

Hygiene Protocols for the Prevention  
and Control of Diseases  
(Particularly Beak and Feather Disease)  
in Australian Birds

Methods of Transmission of Pathogens



**Australian Government**

---

**Department of the Environment and Heritage**

# Copyright

© Commonwealth of Australia 2006

Information contained in this publication may be copied or reproduced for study, research, information or educational purposes, subject to inclusion of an acknowledgment of the source.

The views and opinions expressed in this publication are those of the authors and do not necessarily reflect those of the Australian Government or the Minister for the Environment and Heritage.

While reasonable efforts have been made to ensure that the contents of this publication are factually correct, the Commonwealth does not accept responsibility for the accuracy or completeness of the contents, and shall not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance on, the contents of this publication.

This publication is available online at:

<http://www.deh.gov.au/about/publications/index.html>

For additional hard copies, please contact the Department of the Environment and Heritage, Community Information Unit at [ciu@deh.gov.au](mailto:ciu@deh.gov.au) or 1800 803 772.

## Disclaimer

### Note

This document describes the *Methods of Transmission of Pathogens*, and has been developed with the involvement and cooperation of a broad range of stakeholders, but the making of this document does not necessarily indicate the commitment of individual stakeholders to undertaking any specific actions. The attainment of objectives and the provision of funds may be subject to budgetary and other constraints affecting the parties involved. Proposed actions may be subject to modification over the life of the document due to changes in knowledge.

## Methods of Transmission of Pathogens

---

Nelson and Tablante (2004) stated that biosecurity is informed common sense - “you do not bring germs to birds and do not bring birds to germs”. Personnel and facilities are the weakest links.

Preventing pathogen transmission to birds requires an understanding of how they are transmitted. Transmission is the passing of a disease agent from an infected bird or group of birds to a previously uninfected bird or group of birds. Once inside the body, even in either a vaccinated bird or a previously infected and recovered bird, infectious agents can multiply and be passed from one bird to another. Some can survive outside the body for a considerable length of time in an intermediate medium such as water or food. Others die quickly without the protection of the body. Microorganisms that cause disease (pathogens) may be transmitted from one bird to another by one or more of the following means:

- i. **Direct:** Physical transfer and replication of the agent occur through physical contact between an infected bird and a susceptible uninfected healthy bird. Direct contact includes touching an infected individual (including mutual preening), sexual contact, contact with oral secretions (mutual preening, mutual feeding), or contact with body lesions. Direct transmission requires close contact with an infected individual. Examples of diseases transmitted directly in this way include PBFD, papovavirus infection, Pacheco’s disease and tuberculosis.
- ii **Indirect.** Where a viable infectious agent on a surface enters a susceptible uninfected healthy bird when it contacts the surface and then replicates in that bird. Some PBFD infected birds (for example, king parrots, rainbow lorikeets, budgerigars and eclectus parrots) may excrete the virus without showing clinical signs. Some organisms can survive on surfaces for extended periods. It is possible that some nesting hollows that have been occupied by PBFD-affected birds may harbour viable BFDV for long periods. To reduce transmission by indirect contact, frequently touched surfaces should be properly disinfected. Frequently touched surfaces that may carry pathogens (also called fomites) include:
  - Nest boxes, cages, nests
  - Transport boxes
  - Traps, nets
  - Utensils such as knives, spoons
  - Food and water receptacles.
  - Medical instruments
  - Hands, clothing, hair, footwear
  - Telephones, including mobile phones. The buttons of any electrical device.
  - Computer keyboards, mice
  - Pens, pencils, phones, office supplies
  - Spectacles
  - Door knobs, door handles, handrails
  - Keys
  - Steering wheels, gear levers etc
  - Tables, chairs
  - Light switches

- Electrical tools
- Plumbing tools
- Hair, in particular the hairs on the forearms and back of hands.

Examples of diseases that may be spread in this way include PBFD, Pachecos's disease and psittacosis.

- iii. **Droplet**, where contaminated droplets contact surfaces of the eye, nose, or mouth. This is also referred to as **droplet contact transmission**. Droplets containing microorganisms can be generated when an infected bird coughs or sneezes.

Droplets are too large to be airborne for long and quickly settle out of air onto fomites.

Examples of diseases transmitted in this way include avian influenza, Newcastle disease and tuberculosis

- iv. **Airborne**, where droplet nuclei (residue from evaporated droplets) or dust particles containing microorganisms can remain suspended in air for long periods of time. These organisms must resist drying and be able to survive for long periods outside the body and must be resistant to drying. Airborne transmission allows organisms to enter the upper and lower respiratory tracts. Fortunately, only a few pathogens may be transmitted by air.

Pathogens capable of airborne transmission include:

- Tuberculosis
- Newcastle disease
- Aspergillosis in hatcheries
- PBFD
- Psittacosis

- v. **Faecal-oral**: usually associated with organisms that infect the digestive system. Microorganisms enter the body by the ingestion of contaminated food or water. Inside the digestive system (usually within the intestines) these microorganisms multiply and are shed from the body in faeces. A susceptible bird may ingest the pathogen in the faeces, or via contaminated water or food.. Dried faeces around cloaca may be spread over the plumage to other birds by mutual preening. Wooden nest boxes should be destroyed after once-only use. Rain water from gutters may be contaminated with bird droppings

Examples of diseases transmitted in this way are gastro-intestinal parasites, papovavirus infection, salmonellosis, tuberculosis and PBFD.

Faecal-oral transmission can be reduced by:

- Suspending cages
- Placing of food and water receptacles away from possible faecal contamination by the birds.
- Disinfecting frequently touched surfaces to prevent indirect contact transmission
- Increased personnel awareness of hygiene concepts.

- vi. **Sexual**: via mating. For example, *Mycoplasma meleagridis* in the turkey

- vii. **Iatrogenic transmission:** transmission by medical procedures such as vaccination, administration of therapeutics, artificial insemination and endoscopic sexing.
- viii. **Vector-borne:** Agents transmitted by animals such as flies, mosquitos, mites, fleas, ticks, rats, and mammals (e.g., rats, mice). The most common vector for disease is the mosquito, a vector for avian malaria, West Nile virus and avian pox. Since vectors are mobile, they increase the transmission range of a disease. Biting is not the only way vectors can transmit diseases. Diseases may be spread through the faeces of a vector as well as by biting.
- ix. **Vertical transmission** can occur either congenitally or genetically.
- **Congenital vertical transmission** occurs *in utero* or *in ovo* as in the case of lymphoid leukosis virus when it is shed by the domestic fowl hen into the egg albumen and transmitted to the embryo. On hatch, the chicks have a chronic viraemia and immune tolerance to exogenous virus. Leukaemia is common in such chicks. Other micro-organisms, such as *Mycoplasma* spp., can access the yolk surface as it contacts the inner surface of the left caudal thoracic airsac when passing to the infundibulum. Organisms are transferred to the surface of the yolk, are enclosed by albumen and shell, and at hatch, they replicate and the chick acts as a source of horizontal transmission (see below) of *Mycoplasma* spp.
  - **Genetic vertical transmission** occurs when viral DNA (lymphoid leukosis virus in the domestic fowl) is integrated into gametic DNA of the sperm or ova and transmitted to the embryo.

If the hen excretes an infectious antigen that contaminates the eggshell after lay, the nestling may be infected by the horizontal route (see below) at hatching

Additional terms that are mentioned in relation to the transmission of diseases include the following:

**Horizontal transmission** may occur through droplet, airborne, faecal-oral, sexual, iatrogenic or vector-borne routes. Direct horizontal transmission occurs when a susceptible bird is infected following contact with an infected parrot or contaminated discharges. Indirect horizontal transmission involves an intermediate vehicle (living or inanimate), that transmits the agent between infected and susceptible parrots (e.g., a person).

**Carriers** are bird reservoirs of infection that fail to show significant signs of infection. They can continue to serve as a reservoir even after apparent recovery from a disease. Examples of pathogens that can be transmitted by carriers include those causing Pacheco's disease, chlamydia and PBFD (lorikeets, budgerigars, king parrots).

### **Reference**

1. Nelson TM and Tablante NL 2004. Stomp the Invisible Enemy. Web Page: <http://www.agnr.umd.edu/MCE/Publications/Publication.cfm?ID=645>