HEALTH PROBLEMS DURING THE FIRST MONTH OF LIFE OF CAPTIVE-BORN ASIAN HOUBARA BUSTARD CHLAMYDOTIS MACQUEENII CHICKS

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KEYWORDS

Houbara – Bustard – Neonate – Pathology – Disease – Management - Prophylaxis

ABSTRACT

Houbara hatchlings are nidifugous and are fed bill to bill by their mothers in the wild. At the NWRC, houbara chicks are hatched and raised separately from their mothers with humans acting as foster mothers. Diseases more or less related to the artificial incubation and artificial rearing technique can affect captive-born houbara chicks. Between 2000 and 2006, a veterinarian was involved in the NWRC houbara rearing programme, in order a) to provide medical care to the captive-bred houbara chicks, b) to implement updated disease prophylaxis, and c) to assist the captive breeding team in improving the rearing techniques and performances. This paper documents disease prevalence and serology in C. macqueenii houbara chicks. Within seven years, successive technical improvements resulted in a lower morbidity, a higher survival rate, and better quality chicks.

1 INTRODUCTION

Houbara bustards belong to the genus Chlamydotis and are the traditional game birds of Arab falconers. In response to marked houbara bustard population declines in Arabia, a captive-breeding programme was initiated at the NWRC in Taif, Saudi Arabia, during 1986; the long-term goal being the reintroduction of this species into its former habitat.

Diseases more or less related to the artificial incubation and artificial rearing technique can affect captive-born houbara chicks. Before 2000, mortality rate reached up to 25% during the first month of life of houbara chicks hatched in captivity at the NWRC (VAN HEEZIK and OSTROWSKI, 2001). Herein, I document results and improvements in the NWRC rearing programme from 2000 to 2006.
2 MATERIALS & METHODS

From 2000 to 2006, 1274 Asian houbara bustards hatched and were raised from eggs laid by a captive-bred flock vaccinated against the avian poxvirus using an attenuated live vaccine (Poulvac P Canary®, Fortdodge) and against the Newcastle disease virus (NDV) using an oil-emulsion inactivated vaccine (Imopest®, Merial or Newcavac®, Intervet).

Houbara chicks were reared completely separated from their mothers, with humans acting as foster mothers. Progressive improvements in the neonates’ management consisted of preventing forced drying and cold stress upon hatching; supplying drinking water in hatchery; canceling fasting period upon entry to the rearing unit, modifying food intake and implementing sanitary prophylaxis.

Until 20 days of age, we raised chicks indoors at 23°C with a temporary complementary 42°C heater. For the first 10 days, we housed chicks in small Perspex boxes on a sandy substrate covered by a shade-cloth net to prevent the chicks from eating sand; by ten days of age, chicks were moved into large indoor Perspex boxes on a sandy substrate; by 20 days of age, chicks were moved outdoors onto a sandy substrate, with a shelter for the night. Houbara hatchlings do not feed independently. We hand-fed them with tweezers for the first 10 days whereafter they fed autonomously, although both pecking and drinking behaviour were still being stimulated. Diet consisted of *Tenebrio molitor* mealworms, poultry meat extrutated pellets (crude protein=23.5%) swollen in drinking water, fresh alfalfa leaves and dry pellets (crude protein=22%, calcium=1.5%, phosphorus=0.8%, vitamin A=20,000IU, vitamin D₃=2,000IU, vitamin E=200IU). In 2000 and 2001, diet also included *Grillus bimaculatus* crickets.

We assessed neonates’ body mass as soon as their down was dried, then daily during the first 10 days, and then every third day up to the age of one month.

The houbara chick flock was monitored daily and keepers reported any abnormalities to the veterinarian who acted immediately and did the necessary investigations. Every death was subjected to a necropsy performed by veterinarians, and, when necessary, to histopathological examination and bacteriological investigations. Herein, medical case refers to any (single or repeated) veterinary intervention for diagnosis and treatment of one sickness event or to necropsy.

Houbara chicks were not vaccinated before the age of one month. We investigated serological status against the NDV through haemagglutination inhibition (HI) assay conducted on serum extracted within 24 hours after blood sampling and frozen at -70°C until serological analysis were carried out at the Fakieh Poultry Health Laboratory (Taif, Saudi Arabia). Chicks were sampled in 2001, chicks and mothers in 2002, while sentinel female houbara bustards were sampled from the breeding flock during each breeding season from 2002 onwards. PMV-1 antibodies HI titres are given as average ± SE.
3 RESULTS

3.1. PMV-1 serology

Breeding flock sentinel PMV-1 HI titres ranged from $2^{8.6\pm0.5}$ to $2^{11.4\pm0.2}$. PMV-1 HI titre decreased during the first month of life for houbara chicks. At the age of one-month, it reached $2^{5.4\pm0.4}$ in 2001 (n=10), and $2^{5.3\pm0.3}$ in 2002 (n=19) while sentinel mean titre ranged from $2^{9.4\pm0.4}$ to $2^{9.5\pm0.3}$. The titres of the mothers and their one-month-old chicks were related.

3.2 Medical cases

In seven years, we recorded 1113 medical cases consisting of:

- Non-viable hatchling with or without deformity;
- Hatching related pathology including: exhausted hatchling, dehydrated hatchling, dyspneic hatchling, assisted hatching due or not to inversed malposition in ovo, splayed legs, abnormal umbilicus (umbilicus not closed or yolk sac hernia);
- Growth impairment including: yolk sac retention, infection, phospho-calcic metabolic disorder, poor quality feathers. Infection cases included a wide range of bacteria. In 2001, we experienced a colibacillosis outbreak involving an avian pathogenic *Escherichia coli* when chicks were fed on vitamin D3 deficient dry pellets (content 10 times lower than the NWRC’s specifications) and concomitantly displayed rickets. Until 2003, many infectious cases were recorded in neonates involving *E. coli* from systemic infection or from liver/spleen and peritoneal lesions, *Pseudomonas aeruginosa* from systemic infection; *Proteus sp.* from liver lesion; *Proteus sp.*, *P. aeruginosa*, *Klebsiella sp.* and *Staphylococcus aureus* from unresorbed yolk sac; *Klebsiella sp.* from kidney lesion; *Clostridium perfringens* from small intestine lesions.
- Pathology of unknown origin including: tongue pathology, cloacal prolapsus, hemorroids, dwarfism, standing-up disability, drooping wings/lids syndrome, subcutaneous lesion and sudden death without any macro/microscopic lesions;
- Skeletal deformities affecting the head, neck, spine, legs and wings (including angel wing syndrome);
- Trauma affecting the head, spine, legs, wings, skin, internal organs, as well as drowning in water-feeder or asphyxia related to feeding.

3.3 Causes of mortality

In seven years, most of the deaths were related to abnormal embryo development and hatching-related health problems, and at a lower prevalence to growth impairment and trauma. Prevalence of mortality related to infection decreased drastically during the last years.

3.4 Disease prevalence in viable chicks

The morbidity rate in the viable chicks ranged from 52.8% (in 2006) to 117.19% (in 2001). The prevalence of diseases varied year to year as illustrated below:
In flocks of more than 200 viable chicks, survival until one month of age ranged from 92% (in 2001) to 97% (in 2006). The prevalence of antibiotherapy ranged from 24.1% to 61.4% until 2002 and from 2% to 5% from 2003 to 2006.

4 DISCUSSION

Raising wild hatchlings is difficult when little relevant information about the natural behaviour of the parents in the wild is available. In contrast technical specifications by the poultry industry provide guidelines for the artificial incubation of poultry eggs and for raising chicks in the absence of parents. However, houbara hatchlings do not behave like the chicks of domesticated poultry. Bustards present precocial characteristics like well-developed down and eyes, as well as very good mobility at the time of hatching, while still displaying the more altricial characteristics such as their need for parental nourishment and care.

Historically, houbara bustard chick mortality at the NWRC occurred mostly during the first month after hatching and usually before the age of eight days due to yolk retention, anoxia, impaction/foreign body, secondary hyperparathyroidism and infection (OSTROWSKI and COMBREAU, 1995; OSTROWSKI et al, 1996). High infection prevalence was still problematic in 2000, resulting in intensive use of antibiotics and subsequent development of bacterial antibio-resistances.

Female houbara reportedly (SCHULZ and SEDDON, 1996) brood their hatchlings for the first 24 hours. In 2000, the main problems were exhausted hatchlings, yolk sac retention and neonatal infection. The role of pathogens in determining these neonate diseases is not clear. From 2004, we found that suppressing cold stress in the hatchery (through preventing exposure of the hatchlings to cold temperatures and forced drying) reduced the number of exhausted hatchlings. Implementing sanitary prophylaxis also helped decreasing the infectious pressure. However, congenital malformations and non-viable hatchlings are still a problem, possibly due to the incubation technique and/or to inbreeding.

In the wild (SCHULZ and SEDDON, 1996), female houbara offer live-food to their chicks (bill-to-bill) whilst vocalizing a little; when the chicks are about two or three days old, the female drops live prey on the ground, to be retrieved by the chicks. Chicks start feeding independently from the age of five-six days. Feeding chicks artificially at the NWRC raised questions about suitable diet, the correct food intake, which would not lead to excessive
growth on one hand or to malnutrition on the other hand. The 2001 diet was accidentally vitamin D₃ deficient, led to rickets prevalence and facilitated a colibacillosis outbreak. Until 2002, chicks were consistently hungry within half an hour after each meal. Providing swollen, extrudated pellets at the beginning of the meal quickly led to satiety, but this was achieved well-before chicks consumed enough food to cover their requirements. This neonate management regime worked relatively well on a small flock (in 2000), but when the size of the flock increased, morbidity also increased and survival required intensive use of antibiotic therapy in those chicks suffering infectious outbreaks. From 2003, we completely revised the sequence of offering food to the chicks. Subsequently the growth curve was progressively modified in the opposite direction. Over-feeding the 2003 and 2004 cohorts resulted in a faster growth rate, concomitant with higher prevalences of angel wing syndrome. The 2005 and 2006 growth curves which were intermediate, appear to be a good balance between covering requirements and managing the hand-feeding of large numbers of houbara chicks. Compared to 2002 and 2001, morbidity during 2005 and 2006 was significantly reduced - as was the use of antibiotics - even in a flock of more than 200 chicks. However, we do not know whether this growth curve is the best in terms of fitness and body development, since nutritional level during early ontogeny causes persistent effects on bird morphology (OHLSSON and SMITH, 2001) and possibly also on breeding potential.

The occurrence of yolk sac retention remained a problem until 2003. Up to 2002, the NWRC neonate management regime recommended inducing a 5% body mass loss before the first meal of the houbara hatchlings. In contrast, NOY et al (1996) found that supplying hen hatchlings with a small quantity of drinking water soon after hatching facilitates the use of the yolk as well as the digestive transit. From 2004 onwards we successfully implemented Noy’s recommendation, thereby reducing the occurrence of yolk sac retention.

Skeleton development can be impaired during incubation and after hatching. We did not successfully treat congenital skeleton deformities. When diet was not vitamin D₃ deficient, post-hatching skeleton development impairment consisted mainly of angel wing syndrome and of tibiotarsus rotation. As both conditions have been successfully treated since 2004, they are no longer problematic.

Houbara bustards are susceptible to NDV and avian poxvirus disease, both being endemic in the vicinity of the NWRC. Antibodies capable of protecting a bird against NDV can be measured by virus-neutralisation test. Maternal immunity to NDV, which is passed on through the egg, is protective. HI assay detects IgG only (ALEXANDER, 1991). IgG are not virus-neutralising antibodies (GERLACH, 1994). Consequently, HI titres are not directly correlated with immunity, but HI test is a reliable and practical serologic indicator of immunity. The lowest PMV-1 HI titre which still provides protection in houbara, is not known. While houbara female sentinels presented a mean HI titre of about 2⁶, one-month-old chicks’ titre averaged about 2². No NDV cases were recorded during the first month of life in houbara chicks, which is consistent with field challenge with PMV-1 that did not kill domestic hen chicks with HI titre greater than or equal to 2⁵ (ALEXANDER, 1991).

OSTROWSKI et al (1996) demonstrated cross-protection of a canary poxvirus disease vaccine against the poxvirus disease affecting houbara bustards. The regular vaccination of the breeding flock seemingly provided sufficient protection to houbara chicks until the first vaccination against avian poxvirus disease at one-month of age. When avian poxvirus disease outbreaks occurred at the NWRC, it did not affect houbara chicks younger than six-weeks old.

In conclusion, involving a veterinarian in the houbara captive breeding process was useful because the veterinarian was involved in technical activities such as incubating houbara eggs and rearing houbara neonates. When houbara neonates are raised separately from their parents, managing neonates requires highly skilled collaborators, able to provide them
with suitable parental care. Improving the techniques that are used needs the compliance and collaboration of all staff members in order to maximize feed-back from staff. This, in turn, enhances the approach of disease pathogenesis in the captive-bred houbara bustard chicks.

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6 CITATION INDEX


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