CAUSES OF MORTALITY IN CAPTIVE SPEKE'S GAZELLE (*GAZELLA SPEKEI*) AT AL WABRA WILDLIFE PRESERVATION (AWWP) QATAR FROM 2001 - 2007

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Summary

Since 1999, a population of Speke's gazelles (Gazella spekei) has been managed at Al Wabra Wildlife Preservation (AWWP) in Doha, State of Qatar. As the population at AWWP seems to have suffered unprecedented declines, as compared to other gazelles at AWWP, over the last few years, it was decided to retrospectively evaluate all 206 necropsy reports recorded between 2001 and 2007 to investigate the reasons behind the observed mortality. Postmortem findings indicating lung infections accounted for almost 30 % of all deaths, followed by traumatic injuries (17.9 %) and maternal neglect leading to starvation and death in neonatal animals (13.5 %). Animals between 10 days and 1 year of age showed a higher tendency toward problems with lung infections, whereas animals between 2 and 3 years of age died more often because of traumatic injuries. Individuals older than 3 years of age often suffer from lung infection but usually in combination with other illnesses, such as renal and gastrointestinal diseases.

Introduction

The Speke's gazelle (*Gazella spekei*) is a small antelope that occurs at the Horn of Africa, mainly in Somalia. The main characteristic of this small gazelle is a black horizontal stripe on the side of its chest and a nasal bag, which can be insufflated with air and produce a sneezing sound when the animal is excited (SAINT LOUIS ZOO, 2009). Due to overgrazing by domestic cattle, civil war and other changes in their natural habitat, the number of individuals has decreased drastically during the last few years. In Ethiopia it seems to be extinct and its population is decreasing dramatically. It was therefore upgraded on the Red List to "endangered" by the IUCN in September 2007.
As the AWWP captive population of the Speke's gazelle has diminished by over 60 % between 2001 and 2007 (especially after 2005), an evaluation of the causes of death was considered important. A special focus was put on macroscopic pathological findings in the lungs, because the population of Beira antelopes *(Dorcatragus megalotis)* also kept at AWWP have been affected by a severe "Fibrinous Pleuropneumonia Syndrome" (FPPS) of unknown origin since 2006 (HAMMER et al., 2007). The major question was the determination of particular presence of macroscopic signs of lung infection in the population of the Speke's gazelles. Until now the only health related reports of the Speke's gazelle described in literature are hypophosphataemia associated with hypovitaminosis-D (WEBER and JUNGE, 2001), hepatic abscesses (*Fusobacterium necrophorum*) (MUNSON and MILLER, 1986), inbreeding depression (TEMPLETON and READ, 1984), and suboptimal diet (lack of phosphorus and albumin in serum) (HAMMER et al., 2006).

Methods

At Al Wabra Wildlife Preservation in Qatar, the Speke's gazelles are kept in 6 breeding pens in groups of 5 to 10 individuals. Some of the surplus male individuals are kept together with males of other antelope species in a mixed species male pen. The gazelles are fed with a mixture of different pelleted feeds and wheat bran. In addition, they receive approximately 500 g fresh alfalfa (*Medicago sativa*) per animal per day and grass hay ad libitum. Once a week, some branches of *Ziziphus spina cristis* and *Acacia* spp. are offered to the groups. A mineral lick with a high amount of copper is available in every enclosure, as the soil in the area has been found to be copper deficient (HAMMER et al., 2006). For water supply, subterranean water drawn by a pump is supplied ad libitum.

For this study, information about Speke's gazelles was compiled from the AWWP stock list program, the AWWP clinical records of each individual animal, and the necropsy reports of all Speke's gazelles kept at AWWP between 2001 and 2007 (206 of 259 animals in total). Six different age categories were constructed for evaluation: less than 10 days, 10 days to 3 months, 3 months to 1 year, 1 year to 3 years, more than 3 years, and unknown age. At the beginning of 2001, 94 animals were living at AWWP whereas at the end of 2007 only 40 individuals were alive. During this period, 206 animals died in total at AWWP, and 13 were shipped to another institution in April 2007.

The necropsy reports were sorted by causes of death into 13 groups: Lung infections of no further specified origin without other pathologies (L), lung infections together with either gastrointestinal diseases (L + GI), trauma (L + T) or urinary tract diseases (L + Ur), maternal neglect (N), trauma (T), general weakness (W), diseases of the urinary tract and/or reproductive system (Ur/R), gastrointestinal diseases (GI), euthanasia (E) for management purposes (i.e. elimination of breeders with long claws, twisted horns, or surplus males), infections of unknown origin (I), unknown cause of death (U) and other reasons (O).

Furthermore, an effort has been made to find a specific pattern or tendency of distribution for the three main diseases (lung infections, traumatic injury and maternal neglect) over the years. Therefore, the above named categories were evaluated for each year, including all the dead individuals regardless of their age.

Results

It could be demonstrated that between 2001 and 2007, lung infection independently accounted for maximum mortalities during the study period, followed by trauma and maternal neglect (figure 1). The incidence of gastrointestinal diseases, unknown cause of death, diseases of the urinary tract/ reproductive system, euthanasia and other reasons was rare. Lung infections, in combination with gastrointestinal diseases general weakness and infections of not further specified origin, and combinations of lung infections with urinary tract diseases or trauma played a minor role in the pathologies of the Speke's gazelle at AWWP (figure 1).

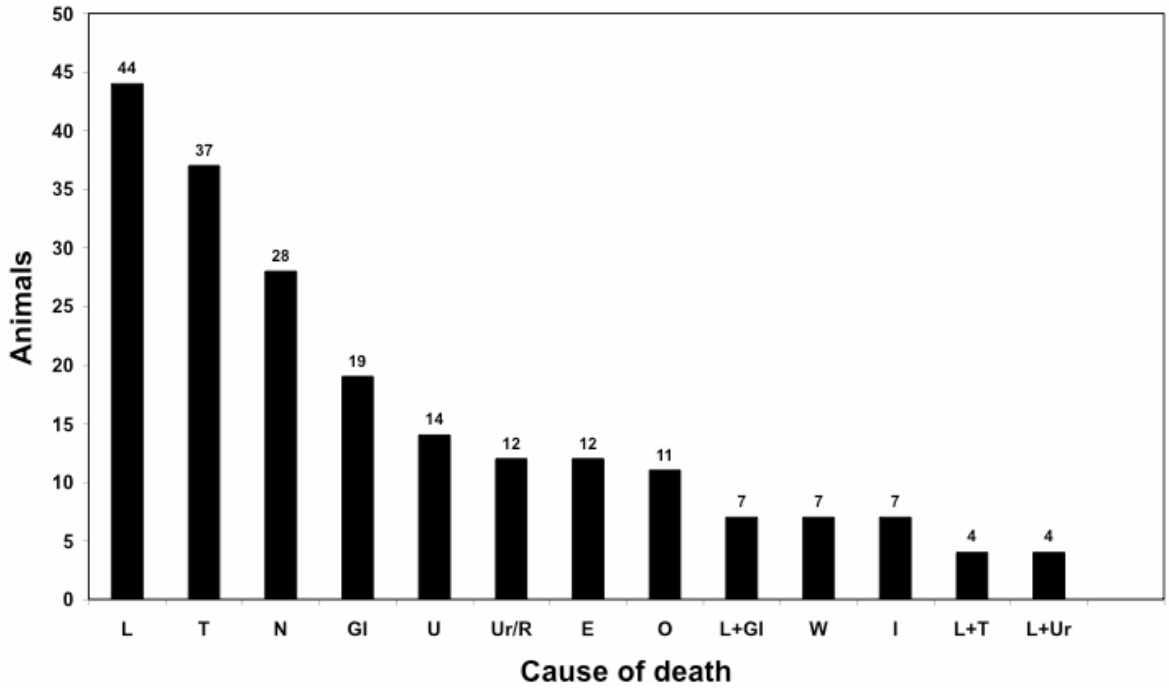

Figure 1: Distribution of the causes of death between 2001 and 2007 in Speke's Gazelles (n = 206); L = lung infection, T = traumatic injury, N = maternal neglect, GI = gastrointestinal diseases, U = unknown, Ur/R = problems of the urinary tract and/or reproductive system, E = euthanasia, O = other, L + G I= lung infection combined with gastrointestinal diseases, W = weakness, I = infections of unknown origin, L + T = lung infection combined with traumatic injury, L + Ur = lung infection combined with urinary tract disease.

In the group of animals younger than 10 days (n = 51), maternal neglect played the predominant role in the causes of death with 54.9 % (n = 28). Individuals were only put in this category when their abomasum did not contain any milk at necropsy. 17.6 % (n = 9) were found dead and no reason could be determined because the carcasses were autolysed. 7.8 % (n = 4) of the animals suffered from lung infection. The same proportion died of other reasons such as lung bleeding, euthanasia, was aborted or killed by predators (figure 2).

In the group of individuals at the age of 10 days up to 3 months (n = 22), most gazelles, namely 45.5 % (n = 10), died of lung infection, 18.2 % (n = 4) because of trauma followed by 13.6 % (n = 3) of gastrointestinal diseases such as hemorrhagic enteritis. 9.1 % (n = 2) died of other reasons and 1 individual was euthanised due to general weakness (figure 2).

Of the individuals at the age between 3 month and 1 year (n = 29), the largest percentage (48.3 %, n = 14) of the animals died because of lung infection and 27.6 % (n = 8) because of traumatic injury. 13.8 % (n = 4) died due to other reasons such as infectious hepatitis, nephritis, muscle dystrophy, euthanasia due to poor eyesight and abscesses on the chest. In 2 individuals (6.9 %) the cause of death could not be determined anymore and 1 (3.4 %) suffered from hemorrhagic enteritis (figure 2).

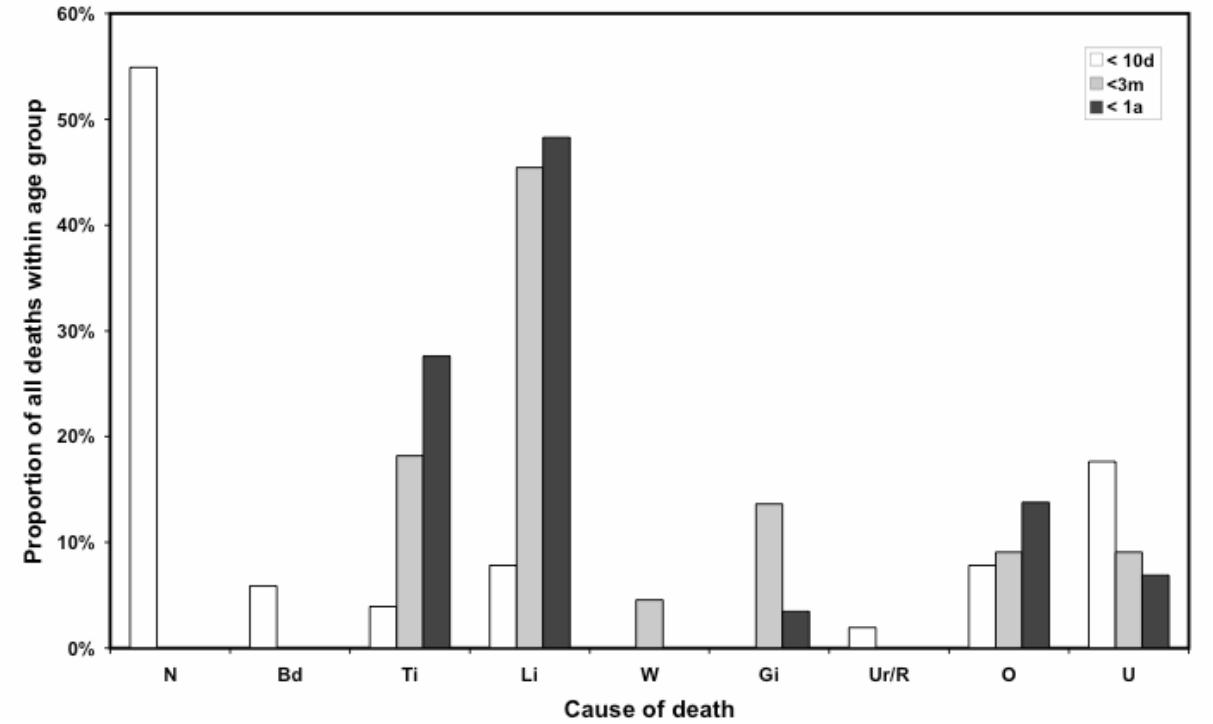

Figure 2: Overview of the causes of death in Speke's Gazelles between the age of 10 days and one year (n = 104); N = neglected, Bd = born dead, Ti = traumatic injury, Li = lung infection, W = weakness, Gi = gastrointestinal diseases, Ur/R = problems of the urinary tract and/or reproductive system, O = others, U = unknown.

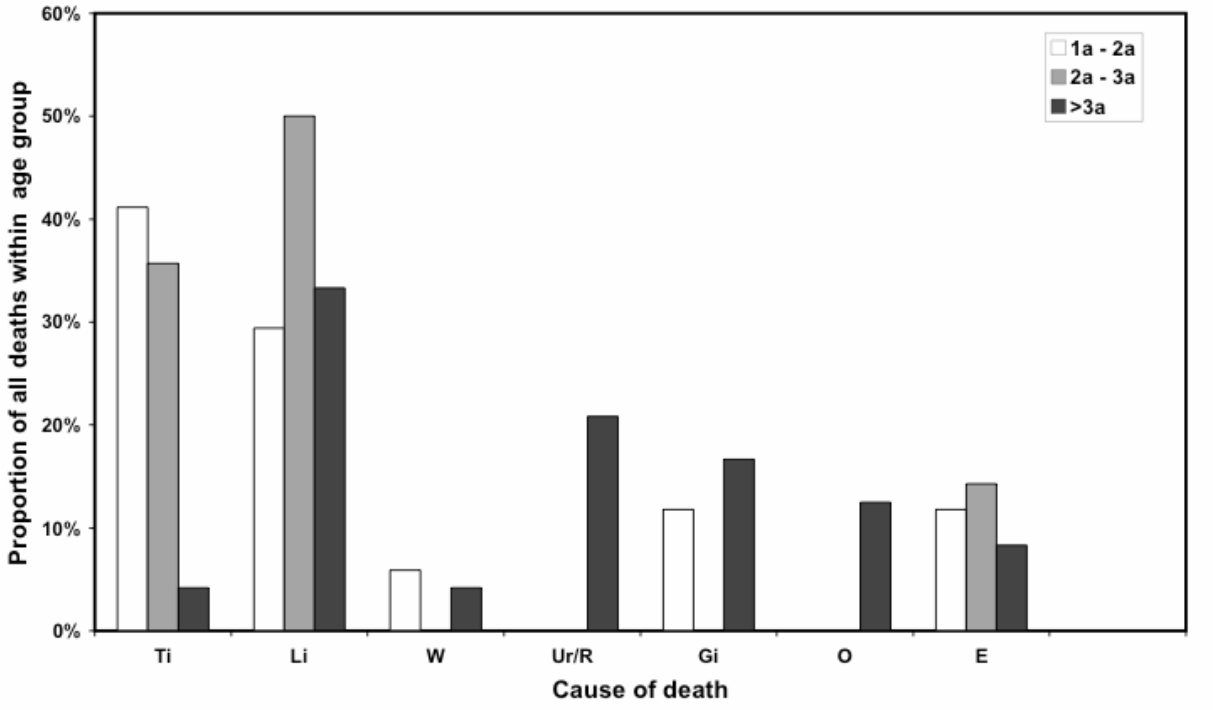

Figure 3: Overview of the causes of death in Speke's Gazelles over one year of age (n = 41); Ti = traumatic injury, Li = lung infection, W = weakness, Ur/R = problems of the urinary tract and/or reproductive system, Gi = gastrointestinal diseases, O = others, E = euthanasia.

Within the age group of 1 to 3 years (n = 31), 41.9 % (n = 13) of the Speke's gazelles kept at AWWP died because of lung infection and 35.5 % (n = 11) because of trauma. Gastrointestinal problems and euthanasia occurred both at 6.5 % (n = 2) of the cases and 1 individual (3.2 %) died in each of the categories general weakness, urinary tract or reproductive system diseases and other reasons. When splitting up the group into 2 subcategories of individuals at the age of 1 to 2 years (n = 17) and 2 to 3 years (n = 14), it can be seen, that in the former group the main reason of death is with 41.2 % (n = 7) trauma and with 29.4 % (n = 5) lung infections whereas in the older group 50 % (n = 7) of the animals die because of lung infection and 35.7 % (n = 5) because of trauma. The above named parameters such as gastrointestinal problems, general weakness and euthanasia only occur in the first subcategory, 1 endometritis and septicaemia in the second one (figure 3).
Individuals older than 3 years (n = 24) have often had lung infections 33.3 % (n = 8). Illnesses of the urinary tract or reproductive system 20.8 % (n = 5) and gastrointestinal diseases 16.7 % (n = 4) occurred more often than in younger individuals. 12.5 % (n = 3) died of other reasons, 8.3 % (n = 2) were euthanised due to long claws and only 4.2 % (n = 1) died either because of traumatic injury or general weakness (figure 3).
Fourty-nine animals could not be allocated to one of the above named groups because no records of their date of birth or estimated age at autopsy were recorded in the stock list. It can be assumed that most of these animals represented adults that were born before 2001 at Al Wabra. The main causes of death within this group were trauma at 20.4 % (n = 10), and lung infections and gastrointestinal diseases at 18.4 % (n = 9) each. General weakness, diseases of the urinary tract and/or reproductive system, infections of no further investigated origin and euthanasia occurred in 8.2 % (n = 4) each and 10.2 % (n = 5) died because of other reasons (figure 3).
Across the years, none of the three major reasons of death prevailed consistently (figure 4). Lung infections prevailed in 2003, 2005 and 2006, but showed a nadir in 2004. Trauma only occurred rarely in the last 2 years, whereas maternal neglect increased in frequency in that time period.

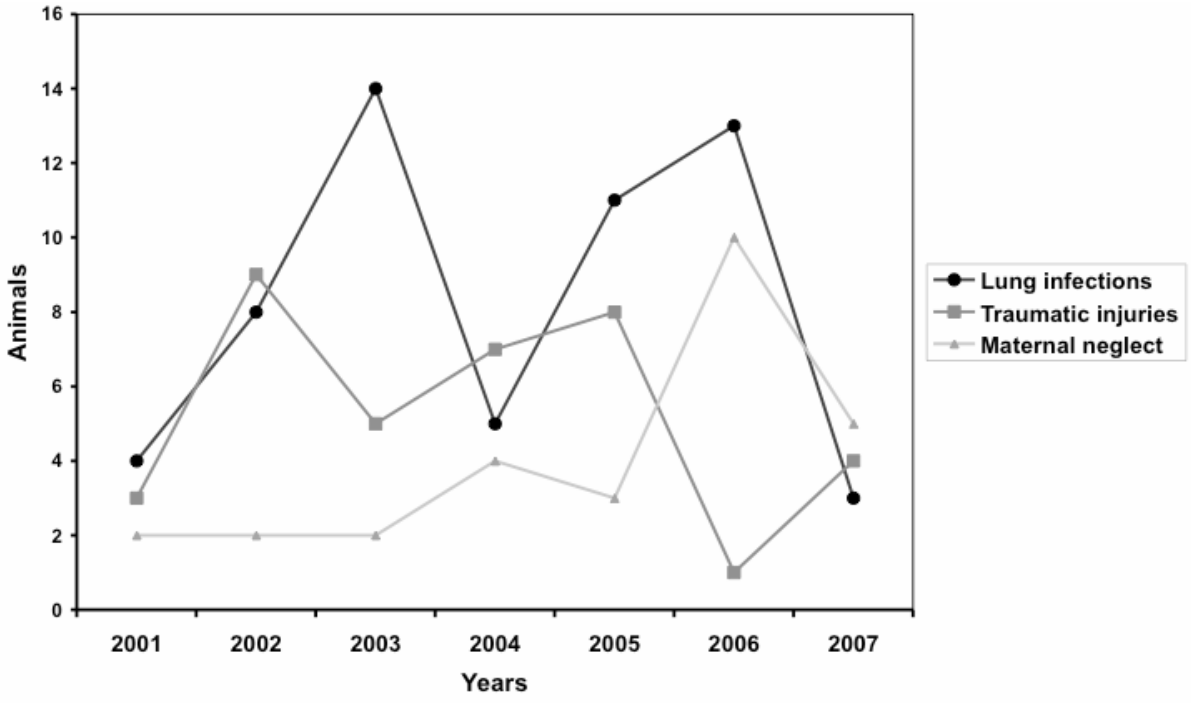

Figure 4: Overview of the distribution of the three main causes of death from 2001 to 2007 in Speke's Gazelles (n = 124). Lung infections n = 59, Traumatic injuries n = 37, Maternal neglect n = 28.

Discussion

The three major problems at AWWP in the population of the Speke's gazelles are lung infections - also in combination with other diseases -, traumatic injuries, and maternal neglect. Young individuals up to 1 year of age died primarily because of lung infection. A potential reason for the apparently higher susceptibility for lung infections at this age could be a general lack of colostral antibodies combined with an insufficient immune system response known in cattle and other mammals (BUTLER and SINKORA, 2007), and a viral epidemic affecting the respiratory tract (LECHENNE et al., 2009). Between 1 and 2 years of age traumatic injuries as cause of death are predominant since at this age, the adolescent animals fight for their position in the herd. An interesting fact is that only 4 out of the total amount of 7 animals of this category were males. Therefore, the adolescent females are also involved in fights – either as active participants or just as victims. Unfortunately, the data did not differentiate between trauma due to intra-specific aggression and trauma from jumping into fences. At AWWP, efforts for preventing injuries by running into fences are made for example by making them more visible with the help of bound palm leaves.

The animals between 2 and 3 years of age again show a higher prevalence of lung infection. In the group of the older than 3-years-old individual, gross pathological findings of lung infections still occur in a higher rate but it seems that other diseases such as problems of the urinary tract and/or reproductive system and gastrointestinal illnesses are of importance as well. Especially the more frequent changes in the kidneys may lead to the suspicion that the Speke's gazelles suffer from FPPS as well as the Beira Antelopes (NAGY et al., 2008). Studies and testing of other diseases than *Mycoplasma* spp. causing lesions in the lung, such as BRSV (Bovine Respiratory Syncytial Virus) or PI3 (Parainfluenza-3), indicate that these viruses occur frequently in AWWP Speke's gazelles and are linked to clinical respiratory signs (LECHENNE et al., 2009). These findings suggest that one major management decision regarding the Speke's gazelles is the introduction of a vaccination regime against these viruses.

By evaluating the populations' main diseases over the years, it is conspicuous that after lung infections and traumatic injuries increased in 2005, maternal neglect rose to its maximum in the following year, while lung infections still increased.

A reason for the massive decrease of traumatic injuries from 2005 onwards could be explained by giving the animals access to larger enclosures (stress reduction) with better infrastructure and design (sight barriers, natural vegetation, more shelter).

The peak of maternal neglect could lead to the suspicion that this is the result of 2 consecutive years of lung infection weakening the females. The increased mortality from lung infection in 2006 supports this hypothesis and it is not unreasonable to assume that the spreading infection contributed to neonatal mortality with weak or peracutely sick newborn animals, in addition to weak mothers. It is also possible that the peak in maternal neglect was a result of intensive newborn treatments coming into effect, although the overall mortality due to maternal neglect over the years has been found to decrease slightly after initiation of newborn treatments in a parallel study (MEIER et al., 2009). In addition, the recruitment into the population in 2006 was analysed to see if the higher mortality was proportionate to increased recruitment but the recruitment in 2005 and 2006 were more or less similar with 20 and 22 animals, respectively.

As a conclusion, the relevance of trauma and potentially infectious lung disease in Speke's gazelles suggests that the formation of smaller groups, which are kept separately from each other, could be a reasonable step to attempt to improve the husbandry success in this species. A regular health check with separating animals and groups from each other according to their test results and clinical signs, could be a complex but effective approach to improve livestock health at AWWP. In addition, the

cause of respiratory infection which is responsible, alone and in combination with other pathologies, for almost 30 % of all mortalities over the 6 year period needs to be investigated.

Acknowledgments

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