Acute Pneumonia in a Macaw - A Case Study

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Introduction

Aviary cleaning and disinfection is a regular and important routine for the keeper of every bird kept in captivity, both for the health of the individual birds and for the keeper. This paper presents a case where a common method of cleaning lead directly to the sudden death of a captive blue and gold macaw (*Ara ararauna*).

Case Report

An approximately 6-month-old male blue and gold macaw that was owned by a large pet store was presented to the Normanhurst Veterinary Practice after a sudden onset of respiratory distress and severe lethargy. The bird had been at the pet shop for the last two months. The bird was hospitalised, place in a heated oxygen hospital box, given fluid therapy using 30ml/kg Hartmann's solution with 5% glucose subcutaneously (s/c) and amoxicillin/clavulanic acid at 125mg/kg s/c SID (Noroclav, Norbrook®). Despite treatment the bird continued to deteriorate and died several hours later.

The bird had two siblings that lived in the same aviary at the pet shop and these were unaffected.

All three blue and gold macaws had been hand raised and were very friendly – the young male that subsequently died had interacted the most with the staff and customers. After extensive questioning the only clinically relevant history gathered was that the area under the cage was cleaned using a high water-pressure cleaning apparatus the previous day. This particular bird came much closer to the pressurised water but was not in the direct stream.

A post mortem examination was performed the following day. The outer nine primary flight feathers of the wings of the macaw had been clipped. The bird was in good body condition and there were two healing skin lesions on the ventral abdomen from previous trauma of unknown origin. Respiratory noises which sounded like heavy breathing with mucus filled airways were evident when the bird's body was manipulated. There was significant thick mucus present in the choana and pharynx. Serosanguinous free fluid and mucous were present in the left cranial thoracic air sac and there was also a mild pericardial effusion with petechiation of the major heart vessels. The lung tissue was grossly affected by pulmonary oedema and the left cranial lung lobe was consolidated.

Samples were collected and formalin fixed for histopathology. Other samples collected for further testing included smears and swabs from the choana, free fluid from the left air sac as well as fresh tissue from the lung, liver, spleen, kidney, pancreas and cloacal bursa.

Histopathology of tissues demonstrated that throughout both left and right lungs there was extensive but well demarcated areas of coagulative necrosis associated with high numbers of Gram-negative bacteria (coccobacilli). Associated with this were widespread thrombosis and vascular necrosis. Similar areas of necrosis were present in the spleen and liver associated with bacterial aggregations. Severe acute necrotising bacterial pneumonia was determined as the cause of death. The Gram stain morphology of the bacteria was consistent with *Pasteurella* spp. Further testing to identify the agent was declined. Given the history of recent high pressure hosing of the environment the most likely scenario is an acute aerogenously-derived spread of bacteria into the bird's respiratory system.

Discussion

Efficient high-pressure cleaning is also called power washing, water blasting and high pressure spray washing. When compared to unpressurised cleaning procedures, it offers impressive advantages in terms of economy, cleaning results and minimal environmental impact. High-pressure cleaners are designed to achieve maximum cleaning results with the minimum of energy and time. At the same time, they reduce the level of waste water. Aviary cleaning can be labour intensive and time consuming however is very important. The use of a high-pressure water cleaner to clean aviary enclosures is an attractive method, especially in our time-poor society.

If a high-pressure water cleaner is to be used for cleaning it is advised to avoid spraying any live bird or animal. However it is often overlooked that these apparatuses also aerosolise the organic material and debris that is being cleaned from the hard surfaces. Such particles are then easily inhaled and in a significantly higher concentration than if the area was being hand cleaned, or cleaned using low–pressure water.

Scientific principles of infection and disease are universal: disease can result from highly pathogenic organisms, large numbers of organisms, repeated exposures, specific susceptibility or immunosuppression. This case demonstrates a mortality that has been very likely caused by an acute aerogenously-derived infection due to aerosol exposure after a routine cleaning of an aviary using a high water-pressure cleaner. A similar case study is reported in the literature of an outbreak of respiratory disease in neonatal veal calves caused by *Pasturella haemolytica*, which correlated with the cleaning of the occupied calf rooms using a high pressure water sprayer (Palechek et al., 1987).

Etiological organisms associated with respiratory disease in birds include: bacterial infection by *Chlamydia psittaci, Escherichia coli, Mycoplasma* spp*., Pseudomonas aeruginosa, Klebsiella pneumoniae, Pasteurella multocida, Yersinia pseudotuberculosis, Salmonella* spp*, Mycobacterium* spp*, Proteus* spp*., Haemophilus* spp*., Bordetella avium, Streptococcus* spp, and *Staphylococcus* spp.; fungal infection by *Aspergillus* spp. or *Cryptococcus* spp.; and viral infection by paramyxovirus, herpesvirus, avian influenza virus and pox virus (Tully and Harrison, 1994; Doneley, 2011). Any of these organisms when aerosolised in large numbers are capable of causing infection and disease.

The significance of this case must also take into account the increased risk of human aerogenously-derived infection via aerosol exposure of pathogens from the same mechanisms. In different occupations, cleaning is identified as a work task causing the highest exposure to aerosol components (Nieuwenhuijsen et al., 1999; Tsapko et al., 2011). Several papers describe the problems of exposure to aerosols from the use of high pressure cleaning but the exposure results are not presented. Thus it seems to be assumed that high pressure cleaning results in high exposure (Madsen and Matthiesen, 2013). A few cases about outbreaks of diseases caused by exposure to microorganisms and endotoxin during high pressure water cleaning in occupational settings have also been published which shows that exposure levels can cause acute health effects (Madsen and Matthiesen, 2013). Additionally, the size of particles influences where and how large a fraction is deposited in the airways (James et al., 1991). It also affects the length of time a particle can remain airborne and thus how far away or for how long time people may be exposed. A single study has shown that use of a water efficient device during high pressure cleaning seems to generate more small particles of a respirable size (smaller than 2µm in diameter) (O'Toole et al., 2009), but no study has been found comparing exposure during the use of different high pressure cleaners.

Pasteurella spp*.*, the likely causative organism in this case, has been reported to cause serious disease in humans, although more commonly from bite wound infections (Weber et al., 1984; Orsini et al., 2013; Wilson and Ho, 2013). One of the most threatening zoonotic diseases transmitted by birds to humans is chlamydophilosis (also known as chlamydiosis, ornithosis, psittacosis or parrot fever), caused by the intracellular bacterium *Chlamydia psittaci*. Psittacine species are highly sensitive to this pathogen, but passerines are not excluded. Other potential zoonoses include: *Pseudomonas aeruginosa, Salmonella* spp, *Mycobacterium* spp; fungal infection by *Aspergillus* spp. or *Cryptococcus* spp.; and viral infection by paramyxovirus or avian influenza virus (Boseret et al., 2013). Again, these organisms when aerosolised in large numbers are capable of causing infection and disease, most particularly in immunocompromised individuals. This reinforces the need for hygienic measures to be applied in places of risk, i.e. at veterinary facilities, bird fairs, pet shop facilities and breeding units.

Despite the advantages in terms of economy, cleaning results and environmental impact which high-pressure cleaners are designed to achieve, there is the potential for serious risks to the health of both the birds and the keeper when they are used to clean enclosures. Aerosol exposure to microorganisms and endotoxin during high pressure water cleaning should be assumed to be high and to cause acute health effects. The risk is greater still when the potential for zoonotic infection from avian species is taken into consideration.

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