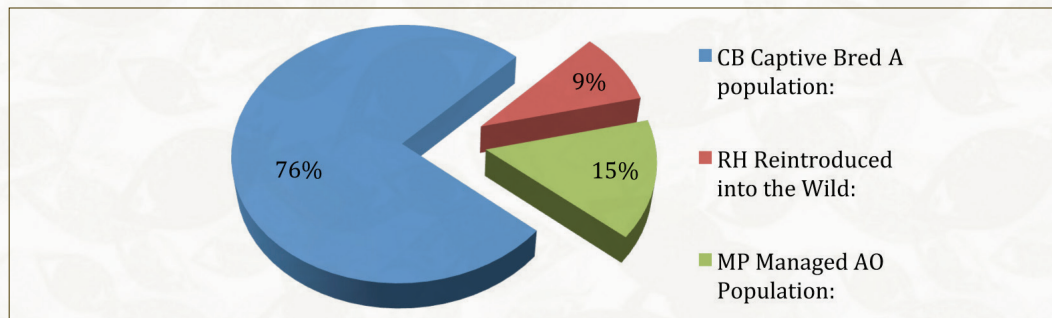


Figure 3. Distribution of Arabian Oryx herds in the Middle-East.

A vast majority (76%) of the overall Arabian oryx population covered by this study are kept and bred in captivity.

## Sex ratio:

Of the Arabian Oryx population of under the supervision of the collection managers surveyed, the sex ratio was 89.3 adult males per 100 adult females.

## Juvenile population:

For the same population juvenile Arabian oryx represent 13.50% of the total population, and 29.50% of the adult female population.

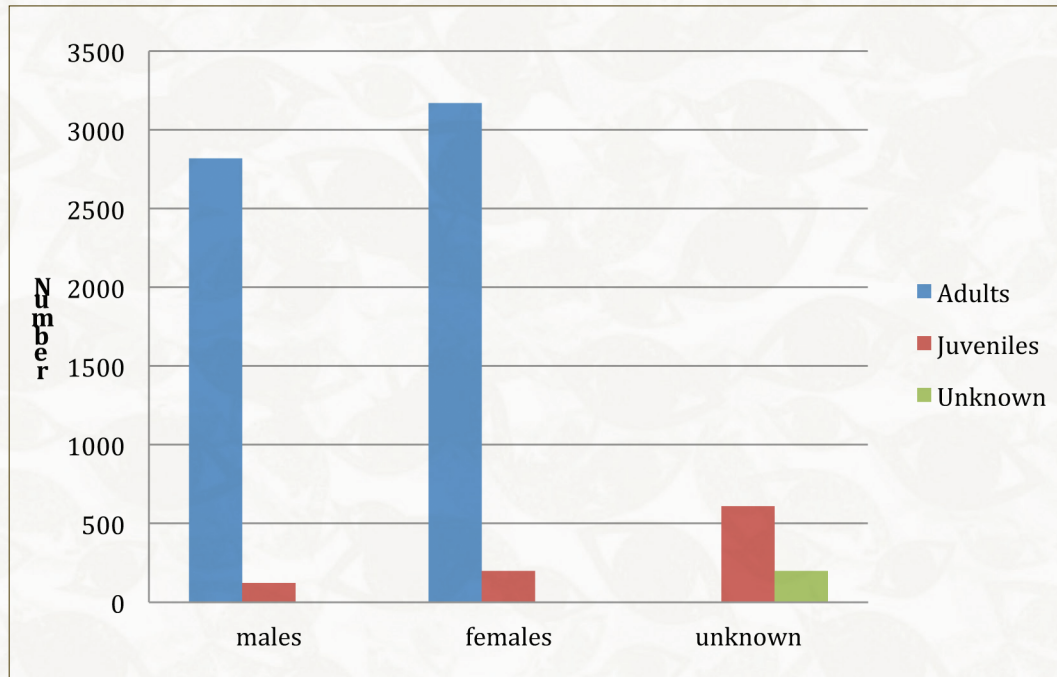


Figure 4. Distribution of male to female and adult to juvenile arabian oryx in the 2011 population



## Reported Pathologies in 2011

228 mortalities were reported in Arabian oryx collections covered by this survey. Fig. 5 shows the different causes of death, with the number of Arabian oryx that died in 2011. Fig. 6 shows the impact of infectious diseases on these collections where some 314 oryx suffered from such diseases in 2011.

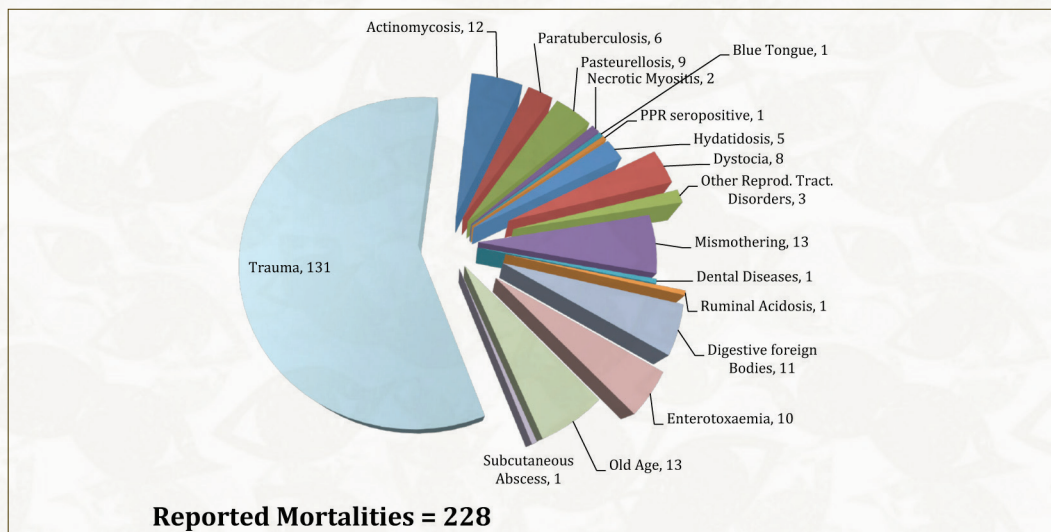


Figure 5. Reported causes of death in Arabian Oryx in 2011.

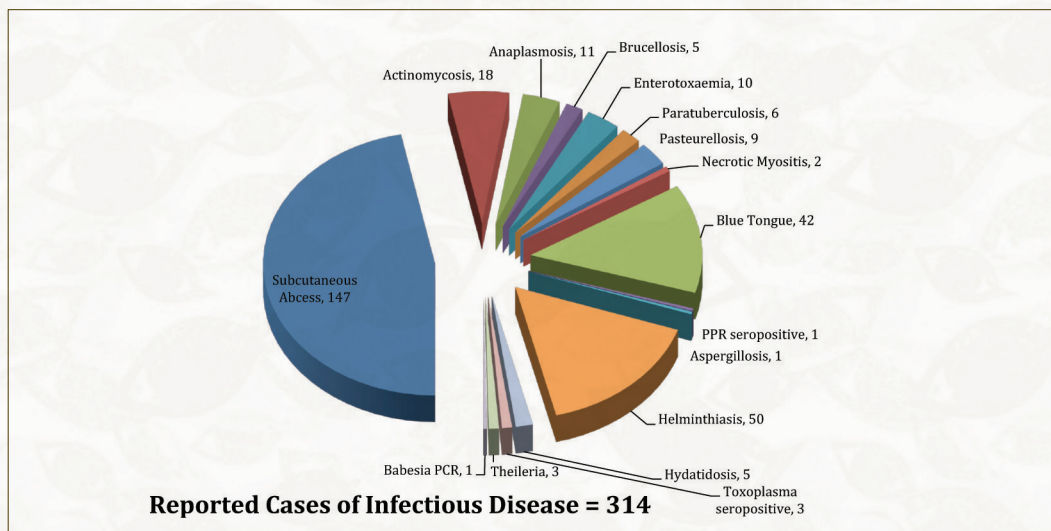


Figure 6. Reported type of infectious disease suffered by Arabian Oryx in 2011.

# Bacterial Diseases

## Subcutaneous Abscess

147 animals were affected in 2011. *Corynebacterium sp* was isolated in one collection in the UAE.

This is the most common lesion. Subcutaneous abscesses are secondary to horn wounds caused by intraspecific aggression. These lesions usually heal without medical intervention. Only one animal was reported to have died from such an abscess.

## Actinomycosis

A total of eighteen Arabian oryx were reported to have been affected by Actinomycosis. All of these were in the UAE and Qatar. Twelve of the 18 animals died, and of these mortalities, 10 were in Qatar. *Actinomyces meyeri* was isolated in the UAE.

## Anaplasmosis

This bacterium uses ticks from the Ixodidae family as a vector.

Eleven animals were diagnosed with Anaplasmosis in a single collection within the UAE. No animals died as a result of this bacterium.

## Anthrax

The disease was not reported in the Arabian oryx studied in this 2011 disease survey.

## Botulism

The disease was not reported in the Arabian oryx population studied in this 2011 disease survey.

## Brucellosis

5 animals were reported positive for *Brucella sp* in the UAE and Oman. Four oryx were confirmed positive for *Brucella sp* using ELISA in one collection, while the fifth was PCR positive.

A study published in 2007 (Ofner et al. 2007) showed that 158 Arabian oryx sampled from November 2003 to March 2005 in 2 private collections in Dubai were seronegative for *Brucella sp*.

According to the results of this study only 25% of the overall Arabian oryx population is screened for Brucellosis (see routine procedures). This is particularly worrisome because it can be transmitted to humans and cause abortion and sterility in both animals and humans. Herds showing evidence of abortion, orchitis or lameness should be systematically tested. In addition, all animals being imported, exported or reintroduced into the wild should also be tested for this disease.



Inexpensive triage test are available (buffered Brucella antigens tests, for both *Brucella melitensis* and *Brucella abortus*, ex.:Rose Bengal). The animals testing positive should subsequently be re-tested using confirmation procedures.(Ostrowsky & Anajariyah, 2003) provides a good practical example.

## Caseous Lymphadenitis (Pseudotuberculosis)

The disease was not reported in the Arabian oryx population studied in this 2011 disease survey.

## Chlamydiosis

The disease was not reported in the Arabian oryx population studied in this 2011 disease survey.

## Clostridiosis

- Enterotoxaemia  
10 animals died of enterotoxaemia in the Arabian oryx population studied in this 2011 disease survey.

See Chapter “Routine procedures and vaccinations”

- Tetanos  
The disease was not reported in the Arabian oryx population studied in this 2011 disease survey.
- Blackleg  
The disease was not reported in the Arabian oryx population studied in this 2011 disease survey.

## Leptospirosis

The disease was not reported in the Arabian oryx population studied in this 2011 disease survey.

## Lyme Disease ( Borreliosis)

The disease was not reported in the Arabian oryx population studied in this 2011 disease survey.

## Tuberculosis

The disease was not reported in the Arabian oryx population studied in this 2011 disease survey.

## Mycoplasmosis

The disease was not reported in the Arabian oryx population studied in this 2011 disease survey. However, a recent study (Ostrowski, 2011) indicates that the bacterium *Mycoplasma capricolum*, the causative agent for CCPP, is underestimated due to lack of testing and difficulty growing the bacterium.





## Paratuberculosis (Johne's disease)

According to the results of this survey six animals in three different collections from the UAE and Oman were suspected to have died of paratuberculosis. One serology was positive in an ELISA test. The infection is caused by *Mycobacterium avium paratuberculosis* which is a subspecies of the avian tuberculosis causative agent. It is challenging to diagnose and impossible to cure. A vaccine exists, but the vaccine can interfere with tuberculosis tests. Studies are urgently needed to determine the efficacy of this vaccine.

## Pasteurellosis

According to the survey results, nine Arabian oryx across 3 collections in the UAE and Qatar died from confirmed or suspected Pasteurellosis. When isolated, the bacterium *Pasteurella multocida* was detected. In cases where animals suffer from immunosuppression, such as stress or concomitant disease, this bacterium, part of the normal flora of the upper respiratory tract, can overgrow and cause death.

## Q-fever

The disease was not reported in the Arabian oryx population studied in this 2011 disease survey. A study recently published in the Journal of Wild Diseases (Chaber, 2012) reported that seven sera collected between December 2005 to February 2008 from a 170-head Arabian oryx herd tested positive for Q-fever, and two additional sera were suspected to be positive. Several animals from different wild ungulate species living nearby also tested positive. In addition, seventy per cent of the domestic livestock living in the vicinity (less than 2 km) tested positive for *Coxiella burnetii*.

More than one third of the total number of Arabian oryx in the Middle East live at a distance of less than 1km from domestic ungulates. According to the 2011 Arabian Oryx Disease Survey, only one collection claimed to be doing annual checks for this disease. The results indicate that no positive results were obtained.

All animals being imported, exported or reintroduced into the wild should be checked for this disease. This disease can be transmitted to humans. It can easily spread and should be much more investigated.

## Necrotic myositis

According to the results of the 2011 Middle East Arabian oryx Disease Survey two Arabian oryx died in one collection located in the UAE.

Beta haemolytic *Streptococcus sp* was isolated.

## Viral Diseases

The only two viral diseases that were reported in the 2011 Middle East Arabian oryx Disease Survey were Blue Tongue and PPR.

## Blue Tongue

According to the results of the 2011 Middle East Arabian Oryx Disease Survey about 40 Arabian oryx were CR positive for Blue Tongue Virus in Oman. However, no mortality was reported.

In Qatar, two Arabian oryx in one collection tested ELISA positive, and one Arabian oryx died.

The relatively low number of Blue Tongue cases may not necessarily indicate an absence of the disease in the regional herd. Indeed the reported presence of the disease in the regional herd of Arabian oryx suggests an interesting veterinary case calling for further research. Frolich et al. (2005) reported in a recent publication that: "although no evidence of either BTV or EHDV infection has been reported for Arabian oryx, the results here indicate that this species, like other ruminants, is susceptible to infection." Further analysis of this disease among regional Arabian oryx is necessary.

## Peste des Petits Ruminants (PPR)

According to the results of the 2011 Middle East Arabian oryx Disease Survey one Arabian oryx died with a clinical suspicion of PPR in Qatar. An ELISA test was performed and indicated the presence of antibodies against the virus.

Seropositive Arabian oryx for PPR were found in the past but there is no evidence showing that this species can contract the disease. The only record of a hippotraginae contracting PPR was in 1987, when a Gemsbock (*Oryx gazella*) developed symptoms of PPR in Al Ain Zoo (Furley et al. 1987). The same article mentions that the Arabian oryx present in this collection didn't develop the clinical signs. An ELISA positive result doesn't mean that this animal died of PPR. It only means that this animal has been in contact with the pathogen during a natural infection that may have been left unnoticed or after an "unnatural" infection (vaccination).

If the clinical suspicion of PPR in Qatar can be confirmed, the case is very interesting because it would be the first reported Arabian oryx developing the symptoms of PPR and dying from the disease. We recommend further investigation, as well as publication/presentation during next Arabian oryx workshop.





## Fungal Disease

According to the results of the 2011 Middle East Arabian oryx Disease Survey one animal has been reported suffering from *Aspergillus fumigatus*. No mortality was recorded.

## Parasitic Diseases

*Helminthiasis Strongylus sp.* and *Moniezia expensa*, were the two species of helminthes reported in the 2011 Middle East Arabian oryx Disease Survey. Furthermore, 50 animals were recorded as having worms. However, no mortalities were reported.

### Helminthiasis

*Strongylus sp.* and *Moniezia expensa*, were the two species of helminthes reported in the 2011 Middle East Arabian oryx Disease Survey. Furthermore, 50 animals were recorded as having worms. However, no mortalities were reported.

### Hydatidosis

According to the results of the 2011 Middle East Arabian Oryx Disease Survey Hydatidosis was found in five animals upon post-mortem examination. From these five cases, four were in the same collection in Jordan, and the other was in a UAE collection.

Hydatidosis, also called Echinococcosis, is caused by *Echinococcus sp.* tapeworms that use canids as definitive hosts. Ungulates and also humans are intermediate hosts for the tapeworms. It is a zoonotic disease and extra care should be taken when proceeding to post-mortem examination on the animals..



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Picture 2. Hydatid cyst on liver in Arabian oryx

## Coccidiosis

Six collections located in UAE, Oman, Saudi Arabia, and Qatar reported the presence of *Coccidia* in their herds. Most animals infested with *Coccidia* do not display symptoms. However, in cases of heavy coccidian load younger animals may develop diarrhea,, weight loss, and death is sometimes observed.

It can have a debilitating effect on the animal's immune system and pave the way for other pathologies to occur. The species *Eimeria tenella* was the most frequent.

## Warble fly or hypodermosis

According to the results of the 2011 Middle East Arabian oryx Disease Survey Warble flies occurred in 3 collections in the UAE and Oman, affecting up to 40% of the animals after the rain in one of these collections.



Picture 3. Skin lesion due to warble fly

## Toxoplasmosis

In a collection in Oman three adults from a group of nine animals sampled tested positive for *Toxoplasma* using a Latex agglutination test and ELISA. This 381-animal collection (193 females) lost 12 calves, out of 65 born that season. Shortly after birth these 12 calves showing signs of diarrhea and dehydration, collapsed and died within 3 to 7 days after showing the initial signs of illness. Toxoplasmosis was suspected as being the main cause of abortion and calf mortality.





It appears as though toxoplasmosis in the three adult Arabian oryx from Oman was not caused by to a pathological event. Nevertheless, it could be worth investigating toxoplasmosis in Arabian oryx more carefully because (1) the disease uses *felidae* to disseminate; (2) the disease can lead to abortion in ungulates when seronegative, and (3) toxoplasmosis is not documented in Arabian oryx. In ungulates (and other species), *Toxoplasma* is an important cause of early embryonic death, resorption, fetal death and mummification, abortion, stillbirth, and neonatal death (Dubey 2009).

## Theileriosis

This parasite is transmitted by hard ticks from *Rhipicephalus* and *Hyalomma* species. According to the results of the 2011 Middle East Arabian oryx Disease Survey the Theileriosis parasite was found in 3 out of 9 Arabian oryx blood samples in a collection in Oman.

Theileria was also found in the Arabian oryx collections of Qatar. However, no mortalities resulting from this parasite were reported in either Oman or Qatar.

## Babesiosis

This parasite is transmitted by hard ticks from the Ixodidae family. According to the results of the 2011 Middle East Arabian oryx Disease Survey a PCR for *Babesia* sp indicated the presence of babesiosis in one Arabian oryx in Saudi Arabia. However, no mortality was reported.

## Mange

According to the results of the 2011 Middle East Arabian oryx Disease Survey ten Arabian oryx in Qatar were diagnosed with Mange using skin scrape technique.

## Ticks

According to the results of the 2011 Middle East Arabian oryx Disease Survey seven collections from the UAE, Bahrain, Oman, Saudi Arabia, Jordan and Qatar reported tick infestations, ranging from a low level ( as few as 2 animals in a collection of 1,352) to a much higher level (about 80% of the animals of some large collections).

Curiously, tick infestation was not reported in the collection that reported anaplasmosis - a disease commonly associated with ticks.

Tick-transmitted diseases reported in the 2011 Middle East Arabian Oryx Disease Survey to have occurred include Anaplasmosis, Theileriosis, and Babesiosis.

## Other pathologies

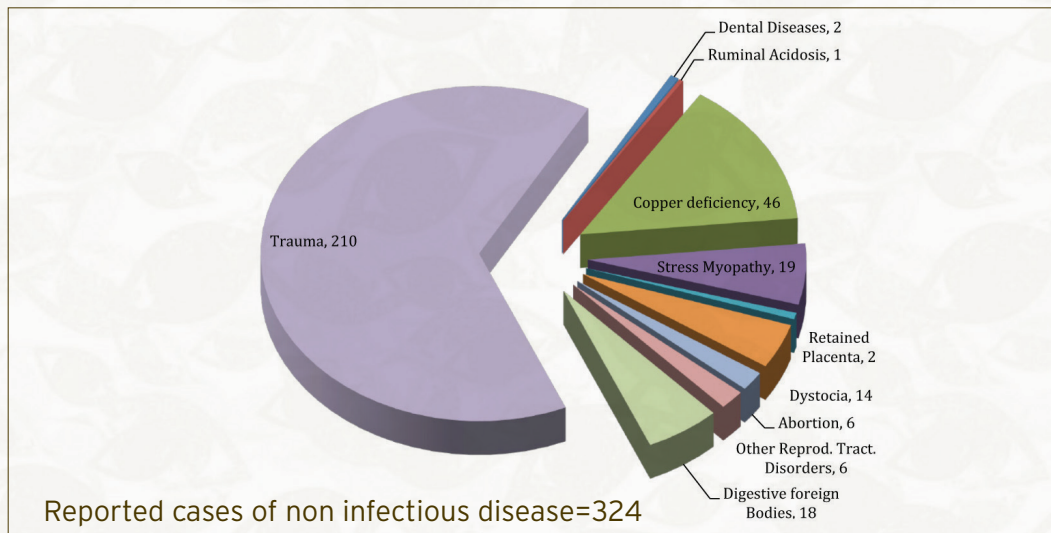


Figure 7. Reported number of Arabian oryx affected by type of non-infectious diseases in 2011

### Dental diseases

In the UAE, two animals were affected and 1 died from dental disease. One would usually think that dental disease does not cause death. However, the dental-related mortality reported in the disease survey resulted from a dental abscess and fissure in mandible.

### Ruminal Acidosis

One Arabian oryx died in the UAE as a result of Ruminal Acidosis.

### Copper deficiency

According to the results of the 2011 Middle East Arabian oryx Disease Survey three Arabian oryx herds experienced a copper deficiency, one herd was located in the UAE, while the other two were located in Oman.

According to research published in the Journal of Wild Diseases (Johnson et al. 2007), copper deficiency can primary be due to a low level of copper in the diet of animals. But the lack of iron is mainly secondary to the presence of high levels of heavy metals, such as molybdenum or zinc, in the diet preventing assimilation of copper.

Selenium supplementation can also interfere with copper absorption (Koh & Judson, 1987). Feed analysis and copper supplementation (where the copper is mixed into the diet or with bolus) should be of interest to vets and collection managers, as methods to reduce risk from copper deficiency.





Roelandt et al., (2010), discussed the oral supplementation with copper and the situation about copper deficiency in Arabian oryx in Dubai, UAE.

## Stress myopathy

The disease survey revealed that 19 animals from four collections located across the UAE, Oman and Qatar suffered from stress myopathy. From these 19 animals, 12 died.

## Trauma

The main cause of these traumas is antagonistic behavior. It can lead to lameness, subcutaneous abscesses (see previous chapter), broken horns, and eye enucleation.

Over 200 animals were recorded to have suffered directly from trauma. More than 130 Arabian oryx died as a result of trauma. In one collection nearly 100 juveniles died from physical injuries. Two Arabian oryx suffered from lameness and one subsequently died.



Picture 4. Healed ruminal traumatic lesion in Arabian oryx due to fighting.

Two Arabian oryx had surgery to fix a broken horn in Saudi Arabia, and two other animals required the removal of an eye after a fight in Jordan. Combining the 147 Arabian oryx suffering from a subcutaneous abscess (reported in a previous chapter), with these 200 cases, trauma was the main pathology among Arabian oryx reported in the disease survey in 2011.



Picture 5. Traumatic eye injury due to fighting.

## Reproductive tract disorder

Of the reported diseases from 2011 survey, two females had a retained placenta. One died of endometritis, in the UAE. 6 females aborted in Oman, Saudi Arabia and Qatar.

Fourteen females from collections located in the UAE, Saudi Arabia, Oman, and Qatar had dystocia\*, and of these eight died.

\* Under some circumstances diagnosing dystocia can be difficult considering its similarities to abortion and/or stillbirth. For clarification, it is important to note the differences between these. Please see below for more detailed definitions of the events.

Dystocia is a pathologic or difficult labor, which may be caused by an obstruction or constriction of the birth passage or abnormal size, shape, position, or condition of the fetus. This condition usually requires human intervention.

Stillbirth is a delivery of a fully formed dead neonate.

Abortion is a premature expulsion from the uterus of the products of conception; termination of pregnancy before the fetus is viable. Most of the time, an early abortion won't be noticed at all. When an abortion occurs during the last stage of pregnancy it can be confused with a stillbirth. Some abortions can also cause dystocia, for instance when the fetus is decaying within the uterus and become swollen.





During post-mortem examination, a double cervix has been observed in one female and para-ovarian cysts on three other females. These were incidental discoveries. 6 animals experienced other reproductive disorders and 3 died because of these disorders.

## Digestive Foreign Bodies

According to the disease survey 18 animals had foreign bodies (ropes, plastics, or metals) in their rumen, and 11 subsequently died.

## Skin disease

In the survey 16 animals in 1 collection in Jordan were reported to have had a skin condition, and all were diagnosed as "parakeratosis".

## Mismothering

Respondents reported 13 calves died due to mis-mothering. This condition can happen mainly in primipara females.

## Old Age

The survey revealed that 13 animals (0.018% of the entire population in the Middle-East) died of old age in the UAE.

# Prophylactic procedures, routine medications and veterinary tests

## Vaccinations

The survey requested participants to describe the vaccination procedures carried out for each collection. The results reported below indicate the number of sites doing regular vaccinations and the number of oryx being vaccinated.

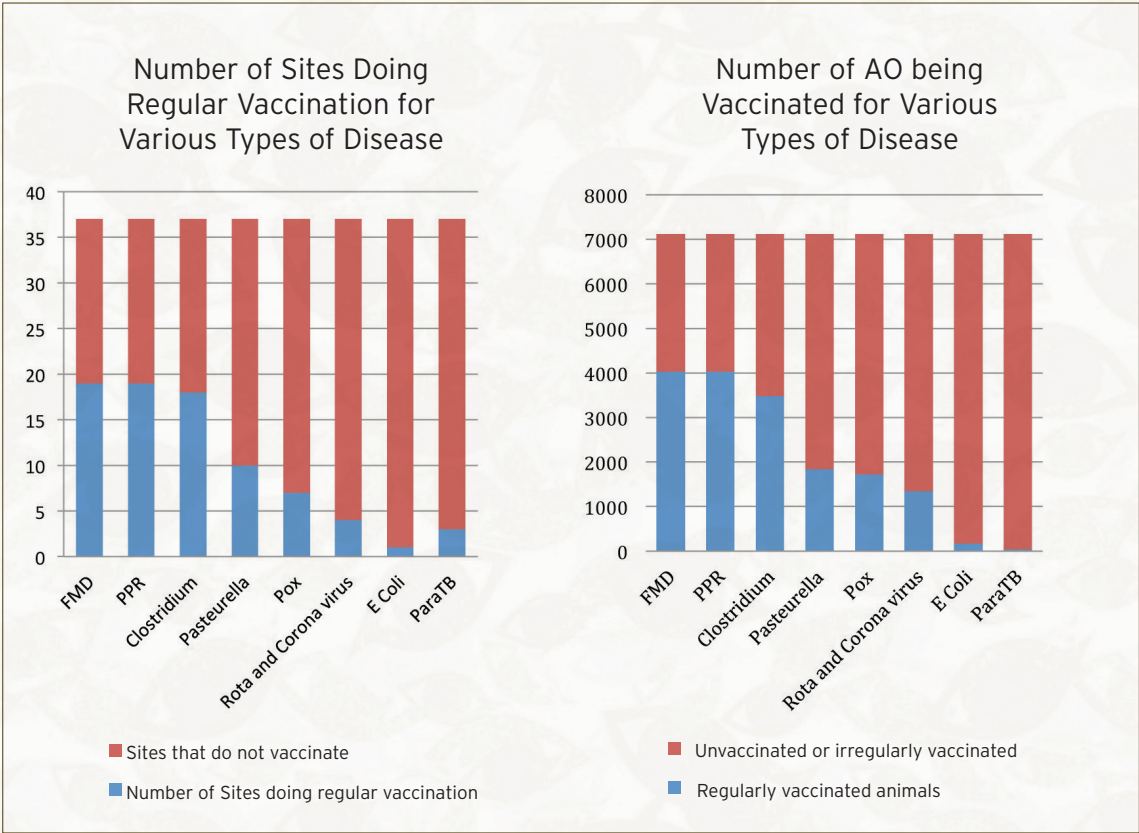


Figure 8. Arabian oryx vaccinations in the Middle East in 2011



## FMD

Nearly half the population of Arabian oryx receives a FMD vaccination.

## PPR

Nearly half the population of Arabian oryx receives a PPR vaccination.

## Enterotoxaemia

Nearly half the population of Arabian oryx receives a vaccination against enterotoxaemia.

## Pasteurellosis

About a quarter of the population of Arabian oryx receives a vaccination against pasteurellosis.

## Pox Virus

About a quarter of the population of Arabian oryx receives a vaccination against pox virus.

## Colibacillosis, Rota and Coronavirosis

About a fifth of the population of Arabian oryx receives a vaccination against neonatal diarrheas.

## Paratuberculosis

One collection vaccinates against paratuberculosis.

## Routinely used medications and supplements

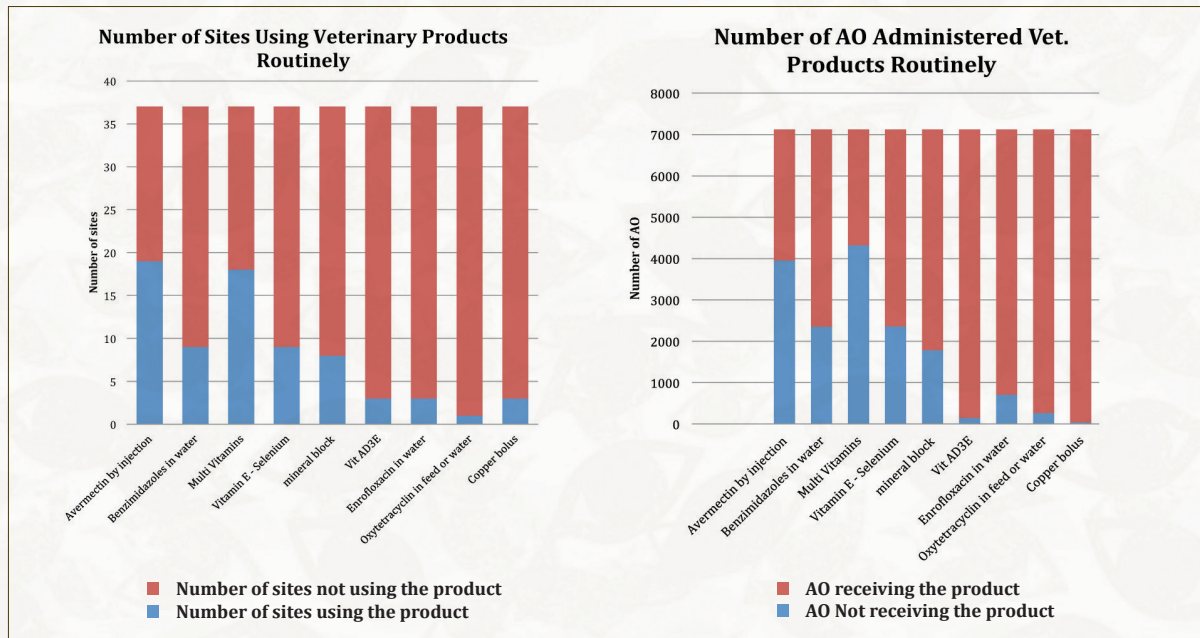


Figure 9. Medications administered to Arabian oryx on a routine basis in the Middle East in 2011

### Avermectin

The most commonly used are Ivermectin and Doramectin, they are given by injection once or twice a year. They are effective against arthropods (including dung beetles) and most of the common intestinal worms, excluding tapeworms.

### Benzimidazoles

Fenbendazole is the most widely used, dissolved in the water.

### Mineral Blocks

Only eight sites reported using mineral blocks. This value of using mineral blocks is likely to be underestimated throughout collections in the Middle East.

### Vitamin E and Selenium

These vitamin supplements are used mainly to prevent stress related diseases.





## Antibiotic in feed or water

One collection is using antibiotics on a routine basis. See our recommendation about this practice in page 36. The use of antibiotics to prevent diseases should be avoided, or it will lead to resistance.

## Routine Veterinary Screening

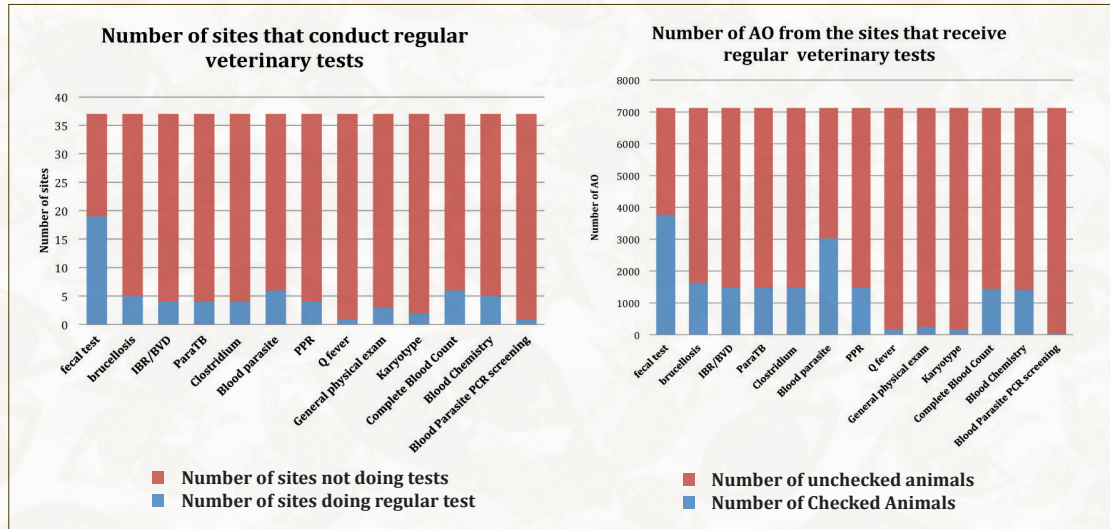


Figure 10. Programmatic veterinary testing in the Middle East in 2011

Regular tests, are done at least once a year. The current survey revealed four collections managing 8 sites perform fecal sampling 2 times per year. Another collection managing one site is performing fecal sampling 4 times per year, and an additional collection managing four sites is conducting fecal sampling every month (12 times per year). There is no indication in the survey results about the percentage of animals being sampled.

## Fecal Analysis

According to the survey fecal analysis is by far the most common test performed across the Middle East Arabian oryx population.

## Brucellosis

While, over 75% of the population is captive bred, less than 25% of this population is screened for *Brucella sp.* Common practice suggests that all animals whether captive bred, imported, exported or reintroduced to the wild should be checked. See chapter "Reported Pathologies in 2011" for more information.

## Q fever

is a zoonotic disease that has been recently investigated and found in Arabian oryx in the UAE (Chaber et al. 2012). All captive bred animals (especially those living close to domestic livestock), imported, exported and reintroduced to the wild should be checked.

## Mycobacteriosis

None of the collections reported performing veterinary checks for Tuberculosis, avian or bovine mycobacteriosis. All captive bred animals, imported, exported and reintroduced to the wild should be checked. Mycobacteriosis is a disease that can potentially be transmitted to humans, and therefore, all handled animals should be checked for the disease

An easy and inexpensive triage test is the intradermal tuberculosis test, using tuberculin purified protein derivative. Automatic syringes (Mc LintockTM) are available and are designed to help accurately inject intradermally the tuberculin. In the process of administering the test, animals should be appropriately marked or identified in order to “read” the results 72 hours after initial injection. Animals testing positive should be retested using confirmation tests. Lateral flow tests for TB and interferon gamma testing should also be considered as quick and effective.

## Karyotype

Cribiu et al. (1991) described what is called the 17;19 Robertsonian translocation in the Arabian oryx. It is a chromosomal abnormality that can be detected with karyotyping. The animals are phenotypically normal and therefore healthy, but their progeny can inherit a form of trisomy. No information has been found as to its implications for the health of the Arabian oryx population. Karyotype can be performed once in a lifetime, specially on animals that have ancestors from Qatar.





## Epidemiological Risks

### General Views

The epidemiological risks observed by Ostrowski and Anajariyah in previous editions of this disease survey are still current:

- Lack of serious sanitary policies.
- Lack of vaccination protocols.
- Lack of procedures to limit direct contact with other ungulate species.
- Presence of ungulate species in the collection which were imported from countries with poor sanitary control.
- Lack of proper fencing systems.

## Presence of Other Wild Ungulate Species in Arabian Oryx Collections

Most of the Arabian oryx collections are in direct contact with other wild ungulate species. Only two out of a total of 36 collections indicated having no direct contact between Arabian oryx and other wild ungulate species.

Of the two collections reporting no direct contact, one holds wild species but these species are not in direct contact with the Oryx, while the second collection has no other wild species at all.

Table 2. Numbers of collections and sites where Arabian oryx are in direct contact with other ungulate species.

Number of Collections	Number of sites	Wild ungulate species
3	4	Mountain gazelles ( <i>Gazella gazella</i> )
3	5	Sand gazelles ( <i>Gazella subgutturosa marica</i> )
2	5	Sand and Mountain gazelles
1	3	Spekes ( <i>Gazella spekei</i> ) and Mountain gazelles
5	15	3 species or more

Other wild ungulate species in direct contact with Arabian oryx include:

- Mouflon or Urial (*Ovis orientalis spp*): 1 collection
- Indian blackbucks (*Antilope cervicapra*): 1 collection
- Barbary sheep (*Ammotragus lervia*): 1 collection
- Nubian ibex (*Capra nubiana*): 3 collections
- Axis deer (*Axis axis*): 1 collection
- Fallow deer (*Dama dama*): 2 collections
- Addax (*Addax nasomaculatus*): 1 collection





## Distance between Arabian Oryx Collection and Domestic Hoof Stock Species

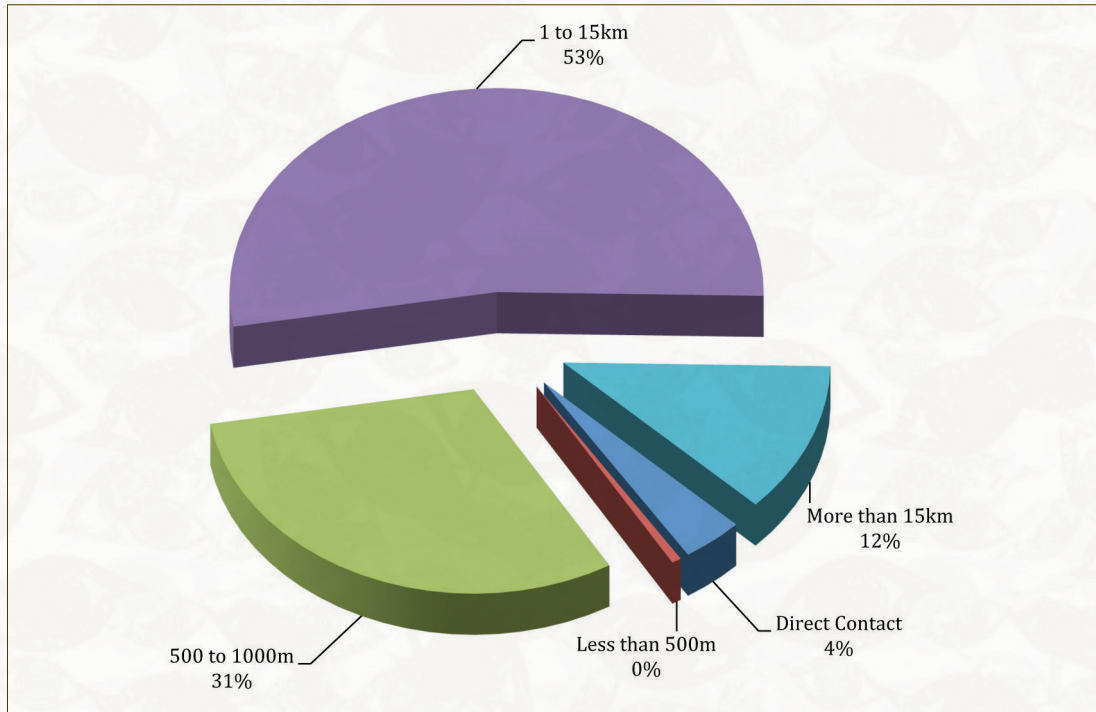


Figure 11. Percentage of Arabian oryx by distance to domestic hoof stock species



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# Recommendations

## Vaccination

At the very least, It is recommended to carry out a regular vaccination protocol on all the captive bred populations. More than 75% of the total population of Arabian oryx in the Middle East is captive bred, but not even half of the population receives regular vaccinations.

Herds in direct contact or close contact (less than 2 km) with domestic and non-domestics ungulate species should be vaccinated and health checked according to international standards.

To confer a good level of protection, at least 75% of a population should be vaccinated. If less than 75% are vaccinated, the population is considered as being at risk. Doing so requires individual identification systems and appropriate record keeping to record which animal has been vaccinated.

### Regular vaccination

A regular vaccination program involves a primary vaccination, consisting of 2 injections with a maximum 1- month interval, followed by an annual booster (see table below for further clarification).

A primary vaccination of only one injection won't result in a good immune response.

Table 3: General Vaccination Protocols

Primary Vaccination		Booster	Booster
FIRST injection	SECOND injection	yearly	yearly
Day 0	Day 0 + 21 to 28 days	Maximum 1 year after the second injection of Primary vaccination	Maximum 1 year after the previous one

### PPR

PPR vaccine is now a homologous attenuated vaccine and provides a strong immunity. According to Saravanan (2010), a single vaccination can provide a lifelong immunity in domestic sheep and goats. This information is corroborated by the European Association of Zoo and Wildlife Veterinarian Factsheet 25. While no study has been officially published on the effects of PPR vaccine in Arabian oryx, one will soon be published based on research conducted on a collection in Dubai.

Vaccination of gestating females doesn't have deleterious effect (Bidjeh et al. 1994).

We recommend starting vaccination at three months of age and revaccinating every three to four years, thereafter. Ongoing research should give us a better protocol.

## FMD

The usual and less expensive water-based Aluminum hydroxide vaccine, broadly available, doesn't offer protection for longer than 6 months (Kilgalon et al. 2008, Parida 2009). Therefore, it requires a booster every six months. Only one collection uses this protocol, the other ones revaccinate yearly. Revaccinating the animals every six months is nearly impossible for several reasons: (1) in most cases as it stresses the animals, (2) it is time and effort consuming, (3) and would require handling animals in very high ambient temperatures - putting further stress on the animal.

The FMD vaccines based on a double oil emulsion seem to give a much longer protection in domestic species (Patil et al. 2002). Furthermore, their use is recommended by the European Association of Zoo and Wildlife Veterinarian (factsheet 24). However, no study has been published on its use on the Arabian oryx.

The strains used in the Middle East should at least contain antigens A and O.

In domestic cattle, it is recommended to begin vaccination at two weeks of age for calves born of unvaccinated cows, and at four months for calves born from vaccinated cows. We suggest following these same principles.

## Enterotoxaemia

Vaccination against Clostridial diseases is one of the most commonly administered vaccines in veterinarian medicine. It is usually multivalent and gives protection against enterotoxaemia (*Clostridium perfringens*), tetanos (*Clostridium tetani*) and blackleg (*Clostridium chauvoei*).

Six Arabian oryx died of enterotoxaemia in 2011 in herds that were regularly vaccinated. This emphasizes that extra care should be taken to reduce the associated factors, such as excessively rich or inappropriate diet, conditions that slow the motility of the gastrointestinal tract, heavy infestations of gastrointestinal parasites, and recovery from illness.

## Pasteurellosis

*Pasteurella multocida* and *Mannheimia haemolytica* are a main cause of respiratory disease in ungulates. These opportunistic agents will take advantage of the deleterious effects of stress: handling, transportation, parasitism, viral infection and overcrowded housing, all predispose the animals to infection (Brodgen et al. 1998).





Different serotypes of both *P. multocida* and *M. haemolytica* exist, and vaccinating against one serotype doesn't always result in cross-protection against the other serotype. Extensive published literature exists on domestic ruminants, without very clear conclusions: some research suggests that vaccination has no effect, yet other research (Smith 2008) indicates that vaccination can reduce the risk of disease. If it seems important to vaccinate against these pathogens, removing and/or reducing the predisposing factors is also an effective way to minimize the risk associated with these diseases.

### Colibacillosis, Rota and Coronavirosis

*Escherichia coli*, rota and Coronavirus vaccination is done on late pregnant females. The second injection of primary vaccination being done two to four weeks before the expected parturition date to increase the antibody level in their colostrum. This will give a passive immunity to the offspring, if they drink the colostrum within 24 hours of birth.

# Diet

Table 4. Recommended diet according to (Ostrowski & Anajariyah 2003).

Physiological status	Diet
Adult, non-pregnant, non-lactating	Dry hay (6 to 8% moisture, 10 to 13% crude protein, 24 to 29%crude fibre) 1to 2kg/animal/day No more than 25.000 kJ Salt blocks and copper supplementation should be available.
Pregnant or Lactating Females	Dry hay (as above), 1to 2 kg/animal/day Supplemented with alfalfa (10% max moisture) Salt blocks and copper supplementation should be available.

## Other recommendations

### About the use of antibiotics in drinking water or feed

Antibiotics must not be used on a routine basis, but only to fight a bacterial infection for which we have a strong idea about the germ that causes the disease, and ideally, choosing an antibiotic should be based on a culture test and sensitivity test. The use of antibiotics to prevent diseases should be avoided, or it will lead to resistance.Vaccination, but also good husbandry and hygienic methods are by far much better mechanisms to prevent an infectious disease. Mixing antibiotics with the feed or dissolving antibiotics in water may not be effective in treating diseased animals, as these animals might not feel well-enough to feed or drink.

### Veterinary Checks

Some chronic diseases that can stay unapparent or involve a public health hazard should be investigated much more and information should be published to improve the global health status. All animals being imported, exported or reintroduced into the wild should be checked at least for tuberculosis, brucellosis, and Q fever.

### Interactions between collections

The Arabian oryx in the Middle East is considered a meta-population, but only a few exchanges are conducted.

This lack of exchange jeopardizes the genetic diversity of the population. Large scale genetic assessment and gene exchange (by the means of animal exchange, or Assisted Reproductive Techniques like sperm cryopreservation or oocytes collection (Roldan et al. 2006) should be considered.

### Results Sharing

sharing Conferences, workshops, and scientific papers on the different veterinary aspects should be encouraged. Scientific publication is a good way to stop doing the same work again and again. It allows others to learn about success and failure. Scientific publication of appropriate and inappropriate medical management of this threatened animal will help us protect it into the future.





## Acknowledgements

We would like to thank the following organizations for their participation in this veterinary survey:

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Oman:	Diwan of Royal Court (Office for Conservation of the Environment); Royal Court Affairs (Omani Mammal Breeding Centre )
Qatar:	Ministry of Environment
Saudi Arabia:	Saudi Wildlife Authority
United Arab Emirates (UAE):	Management of Nature Conservation- Office of HH Sheikh Mansour bin Zayed Al Nahyan- Al Ajban Trophy Hunting & Desert Safari; Environment Agency- Abu Dhabi; Zoo & Aquarium Public Institution at Al Ain; Dubai Conservation Desert Reserve; Wadi Al Safa Wildlife Centre; Breeding Centre for Endangered Arabian Wildlife; Tourism Development Investment Company (Sir Bani Yas Island);
Yemen:	Environment Public Authority (San'a & Taiz zoos).

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### شكر وتقدير

نود أن نتقدم بخاص الشكر والتقدير الى المؤسسات والجهات المشاركة في هذا المسح البيطري وذلك على النحو التالي:  
ملكة البحرين: الهيئة العامة لحماية الثروة البحرية والبيئة والحياة الفطرية الملكية الأردنية الهاشمية: الجمعية الملكية لحماية الطبيعة- محمية وادي رم الطبيعية سلطنة عمان: مكتب حفظ البيئة بديوان البلاط السلطاني- المديرية العامة للخدمات البيطرية بشؤون البلاط السلطاني دولة قطر: وزارة البيئة الملكية العربية السعودية: الهيئة السعودية للحياة الفطرية الامارات العربية المتحدة: دائرة أعمال رئيس الدولة- مكتب الشؤون الخاصة لسمو الشيخ منصور بن زايد آل نهيان- منتجع ومزرعة العجبان الحياة الفطرية- هيئة البيئة- أبوظبي- المؤسسة العامة لحديقة الحيوان والأحياء المائية بالعين- محمية دبي الصحراوية- مركز وادي الصفا للحياة البرية- هيئة البيئة والمحميات الطبيعية بالشارقة -شركة التطوير والاستثمار السياحي (TDIC) الجمهورية اليمنية: الهيئة العامة لحماية البيئة. ونود أن نشكر كذلك هيئة البيئة- أبوظبي على الدعم والمساعدة خلال فترة اعداد هذا التقرير.

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EAZWV Transmissible Disease Fact Sheet

<http://www.eaza.net/activities/tdfactsheets/024%20Foot%20and%20Mouth%20Disease.doc.pdf>

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## ARABIAN ORYX (*Oryx leucoryx*) DISEASE SURVEY, 2011

- This questionnaire is aimed at collecting as many information as possible about the diseases the Arabian Oryx (*Oryx leucoryx*) can face and is sent to the different collections in the range state.
- Please list the diseases encountered by your herd(s) from January 2011 to December 2011.
- It is crucial to be as accurate as possible. We totally understand that for confidentiality reason some of the questions cannot be answered for some of the collections. We would like you to feel free about answering or not to these questions.
- If your collection DOES NOT have veterinary services, please try to fill up the questionnaire as well as you can, and with the higher level of details you can give. This questionnaire has been designed to help you, not to push you or to feel uncomfortable.

Let use a “respiratory disease” as an example to illustrate how to understand this questionnaire:

If you experienced respiratory disease, without knowing the cause, if you don't know whether it was bacterial or viral..., then just indicate “respiratory disease”, how many and what category of animals was sick, if they died, and how many died. You can use the back of the page to write it up. If you think it was due to *Pasteurella* sp, but you didn't get any laboratory result to confirm it, then just put “suspected” in the *Pasteurellosis* line, and indicate how many animals were infected. Now, if you get the full picture, and you were able to identify the species and the strain of the *Pasteurella* involved, first, congratulations! And second, please let us know by filling all the boxes. The same principle can be applied for digestive disorders, skin, eye, musculoskeletal, reproductive, etc... diseases.

- All information provided in this questionnaire will be kept confidential.
- We would like to thank you for the time and efforts you will spend filling it.





# ARABIAN ORYX (*Oryx leucoryx*) DISEASE SURVEY, 2011

## 1.Contact Details

1.1 Country: .....

1.2 City or area: .....

1.3 Name of the Collection: .....

1.4 Name and contact details of your organisation .....

.....

.....

.....

.....

## 2.PRESENTATION OF THE COLLECTION

Please tick (✓) appropriate boxes where applicable.

2.1 Governmental ☐ Private ☐

2.2 Population demography

	How would you Categorize your collection?			Number of Arabian Oryx					
				Adults		Juveniles			Total
	CB	RH	MP	Males	Females	Males	Females	Unknown	

**RH: Reintroduced Herd into the wild:**

- It is free ranging
- It leaves on natural resources and do not require to be supplemented
- Its own diet is not supplemented with food artificially
- It occurs in its natural habitat within the historical distribution range of the particular species and
- The particular species' social requirements must be met at all times

**MP: Managed Population:**

- It is free ranging (managed wild population) or semi free ranging
- It lives on food from natural resources which may require to be supplemented
- It occurs in its natural habitat within the historical distribution range of the particular species and
- The particular species' social requirements must be met at all times

**CB: Captive-bred** : a population bred under controlled unnatural conditions is considered to be captive-bred.





2.3 Is there any other wild ungulate species present in your collection?

YES

NO

2.4 If yes, are they in direct contact (same enclosure or in separated enclosures sharing a same fence)?

YES

NO

From what species:

and number of individuals

.....

.....

.....

.....

2.5 How far is the collection from domestic hoof stock species?

Direct contact

Less than 500m

Between 500 and 1000m

Between 1 and 15km

More than 15km

2.6 Is your collection open to public?

YES

NO

### 3.INFECTIOUS DISEASES

3.1 BACTERIA	Number of Affected animals	Number of Dead animals	Suspected or Confirmed?	Diagnostic tests used to determine	Bacterial species and strain, if possible
Abscess					
Actinomycosis					
Anaplasmosis					
Anthrax					
Botulism					
Brucellosis					
Caseous Lymphadenitis(PseudoTB)					
Chlamydiosis					
Clostridiosis    Enterotoxaemia					
Tetanus					
Blackleg					
Leptospirosis					
Lyme Disease					
Bovine Mycobacteriosis					
Mycoplasmosis					
Paratuberculosis					
Pasteurellosis					
Q-fever					
Other, please indicate					





Post Mortem bacteriological findings	site/organ where sample is taken from	How did the animal died?

3.2 VIRUS	Number of Affected animals	Number of Dead animals	Suspected or Confirmed?	Diagnostic tests used to determine	strain, if possible
Foot and Mouth Disease					
Peste des Petits Ruminants					
Blue tongue					
Rabies					
Lumpy skin disease					
Other, please indicate					

3.3 FUNGUS	Number of Affected animals	Number of Dead animals	Suspected or Confirmed?	Diagnostic tests used to determine	Strain, if possible
Ringworm					
Other, please indicate					

3.4 ENDOPARASITES	Number of Affected animals	Number of Dead animals	Suspected or Confirmed?	Diagnostic tests used to determine	Strain, if possible
Helminthiasis					
Hydatidosis					
Coccidiosis & Cryptosporidiosis					
Other Protozoa					
Other, please indicate					

3.5 ECTOPARASITES	Number of Affected animals	Number of Dead animals	Suspected or Confirmed?	Diagnostic tests used to determine	Strain, if possible
Mange					
Tick					
Lice					
Other, please indicate					





## 4. NONINFECTIOUS DISEASES

	Name of Disease	Number of Affected animals	Number of Dead animals	Suspected or Confirmed?	Diagnostic tests used to determine
Dental disease					
Metabolic disease					
Nutritional disorder					
Stress myopathy					
Trauma					
Reproductive tract disorder					
Foreign Bodies					

	Name of Disease	Number of Affected animals	Number of Dead animals	Suspected or Confirmed?	Diagnostic tests used to determine
Neoplastic disorder					
Other, please indicate					

### Veterinary Checks

Did you encounter any other disease that you couldn't diagnose or that you would have found helpful to investigate further, if you did, please give more details about the symptoms, the tests you performed and your temporary conclusions. Please also indicate if you had any problem after using an anesthetic drug or a medication.





# PROPHYLACTIC PROCEDURES

Vaccination against (strain if possible)	Protocol: frequency, percentage of animals...

Antiparasitic: drug used, way to administer...	Protocol: frequency, percentage of animals...

Other injections or routine medications (including vitamins...) and way to administer	Protocol: frequency, percentage of animals...

## Routine Veterinary Screenings

Fecal analysis, intradermoreaction, etc... that you do on a routine basis.

Tests performed	Frequency	Results





Comments:

This image shows a full page of a worksheet designed for handwriting practice. It features approximately 20 horizontal rows. Each row is defined by two parallel dotted lines, creating a series of uniform gaps for writing. The background is plain white, and there are no margins or additional markings on the page.

**General Secretariat for the Conservation of the Arabian Oryx**

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