

Cleaning and Disinfecting

Dr. Bruce Hunter,¹ Ashley Whiteman,¹ Dr. Babak Sanei,² Al Dam² and Dr. Teresa Cereno

Animals are continually exposed to microorganisms, many of which can cause diseases. Some of these microorganisms can survive in the environment, flock after flock, because they are protected by organic materials/manure or bio-films that are in the environment. In order to prevent diseases, we have to **BREAK THE CHAIN!**

Cleaning and disinfecting (C&D) are two very important steps of a complete biosecurity program and are important tools used in breaking the chain of infection. A good sanitation plan must always be included in any health program. Isolation of the birds and sterilizing the environment would be the ultimate objectives but are not realistic. Therefore, attainable goals must be established so an effective level of sanitation can be maintained.

Sanitation Objectives

- Thoroughly clean all animal facilities, handling or transport equipment and barn tools – there should be no exception in the areas that are included in the program. After cleaning there should be no visible organic matter left behind.
- Reduce microorganisms to the lowest possible level through proper disinfection.
- Obtain new birds from known, disease free sources – to ensure that they do not arrive at your facilities harbouring pathogens like Newcastle Disease virus or *Salmonella* organisms.



An example of a facility with C&D challenges.

Preparing to Clean:

- It is best to clean when birds are not in the facility or can be kept away from the area/pen that is being cleaned.
- Cut the grass around the facilities.
- Remove equipment and other tools that cannot be cleaned and disinfected in the barn or loft, i.e. heaters, drinkers, and feeders.
- Remove left-over feed from feed bins and feeders.
- Remove litter/bedding from the barn and take to a proper storage, disposal or compost area.

Cleaning Procedures

The goal of cleaning is to physically remove all visible debris, dirt, soil, feces, and other organic matter. You need to use a lot of elbow grease! Sweep/blow down dust, cobwebs, and feathers from walls, nest, cages, beams, rafters, fans, and other accessible areas inside and outside the barn. Do not forget the service rooms. It is also a good idea to clean and disinfect the feed bins (if in use) at least once a year.



Scrape off any built-up debris and pay attention to hard to reach areas. Wash all surfaces with water and detergent. The detergent or cleaning agent aids in decreasing surface tension (makes water “wetter”), splits up organic material, emulsifies oils and fats, floats dirt particles, dissolves salts, and carries dirt off the surfaces that you are cleaning.

There are two basic types of detergents that can be used: a) Alkaline-based detergents that remove proteins and fats, and b) Acid-based detergents that remove mineral deposits like scale. The thoroughness of cleaning (use of high pressure washer), use of detergent and exposure time (low pressure application of foam/gel remains on surface longer), and use of hot vs. cold water all contribute to the efficacy of the cleaning job.



Clean all debris off of cages with water and preferably a detergent as well (there are varying types, including organic) before disinfecting.

Disinfecting Procedures

A good cleaning job should ensure that the disinfectant will be able to get to the remaining microorganisms on surfaces and reduce them by at least 99%. **Many disinfectants are inactivated by feces/organic matter.** To avoid wasting time and money make sure that cleaning efforts are thorough before disinfecting.

Choose the disinfectant and the application process based on your facilities and the equipment that you have. See the [Introduction to Disinfectants](#) factsheet (3.4) for different products and their characteristics.

Disinfectants can be applied by several methods including: low pressure (garden hose), through foam using a foam lance, or by thermo-fogging. Some commercial poultry operations use formaldehyde fumigation. This method has significant health and safety challenges and is not recommended for the backyard flock or inexperienced operator. Be sure to observe all safety precautions. Choose a disinfectant and application method that will work in your barn setup, with your bird management system and addresses any human health and safety concerns.

Here are the steps to proper disinfection:

- Read chemical labels thoroughly and make sure that you have the MSDS (Materials Safety Data Sheet) from the manufacturer. This will help you understand the precautions that you must take to protect yourself and what to do in the event of an emergency.
- Always wear protective equipment (clothing, mask, eyewear) when handling chemicals.
- Make sure from the label that you understand the application method. Some disinfectants work best when applied to a dry surface (air dried after cleaning and some to a moist surface)

- Determine the surface area (in square feet) to be disinfected using the following formula:

Barn without cages:

$\text{Length} \times \text{width} \times 2.6 = \text{area (sq ft)}$

Barn with cages:

$\text{Length} \times \text{width} \times 3 = \text{area (sq ft)}$

- Prepare the disinfectant solution based on the total area to be treated and use the dose provided by the manufacturer. Start application from the top of the barn and work your way down to the floor.
- Close and lock the barn. Keep people and animals out of the barn for a minimum of eight hours to allow sufficient contact time for the disinfectant to work. Ventilate the barn properly before repopulating.
- If possible, monitor the C&D by taking environmental samples for bacterial counts. This will tell you how effective your method was.

Organic material cannot be disinfected!!



Key Points to Remember:

- Clean and disinfect all equipment and tools removed from the barn. This includes drinkers, heaters, feeders, fans, shovels forks, wheelbarrows, equipment used for the C&D activity etc. Only return equipment to the barn after it has been disinfected.
- Include trucks and other delivery/ service vehicles in the C&D program.
- Make needed barn repairs. Do not put them off.
- Institute rodent and pest control. See **Pest Management in Bird Production** factsheet (3.5).
- Clean and flush water lines to remove calcium deposits.



TAKE HOME MESSAGE

- Clean out as thoroughly as possible before disinfecting.
- Use appropriate disinfectants and application methods.
- Follow all manufacture label instructions and take safety precautions when handling chemicals.
- Complete C&D program before bringing in disease free birds.

SUGGESTED REFERENCES

For further information on Cleaning and Disinfecting:

Cleaning and Disinfection to Prevent a Foreign Animal Disease Outbreak factsheet in the supplemental section (4.4) or http://www.poultryindustryCouncil.ca/factsheets/fs_157.pdf



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Feed and Water Management

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Feed

Feed is a major expense in livestock production. Birds require carbohydrates, protein, fats, vitamins, minerals, and water. Nutrients offered above a maintenance level are used for growth in young birds and egg production in adult birds. How we provide these very important nutrients to our birds is critical in maintaining healthy and productive animals. Good quality feed and water is paramount in producing a flock that will deliver optimum performance.

Feed should be selected based on the age of the birds and the activities which they will perform (egg production, growth, racing, hunting/release, etc.). Specially formulated feeds offer the nutrients needed for these specific activities. Specific vitamins that need to be supplemented in a diet include vitamin A, D₃, B₁₂, riboflavin, pantothenic acid, niacin, folic acid, thiamine, selenium, and biotin. Critical minerals including: calcium, phosphorus, sodium, chlorine, magnesium, potassium, etc. may need to be supplemented as well if the raw ingredients in the diet do not contain sufficient levels. Common ingredients used in manufacturing a complete feed include: corn, wheat, wheat-by-products, barley, soybean, soybean meal, flax, canola meal, bakery-by-products, etc. Byproducts of animal origin (poultry fat, meat meal, blood meal, meat and bone meal and tallow) are now very seldom used.

In commercial poultry production, feeds can come in the form of a mash, a pellet (also extruded pellets), or a crumble. A mash or crumble feed is generally fed to young birds. Pellets are meant for larger birds. Feeds are also formulated based on the age and production status of the bird. In general, younger birds need higher protein levels. Once the birds organs and skeleton have reached full size, protein levels are decreased. As birds grow older and go into egg production, the nutrient needs are again reviewed to address the additional physiological requirements.

In the game bird industry, nutrient requirements have not been well established because of the variation in the type of markets that they cater to. Diets that have been formulated for commercial turkeys have been used with some success. Additional feeds can be given to birds to supplement their requirements and provide variety. These supplements may be plants or weeds, seeds, grains, fruits, and nuts. It is important to be aware of the management style for your class of bird and always take this into consideration when selecting a feeding program.



Food can be stored in an old freezer (not functioning). This keeps the food fresh and safe from pests.

Feed should always be fresh. Old or spoiled feed may cause illness in birds. Periodically check the quality of the feed, paying attention to color, texture, and smell. Clean up spilled feed around the feed bin and surrounding feeders as this will be an attraction for moulds, rodents, and other vermin. Keep a record of the feed that has been fed to your birds and collect a sample from each batch in case a feed problem ever occurs. The feed sample should be placed in a sealed bag that is properly labeled with the date and batch number and stored in a freezer.

Additional information on feed rations for different types of birds is available in the book *Commercial Poultry Nutrition*, third edition, by Dr. Steve Leeson and Dr. John D. Summers.*

** Mention of specific sources of information is not intended to be an endorsement.*

Water

Good quality water is vital for keeping your birds healthy. Water makes up about 70% of a bird's body weight and on a daily basis, birds will drink at least twice the volume of water compared to the amount of food they consume.

Factors that Affect Water Quality

Everyone who raises livestock or poultry should check the quality of the drinking water regularly. Water that comes from surface sources may contain pathogens or chemicals from runoff. Even water coming from deep wells can change in quality from season to season. Knowing the quality of your water by monitoring different parameters can aid in diagnosing bird health or management problems. Water should be tested a minimum of once a year.

Bacterial level

Water is usually analyzed for total bacteria and total coliforms (*E. coli* is used as the indicator). The level considered ideal for both tests is zero CFU/ml (Colony Forming Units of bacteria per milliliter of water). However, the maximum acceptable levels are 100 CFU/ml total bacteria and 50 CFU/ml total coliforms. The presence of coliform bacteria in the water means that it has been contaminated with fecal materials. If the water supply is contaminated, measures should be initiated to treat it.

- Check the water source making sure that it is protected from surface drainage, sewage problems, and surface application of manure. If it is a well, make sure that well casings and general construction of the well head is sound.

Sample bottle for testing bacterial level in water.



- Contaminated water can be treated using appropriate filtration, physical treatments (i.e. ultra violet, reverse osmosis, etc) or a sanitizing chemical like chlorine, iodine, or hydrogen peroxide. Chlorine levels should be maintained at 1 ppm (parts per million) while hydrogen peroxide's recommended level is 30 ppm. Higher than the recommended levels may cause toxicity or water refusal from birds.
- Drinkers should be cleaned regularly to get rid of biofilm, calcium deposit, and accumulated organic materials.



Clean feeders and drinkers on a regular basis or in between flocks to avoid scum build-up and pathogens being passed to new birds.

Minerals

Calcium, chloride, copper, iron, lead, manganese, nitrate, sulfate, zinc, and sodium should all be tested. Birds may not experience serious health problems with higher levels of certain minerals. For example, high levels of calcium will not be absorbed and will be passed out of the bird in the feces. However, certain minerals in water, when combined with the same mineral in a balanced feed ration can potentially cause problems. For example, combined levels of sodium may result in increased water consumption, wet bedding and loose stool. If using automatic drinkers, clean calcium and biofilms from the water lines. Acidifiers have been used effectively in the commercial industry for this purpose.

Iron and manganese give a bitter metallic taste and iron also supports the growth of bacteria like *E. coli* and *Pseudomonas sp.* Iron, manganese, and sulfur will produce a rotten-egg smell. Chlorination and filtration will alleviate these problems. Chlorine also reduces the oxidation of iron and can therefore prevent the development of rust. The level of calcium and magnesium will determine water hardness. This causes the build-up of scale and sludge that can reduce pipe volume and negatively impact cleaners and disinfectants. Softeners can be used to reduce this problem.

Water pH

pH is measured on a scale of 1-14 with 7 being neutral. Anything below 7 is acidic and intensifies as it gets closer to 1 while anything above 7 is alkaline (basic). Drinking water pH should be close to the neutral level or slightly acidic. A basic water pH level will make chlorination ineffective. On the other hand, very acidic water can be corrosive and unpalatable for birds. Recent studies have shown that acidifying water (using organic and/or inorganic acids) to a pH of 4-6 may provide beneficial protection against bacteria in the digestive tract. You can safely add a small amount of apple cider vinegar to your water to achieve this effect.

Fresh water in a clean drinker. Apple cider vinegar can be added to waters to help keep them clean.





Key Points to Remember:

- Fresh, properly balanced complete feeds should be the target. The use of scratch grains as a supplement will dilute the nutrient content of the ration.
- Fresh potable water should be always available to your birds.
- Test your water at least once a year for bacteria levels, mineral levels and pH and treat if necessary.
- If you are going to acidify and sanitize your water, use the acidifier first.
- Do not mix chlorine and acid as this will result in the release of dangerous chlorine gas.
- Do not mix vaccines intended for water application with chlorinated water as the chlorine will neutralize the vaccine. Skim milk can be added to water (91 grams per 38 liters of water) to neutralize sanitizers.

TAKE HOME MESSAGE

Feed and water quality and delivery are very important for all types of birds. Providing the right feed to address the needs of the birds as they grow can make a big difference in their over-all health and performance. Clean, wholesome water promotes optimal performance and prevents many health concerns. Proper monitoring, cleaning, and sanitation are required to maintain water quality. Lastly, ensure that feed and water are always available. Always check.

SUGGESTED REFERENCES

Additional information on water quality, cleaning and sanitizing:

Hydrogen Peroxide in Drinking Water:
http://www.poultryindustrycouncil.ca/factsheets/fs_12.html

What is the Quality and Safety of Ontario Farm Drinking Water:
http://www.poultryindustrycouncil.ca/factsheets/fs_37.pdf

Water Quality: An Important Consideration:
http://www.poultryindustrycouncil.ca/factsheets/fs_65.pdf

Water Sanitation:
http://www.poultryindustrycouncil.ca/factsheets/fs_85.pdf

Water Quality for Poultry:
http://www.poultryindustrycouncil.ca/factsheets/fs_111.pdf

Avian Advice: Index for all concerns:
<http://www.poultryscience.uark.edu/avianindex.html>

Poultry Nutrition:
<http://www.omafra.gov.on.ca/english/livestock/poultry/facts/introduction.htm>

Water Safety: Putting your well water to the test.
http://www.health.gov.on.ca/english/public/pub/watersafe/watersafe_welltest.html



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What is a FAD?

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A **Foreign Animal Disease, (FAD)**, is an important, transmissible disease believed to be absent or not native to Canada. Some of these diseases are of such importance to human or animal health or to the Canadian economy that animal owners, veterinarians and laboratories are required to immediately report the presence of these conditions to a district veterinarian from the Canadian Food Inspection Agency (CFIA). These diseases known as reportable diseases are outlined in the *Health of Animals Act and Regulations* (http://laws.justice.gc.ca/en/H_3.3/fulltoc.html). Examples of FAD's include: Highly Pathogenic Avian Influenza (HPAI), Bovine Spongiform Encephalopathy (BSE), and Foot and Mouth Disease (FMD).

The Office International des Epizooties (OIE) http://www.oie.int/eng/en_index.htm is an intergovernmental organization responsible for the International Health Code and for the Manual of Standards for Diagnostic Tests and Vaccines. It sets the sanitary standards for the World Trade Organization and defines HPAI and Newcastle Disease as "reportable" diseases, which means that any identification of these diseases requires reporting it worldwide. OIE has also recommended response and control strategies to be used in the face of an HPAI outbreak. These include surveillance and early detection, rapid culling or depopulation, compensation, improved biosecurity, and vaccinations (when appropriate).

Reportable Diseases

In avian species, the following diseases are reportable:

- Notifiable Avian Influenza - (H5 or H7 Type)
- Exotic Newcastle Disease (END)
- Fowl Typhoid (*Salmonella Typhoid*)
- Pullorum Disease (*Salmonella pullorum*)

With confirmation of one of these diseases, CFIA will immediately institute control and eradication measures to protect other Canadian livestock and poultry producers as well as export markets. CFIA pays compensation for birds that are ordered destroyed during an FAD outbreak.



Symptoms such as swollen eyes and respiratory difficulties can occur with AI.

Neurological symptoms (neck twisting) from END.





In addition to Reportable Diseases there are other diseases that occur in Canada that are of sufficient importance to be designated as Immediately Notifiable or Annually Notifiable diseases. A complete list can be found on the Canadian Food Inspection Agency website <http://www.inspection.gc.ca/english/anima/disemala/guidee.shtml>

Relevance of a FAD

Each of the diseases listed above share a number of characteristics. They are all: highly contagious, easily transmissible, capable of causing high death losses, severe production losses and can potentially cripple the Canadian export market. For example the Highly Pathogenic Avian Influenza, (HPAI), strains H5 and H7 outbreaks in poultry can cause 90-100% mortality. The HPAI outbreak (H5N2) in British Columbia in 2004 resulted in 18.9 million birds destroyed, severe international trade restrictions and economic losses exceeding \$370 million at the farm gate and \$850 million retail. Avian Influenza poses an additional threat in that it is capable of causing serious disease and even death in people. Failure to act responsibly when a FAD is diagnosed can result in disaster, not only for your own business, but also for the bird industry in general.

TAKE HOME MESSAGE

- FAD's are extremely important.
- Bird owners/producers should make every effort to develop an effective on farm health management and biosecurity programs to reduce the risk of a FAD, (or any disease), from entering their farm. Every producer should be prepared to cooperate with the Federal authorities in the event of an emergency.
- Every poultry group/association/club should work together to develop biosecurity programs and Emergency Response Plans. If you have an effective biosecurity program in place and a FAD is diagnosed, CFIA may consider not eradicating your flock.

SUGGESTED REFERENCES

Movement Control Following Confirmation of Highly Pathogenic Avian Influenza: (HPAI) in a Flock:
http://www.poultryindustrycouncil.ca/factsheets/fs_144.pdf

CFIA definition and description of Foreign Animal Diseases
http://www.inspection.gc.ca/english/anima/heasan/man/avmmva/avmmva_mod12e.shtml

<http://www.inspection.gc.ca/english/anima/heasan/fad/privete.shtml>

List and definition of Notifiable Diseases

<http://www.inspection.gc.ca/english/anima/disemala/guidee.shtml>

Reportable Diseases Regulations

<http://laws.justice.gc.ca/en/H-3.3/SOR-91-2/index.html>

Health of Animals Act: Compensation for Destroyed Animals Regulations.

<http://laws.justice.gc.ca/en/H-3.3/SOR-2000-233/index.html>



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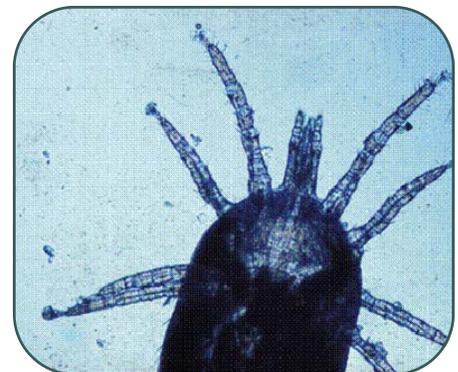
Disease

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The term disease implies a deviation from health. Disease can be caused by invading organisms (infectious diseases), or may result from nutritional imbalances or toxic substances in the feed, environmental stress (as a result of some error or failure in management) or even genetic problems. Disease may be **acute** (sudden onset), **sub-acute** or **chronic**, and either **clinical** (can identify sick animals) or **sub-clinical** (no visible symptoms).

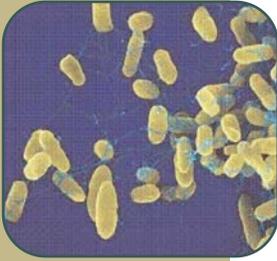
Infectious Diseases are those caused by infectious agents that include a variety of pathogenic bacteria, viruses, parasites, fungi, etc. **Zoonotic** diseases are those that are transmissible from animals to humans and may have significant human health concerns (e.g. Rabies). Infectious Diseases are complex and influenced by many factors. In order for an infection to occur the following combination of circumstances are needed:

- **a susceptible host:** The bird must be susceptible to the disease. It must be the appropriate species, the correct age, and not immune to the potentially infectious agent. If enough birds in a flock are susceptible a disease outbreak could occur.
- **a suitable agent:** The disease causing agent must be able to gain access to or invade the host, then replicate within the host and cause damage that results in the symptoms of the disease. An organism capable of causing disease is called a **pathogen** or **pathogenic agent**.
- **a suitable environment:** Conditions that allow the disease causing agent and the susceptible host to interact.



*Northern Fowl Mite
(Ornithonyssus sylviarum).*

Pathogenic Agents



*Bacteria
(Salmonella
enteritidis).*

Bacteria

Bacteria are small, single-celled organisms that abound in the environment. Some bacteria require oxygen to grow (**aerobic**) and thrive in tissues rich in oxygen like the respiratory tract and blood stream. Other types of bacteria are **anaerobic**, and grow in the absence of oxygen.

Of known bacteria, 99% are considered beneficial or harmless to the body. Bacteria of concern however, replicate in the body and produce toxins, enzymes and acids that harm the host. Most types of bacteria grow well and survive for long periods outside the host in organic substrates like manure. They can survive for months, even years, on surfaces of floors, walls, fans, and boots. Careful cleaning and disinfection of the barn, loft or pens between flocks is crucial in reducing bacterial load and minimizing the likelihood of diseases carrying over to the next flock.

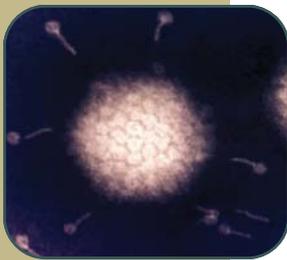
Viruses

Viruses are exceptionally small organisms that can only be observed through the use of an electron microscope. Examples include: Infectious Laryngotracheitis (ILT), Avian Influenza virus, West Nile Virus, and paramyxovirus (Newcastle disease virus). Unlike bacteria, viruses can only replicate within a living host cell. The **virion**, the infective part of the virus that contains the viral genetic material, gets injected into a host's cell. The virus then overtakes the regulation of the cell, forcing it to code for new viral genetic material, enzymes, and structural proteins. This shutdown of the host cell's biochemical pathways and energy producing systems results in damage or destruction of the cell. The cell lyses (bursts open) and the "new" viruses that have replicated are released to infect other nearby cells.

Generally, viruses that cause diarrhea are shed in the feces and infection is through the fecal/oral route. Viruses that infect the respiratory tract are shed through saliva and nasal discharges and infection is through contamination of the oral/nasal cavity or via inhalation. Viruses that impact multiple body systems may enter through many routes. Antibiotics are **NOT** effective against viruses, and with the exception of a few drugs used in human medicine, there is no treatment for viral diseases.

Biosecurity supplemented with vaccination is the best defense.

Some viruses are quite fragile and do not survive for long periods outside the host, while others are amazingly resilient and can survive, but not replicate, for years in the soil or old manure. Some viruses are so resistant that only extremely toxic agents like formaldehyde are powerful enough to kill them. It is because of these characteristics of viruses that producers must be so careful with their management; all in all out, good sanitation, traffic control, wild bird control, etc...all of which make up a good farm **biosecurity** program.



*Virus
(Adenovirus, the cause
of marble spleen
disease in pheasants).*

Pathogenic Agents

Parasites

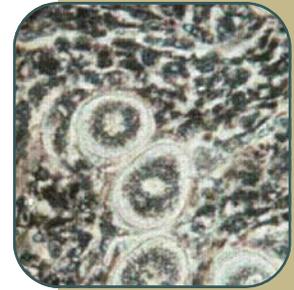
The term parasite includes any organism that lives on or within another living organism and gains nutrients or some other advantage from that organism. With this definition many organisms including bacteria, viruses, and fungi are parasites, but in general the use of the word parasite is restricted to **protozoa** (e.g. coccidia or *Trichomonas*), **helminthes** (worms) and **ectoparasites** (mites, ticks, etc.). Depending on the nature of the invading parasite, they can cause problems by competing for nutrients (i.e. coccidiosis and roundworm infestations), weakening the birds external defense mechanisms (i.e. mites) or by destroying blood cells (i.e. leucocytozoonosis).

Fungi

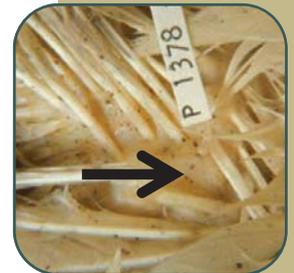
Fungi are single-celled plant organisms that include yeasts, moulds and mushrooms. The simplest forms are single-celled budding yeasts. In birds, yeasts like *Candida albicans* may be present in the environment or within portions of the digestive tract like the crop. Under certain conditions, like prolonged antibiotic use or an over-distention of the crop with food, these yeasts may overgrow and damage the crop lining.

Fungi can cause disease by:

- **Direct invasion of tissues and release of toxins by fungal cells.** Aspergillosis is a good example of this and the most important fungal disease of birds. *Aspergillus* grows readily in damp, warm environments, like wet litter or around a leaky drinker. Birds become infected by inhaling large numbers of the fungal spores which then grow in the bird's respiratory tract and air sacs. Other important fungal diseases are Thrush caused by *Candida albicans* and Dactylariosis caused by *Dactylaria gallopava*. See [Aspergillosis](#) factsheet (6.5).
- **Allergic disease.** Although allergies to the fungal spores are rarely diagnosed or reported in birds, this can be a significant health concern for people working in dusty bird environments (i.e. Bird Fancier's Lung).
- **Mycotoxigenesis or the ingestion of toxic fungal metabolites in feed.** Grains become infected with fungi during the growing season and the toxins, produced by the fungi, remain in the grain after it has been harvested. The toxins become inadvertently incorporated into the avian diets. Mycotoxigenesis is particularly important if the summer has been hot, humid and rainy.



Coccidial eggs in feces.



External parasites (Northern Fowl Mites).



Budding yeasts (*Candida albicans*).



Pigeon with trichomoniasis cankers in mouth.



Non-infectious Disease

Examples of non-infectious diseases include:

- Nutritional deficiencies or excesses.
- Toxic agents (lead poisoning, pesticides, mycotoxins, etc.).
- Genetic abnormalities (extra toes, deformations, etc.).
- Management related diseases (mismanagement of incubator, ventilation, feed, water, etc.).
- Metabolic/endocrine imbalance (leg problems or ascites in fast growing birds, etc.). See [Ascites](#) factsheet (6.3).
- Autoimmune disease (thyroiditis in budgies, etc.).
- Tumours or cancer.

Key Points to Remember:

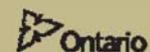
- Bacteria can replicate in the environment in the absence of a host bird.
- Viruses can only replicate within a living host, but some are very hardy and can survive for long periods of time in the environment.
- Bacterial diseases can be treated with proper antibiotics, but antibiotics **ARE NOT** effective against viral diseases.
- Viral diseases must be controlled by good biosecurity, supplemented with vaccination (if available).
- The key to controlling fungal disease and parasites is good management.
- Nutritious feed, good quality water and good management practices will prevent most non-infectious diseases.

TAKE HOME MESSAGE

This factsheet has introduced you to the many different things that can cause disease in your birds and could also impact your health and safety. Understanding the differences between agents that cause disease and the importance of good husbandry will help you develop your management and biosecurity programs.



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Getting Started

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Every farmer intending to raise poultry or other avian species must carefully design the animal housing system before ever purchasing the birds. Remember, you control every aspect of the bird's environment including:

- the quality of the air the birds breathe
- the type and condition of the litter they stand on
- the availability and quality of the drinking water
- the type of feed and the feed delivery system
- the length and intensity of the lighting in the barn
- the general cleanliness and sanitation of the environment

In order to maximize these aspects of good husbandry, the farmer must design the barn or animal holding facility carefully, be familiar with the equipment and understand how his/her barn works.

In most situations when we decide to get into bird production we modify existing structures or build a shell that we can afford, and then try to figure out how the birds will fit. We encourage that you look at the process from the inside out. Decide first on the type of bird you will be raising and then consider their specific needs and your expectations for the operation with regard to bird numbers and anticipated productivity. The barn location, structural design and interior design should meet these requirements.

Housing

Housing may be a permanent structure like a barn or shed, or may be a temporary structure like a mobile covered or domed shelter that can be moved regularly so birds have access to fresh grazing areas. The cost of each of these structures differs significantly and the temporary structures are of course only suitable during certain seasons and weather conditions.

Housing should provide protection from natural elements (heat, cold, wind and precipitation) and adequate comfort. It should also keep out human and animal predators. A good, secure barn design is a critical component of a good biosecurity program. The goal is to keep birds separated from wild birds and other potential disease vectors and it should be easy to clean and sanitize.



Squab housing can have special requirements to consider.

Location

Carefully consider **the location of the facility** so it will remain dry and well-drained regardless of the season and be sheltered from prevailing winds. Location and structure should follow local building codes and be in an area with easy access to feed and water. Odour, noise control and manure handling are increasingly important concerns in areas where urban development encroaches on farming areas and is a common source of friction between farmers and their neighbours. The building should be far enough away from neighbours to minimize these concerns. The structure should also be far enough away from ponds or open water to inhibit any interaction between your birds and wildlife.

Size and Style is Species-Specific

The size of the structure will depend on the type of bird and your purpose. Is this a hobby operation? Do you expect to expand into some sort of commercial production? Are you attempting to raise birds in intensive housing, in a free run environment or perhaps meet the standards of organic growers?

Different species have different needs. Ratites need indoor protection from weather extremes but grow well with access to outdoor runs. Pheasant and gamebird operations may need indoor facilities for hatching and brooding but may prefer outdoor enclosures for breeding, growing and/or release training. Squab pigeon housing should be environmentally controlled, whereas racing pigeon growers may want their birds to have outside access. Organic producers may have other requirements. Remember that with concerns about many diseases, especially Avian Influenza virus, there is increased pressure to have all birds housed under a roof and separated from wild birds. The provincial Animal Health Act in Quebec currently legislates that all birds be kept under cover, but a similar regulation is not yet in effect in Ontario.

The **animal housing areas should be dry, draft-free and easily cleaned and sanitized**. Cement floors, partial cement walls and sturdy washable materials for wall construction are desirable. Porous surfaces are harder to clean and disinfect and are a greater risk for harbouring disease causing agents. If you have a lot of manure to remove, suitable tractor or skid steer access or some other manure handling system, such as a stable cleaner is desirable. Ensure that you have suitable access to all animal holding areas and individual pens.

Lighting and Heating

Lighting can be natural (windows or curtains) or artificial, but in either case should provide sufficient light intensity to meet changing physiological requirements. As photoperiod is critical, most facilities that deal with egg production should invest in light controllers (timers, dimmers, etc.) so light can

be properly regulated. If the operation is seasonal (e.g. some gamebird or ratite operations) natural lighting may be sufficient.

Depending on the species you are raising a well insulated building may be a requirement. Housing areas may need a source of **supplementary heat** to maintain optimal temperatures for different stages of growth. Remember that baby birds cannot regulate their own body temperatures until they are 5-10 days of age. Heat sources should be safe and comply with building codes. Barn fires occur every year and improperly maintained or set up brooder heaters are a common culprit.

Litter Management

Bedding (litter) can be of many types (shavings, chopped straw, etc.). Regardless of the type, it should be absorbent enough to keep the birds clean and spread deeply enough to ensure bird comfort. Litter should only be purchased from a reputable source to ensure its cleanliness and quality. Litter management is important and poorly managed litter will result in a build up of bacteria, moulds and toxic gasses like ammonia. Wet litter may result from leaking drinkers or insufficient amounts of bedding but often it is the result of inadequate ventilation (i.e. not sufficient air exchange to remove the moisture given off by the birds). Good litter management and proper ventilation management are inextricably linked to each other. Litter should be removed regularly after birds are moved from a pen and damp or wet areas should be cleaned up daily and fresh bedding supplied as necessary to keep birds clean and comfortable. Some operations may house birds in cages or on slats where bedding is not required. Regardless of your housing system, manure should be removed regularly.

Feed and Manure Storage

The feed storage area should be physically separated from animal housing and manure handling/storage. The feed storage should be designed so that rodents and other pests cannot access the feed. **The manure storage area** should be outside the barn and designed so that any runoff is contained. Regulations under the Nutrient Management Act should be reviewed as it contains guidelines on building and designing manure storage facilities.

Spatial Needs

Space requirements for birds depend on the species and your production system. Bird density in the barn (i.e. the number of birds per square foot or square meter of floor space) is very important and is a significant animal welfare issue. The density will depend on the species of bird, the sex of the birds (i.e. male broiler chickens and

Laying hens with outdoor access.





turkeys are larger and grow faster than females) and the final target weight. As the stocking density increases beyond optimal, performance and profitability decreases. In some species like pigeons in a squab operation, space may be calculated in cubic space rather than floor space as birds fly vertically to elevated nest boxes.

In intensive farms with high numbers of birds, the stocking density should be reduced in the summer because overheating is a concern and it can be increased in the winter. This is all dependent upon having adequate ventilation in the facility. In commercial poultry acceptable bird density is defined within their "Recommended Codes of Practice". Codes of practice have not been developed yet for other bird species.

FLAWSS

The acronym **FLAWSS** has been used to help trouble shoot for problems in a barn. **FLAWSS** stands for: **F**ood, **L**ight, **A**ir, **W**ater, **S**pace and **S**anitation. When you are evaluating your production system, take the time to look for FLAWSS in your bird management. Evaluate each of these important and critical areas. Some specific aspects of FLAWSS are discussed in greater detail in subsequent factsheets or can be accessed through links on the www.agbiosecurity.ca website.

TAKE HOME MESSAGE

Plan your operation before you build and before your birds arrive.

SUGGESTED REFERENCES

Keeping your Birds Healthy section of www.agbiosecurity.ca: www.healthybirds.ca

Learn more about Nutrient Management: http://www.omafra.gov.on.ca/english/nm/nm_learn.htm

Poultry information - housing and ventilation: <http://www.omafra.gov.on.ca/english/livestock/poultry/housing.html>

Agriculture and Agri-Food Canada, Index to Poultry Marketplace: http://www.agr.gc.ca/poultry-volaille/index_eng.htm

Codes of Practice for Commercial Industry: <http://nfacc.ca/code.aspx>

Canada Plan Service - Poultry Section: <http://www.cps.gov.on.ca/english/po5000/poultry.htm>



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Sick Birds

Dr. Bruce Hunter,¹ Ashley Whiteman,¹ Dr. Babak Sanei,² Al Dam² and Dr. Teresa Cereno

You should always be monitoring your birds for any signs of sickness. If problems are noticed early, there is a better chance for successful treatment and lower bird mortality or production loss. This is described in further detail in the **Biosecurity Principle 2** factsheet (2.3).

Every animal owner should establish a relationship with a veterinarian for consultation and diagnostic services. Under the Veterinary Act, a legitimate veterinarian-client-patient relationship (VCPR) is required for your veterinarian to legally dispense drugs and other medications. This is very important when you encounter a disease problem that would necessitate treatment or any further action that may involve government regulations. A listing of veterinarians registered with the College of Veterinarians of Ontario can be found at: <http://www.cvo.org/>

Veterinarians are educated and trained to diagnose and treat animal diseases. Many practicing veterinarians do not specialize in poultry medicine/diagnostics. Nevertheless, they should be able to quickly diagnose most common avian problems and send appropriate tissue samples to the Animal Health Laboratory (AHL) at the University of Guelph for further testing if necessary. A veterinarian at the AHL will report back to your veterinarian with the results. He or she can then provide you with an interpretation of these laboratory results as well as make recommendations on medication, vaccination, and possible changes in bird management to treat and prevent the further spread of disease.

Scabs on the face and comb of this chicken are consistent with Avian Pox virus infection.



Submitting Samples to your Veterinarian or to the Animal Health Lab (AHL)



Head tilts and neck twisting are signs of problems with the nervous system.

When submitting samples, select specimens and/or freshly dead carcasses that are representative of the problem. Whenever possible, make sure that they have not been treated with antibiotics. Call ahead so the veterinarian or laboratory knows that you will be submitting samples and to determine what information is required so that your submission can be analyzed as quickly as possible.

Obtaining useful/accurate results from your veterinarian or the AHL requires good samples and a complete history. Submission forms for the AHL require standard information like the species, breed, age, sex, weight of the bird(s), flock statistics and relevant bird/flock history. A summary of management practices, recent medications, vaccinations and clinical symptoms are all helpful.

Below is a more detailed list of information that will help in the diagnosis and resolution of your problem. Good background information will increase the chances of a more accurate and rapid diagnosis. This is information that should be readily available as part of your regular record keeping.

History of the Problem

Where possible list dates of onset and/or duration.

- General abnormalities – sudden death, morbidity (the number of clinically sick birds), droopiness, depression, lack of appetite, ruffled feathers, abnormal color of wattles and combs, dehydration, loss of feathers, etc.
- Respiratory system – sound of fluid mucus in the airways (rales), gasping, coughing, swelling of areas around eyes, inflamed sinuses, watery eyes, nasal exudates, etc.
- Digestive system – loose droppings, diarrhea, abnormal color of feces, big belly, etc.
- Nervous system – head shaking, neck twisting, abnormal extension of legs, circling, etc.
- Skin and musculoskeletal system – scratches, abnormal discoloration, lumps, lameness, scaly legs, twisted legs, abnormal back curvature, etc.
- Reproductive system – drop in egg production, poor egg quality: thin shell, abnormal shape, color, and size, etc.



Leg problems or paralysis can cause difficulty with mobility.

Flock Description and History

- Size of the flock/Number of birds at risk.
- Number (or %) sick.
- Number (or %) dead (distinguish natural deaths vs. culls).
- New bird arrivals? Where did they come from; their medication/vaccination history?
- Are there other species on farm? How much contact is there with these other species and the birds?
- Have the birds been to a show or race recently?
- Have they been moved from one barn/loft to another recently?
- Have they had normal molting and brooding behaviour?

Swollen face or eyes. Possible respiratory problems.



Management Practices – Feed and Water

- What type of feed – any recent changes in feed or feed supplier?
- Are there any feed additives?
- What is the source of water (city, well, surface, cistern, etc.) and any recent changes in the source?
- Is the drinking water treated or has the treatment changed? (i.e. filtered, chlorinated, etc.)
- Any changes in the watering system? (i.e. from troughs to nipple drinkers)
- Any water additives used? (i.e. apple cider vinegar, vitamin packs, antibiotics, etc)

Management Practices – Housing

- Access to outside.
- Access to open water.
- Access to wildlife (mainly wild bird populations).
- Cage or housing system.
- Litter/bedding materials, (type of bedding, changes, source).
- Other: ventilation problems, weather or temperature changes, abnormal noise, electrical surges, black-out, recent use of insecticides and/or herbicides, etc.

Pendulous or distended crop.



I think my birds are sick, what do I do?



Caring for animals is difficult and every type of animal operation, whether this is a large animal farm, a commercial poultry operation, or a hobby farm should have a health program and access to a licensed veterinarian for consultation and diagnostic services.



FACTSHEET 1.3
March 2008

TAKE HOME MESSAGE

- Develop a relationship with your local veterinarian before health problems arise.
- Be proactive and develop a health care program for your birds.
- When birds are sick be sure to carefully select representative samples for submission.
- Provide a complete and detailed history of the problem.
- Seek assistance as soon as a problem is identified.



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For information on good health management practices refer to the other factsheets in this kit.

For more information on submitting your birds for testing at the Animal Health lab, visit:
www.labservices.uoguelph.ca/units/ahl/

Introduction to Disinfectants

Dr. Bruce Hunter,¹ Ashley Whiteman,¹ Dr. Babak Sanei,² and Al Dam²

The **Cleaning and Disinfecting** factsheet (3.3) has already described the rationale and procedures for properly sanitizing your facility. Physical cleaning (i.e. by pressure washing) of the barn and the removal of all organic material including feed, carcasses, bedding, litter, dust on the walls etc. is a critical step that must be done before disinfectants are applied. It is known that cleaning before disinfecting will save you time and significantly reduce the pathogen load.

Disinfectants are the chemicals (see table) or physical agents (heat, sunlight, etc.) that when applied to surfaces will kill or inactivate microorganisms. Each disinfectant has different strengths and weaknesses and there is no single ideal disinfectant. If there was an ideal disinfectant it would be: fast acting, inexpensive, non-corrosive, non-toxic, would work in the presence of organic matter at any temperature and would be effective against a broad spectrum of microorganisms. Unfortunately there is no disinfectant that fulfills all of these criteria.

How do I select a disinfectant?

Disinfectants can be organized into categories based on their chemical properties. They can kill the microorganisms by various methods including: protein denaturation, membrane disruption, nucleic acid damage, etc.

Some disinfectants work better against bacteria vs. viruses vs. fungi, etc. A broad spectrum of activity will kill bacteria, viruses and fungi. The following table provides some information that will help you decide which disinfectant is appropriate for your application. Regardless of the disinfectant that you choose make sure that you read the label, follow the instructions and adhere to all human health and safety precautions.

All available product label information for disinfectants made and sold in Canada can be found under Product Used for Chickens: Disinfectants and/or Sanitation of Animal Facilities:

<http://pic.naccvp.com/?u=country&p=msds>

Properties of Commonly Used Disinfectants

Type	Mode of Action	Properties	Limitations	Spectrum of Activity	Remarks
Aldehydes	Kills by protein denaturation. Binds to amine groups in the cell causing a toxic effect and killing the cell.	Rapid action, residual property, non-corrosive, not affected by small amounts of organic matter	Irritating vapours	Kills a broad spectrum of bacteria, fungi and viruses. Sporidical in high concentration	May come in combination with other chemicals like quats. and alcohol Product examples: Virocid
Chlorines	Kills by protein denaturation, inactivation of nucleic acids, and oxidation	Kills quickly, inexpensive	Easily inactivated by organic materials, volatile, corrosive, non-residual, pH dependent	Broad Spectrum	Do not mix with other disinfectants or cleaners. Strong odour. Product examples: Bleach
Cresylic Acid	Invades the cell causing it to rupture	Good organic soil tolerance, some residual action, creates hostile environment for vectors	Can be toxic, strong odor, irritant, corrosive, must be saponified to be water soluble. May be too strong to use frequently or in hatcheries.	Fast acting, strong antimicrobial activity but limited virucidal and sporidical activity. Will kill gram negative bacteria, but not positive.	Coal tar derivative Product example: Creolin is available in most co-op stores. It can also act as an insecticide. It also has phenols in it.
Formaldehyde	Kills by penetrating membranes and changing the amine group in the proteins within the cell, Interference with metabolism causes death	Commonly used for fumigation, effective at barn temperature of 21 degrees C and a relative humidity of over 70%. Avoid human exposure	Toxicity concern, gas penetration can be limited	Broad Spectrum	Product examples: Profilm, Formaline and Fumalyse II is used for fumigation and disinfection: www.bioagrimix.com/engnew/html/products.html

<p>Iodine (chlorhexidine)</p>	<p>Kills by oxidation, interferes with cell metabolism</p>	<p>Quick kill, inexpensive, can be used around birds. Can also be used for footbath and water sanitizing due to low toxicity.</p>	<p>Corrosive, non-residual, volatile, inactivated by organic materials,</p>	<p>Broad spectrum</p>	<p>Product examples: Biodine, Hibitane Disinfectant, Nolvasan and Premise Disinfectant</p>
<p>Peroxygen (oxidizing agents)</p>	<p>Adsorbed into cell wall. Reactions lead to a porous membrane. Causes precipitation and leakage</p>	<p>Fast-acting, effective on porous surfaces, hard water, low temperature. Can come in powder or tablet form for easy storage</p>	<p>May be corrosive in high concentrations</p>	<p>Broad spectrum</p>	<p>Product examples: Kilco, VIREX, hyperox Virkon tablets and Virkon Disinfectant & Cleaner P.W.S www.vetoquinol.ca/en/index.asp?page=63</p>
<p>Phenols</p>	<p>Invades the cell causing it to rupture</p>	<p>Rapid kill, not greatly affected by organic materials, residual action. Incompatible with non-ionic wetting agents.</p>	<p>Can be corrosive, irritating to skin, environmental disposal problems.</p>	<p>Broad spectrum of activity</p>	<p>Product examples: Multi-Phenolic Disinfectant, which also has detergent mixed in. www.bioagrimix.com/engnew/html/products.html Also LpH, and Environ LpH (contains alcohol also)</p>
<p>Quaternary Ammonium (Quats)</p>	<p>Increases the permeability of membrane. Water diffuses inward until cell bursts</p>	<p>Odourless, can be used with animals present, Least corrosive. Different formulations out on the market. i.e. ammonium chloride vs. Cetrimonium Bromide</p>	<p>Incompatible with anionic detergents, must be formulated correctly to work in hard water. Organic material reduces efficacy, but may some products are not effected.</p>	<p>Limited fungicidal activity, may not work for "naked" viruses</p>	<p>Product examples: Coverage 256, PF 300, Proquat and Rocco. Also available is DuPont 904. It has virucidal abilities and is also safe for use in hatcheries: www.vetoquinol.ca/en/index.asp?ref=63&page=187</p>



Key Points to Remember:

- **READ THE LABEL.** This will give you everything you need to know. This includes: effectiveness, dilution rate, toxicity, corrosiveness, application methods, storage, contact time and safety information.
- **Safety first.** Take the needed precautions when applying the disinfectant to keep yourself protected (i.e. gloves, long sleeves, eye protection).
- **Use the instructed dilution rate.** More is not always better.
- **Allow** at least the suggested **exposure time.** This is the time that the disinfectant requires to be left on the surface or in the environment before being rinsed or vented. Exposure times vary. Leave the area. Vent well afterwards.
- **Disinfectants should never be mixed together** unless directed by the label. The different properties could cause dangerous chemical reactions.
- Always **mix/dilute a new solution of disinfectant every time.** Once mixed, chemical properties change over time and become unpredictable.
- Take note of the **application method** (be sure you have the proper equipment) and the amount of product needed to cover the entire area.
- **Store the disinfectant properly.** Usually it is best to have the chemicals in a separate and secure area (away from children and pets), in air tight containers away from direct heat or humidity.
- **Clean the area with soap and water before you disinfect.** Most disinfectants are inactivated by organic matter. Remove as much organic material as possible.
- **Keep records** of which disinfectants you used for each section of your operation (i.e. hatchery vs. outdoor pen).

SUGGESTED REFERENCES

Cleaning and Disinfecting to Prevent a Foreign Animal Disease Outbreak PIC factsheet 157, Supplementary factsheets 4.4:

http://www.poultryindustryCouncil.ca/factsheets/fs_157.pdf

Disease Prevention through proper Disinfection and Sanitation:

<http://habitrail.com/hari/docu/tabcon6.html>

Clean and Mean: Effective targeting for Disinfectants

[http://www1.agric.gov.ab.ca/\\$department/deptdocs.nsf/all/pou3653?](http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/pou3653?)

Compendium of Veterinary Products

<http://pic.naccvp.com/?u=country&p=msds>

**Mention of trade names is not an endorsement for the products.*



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Pest Management

Dr. Bruce Hunter,¹ Ashley Whiteman,¹ Dr. Babak Sanei,² Al Dam² and Dr. Teresa Cereno

The primary goal of all pest control programs is the prevention and elimination of insects, rodents, free-flying birds, predators (i.e. raccoons and weasels) and other pests. Pests may introduce or maintain disease causing agents on a farm, kill or maim your birds and consume and contaminate animal feeds. Also many pests, like boring beetles and rodents, can destroy barn insulation, chew on electrical wiring and create serious fire hazards. Good housekeeping and sanitation are central to pest control in all facilities. Chemical and physical pest control measures may be necessary in conjunction with proper sanitation, storage practices, insect and rodent proofing, and a regular maintenance program.

In commercial animal facilities, an Integrated Pest Management program (IPM) is a requirement for a successful and productive operation. IPM is a system that makes use of several tools to manage pests and lessen their impact on your bird's health. The first line of defense in an IPM program includes proper facility design and construction, regular facility maintenance, an organized and tidy environment and proper sanitation. Pesticides should be used only as a second line of defense. A facility that relies only on chemical control and does not focus on more basic preventive measures runs the risk of inadequate control, pesticide resistance, environmental damage, and non-target species effects.

- A sound **construction** program for new or rebuilt structures creates a barrier that prevents pests from entering the facility. This includes, easily cleanable barn floors (such as concrete), proper sweeps on barn doors to keep out rodents and careful screening of soffit and fan openings to prevent wild bird entry.
- A sound **maintenance** program ensures that any breaks in these construction barriers are promptly repaired and sealed.
- A sound **exclusion** program prevents the entry of pests through windows, doors, vents, and on incoming goods.
- A sound **sanitation** program removes pest hiding places, and spilled feed or water on floors/around feed bins that could attract and support a pest population.



Solid covering over feed and water as well as netting over and around birds will protect them from the majority of pests.

Daily Activities in Pest Management

- 1 Eliminate sources of standing water.
 - 2 Keep grass and weeds cut around the barn (3-5 feet).
 - 3 Pick up and dispose of any refuse and garbage. Have proper, well-maintained disposal containers that can be sealed; empty them regularly.
 - 4 Close all doors when not in use. All windows should be screened.
 - 5 Carefully check all incoming bedding for pests and reject any infested or contaminated incoming supplies. For example: straw contaminated with raccoon feces and then used as animal bedding often results in raccoon round worms infecting birds resulting in neurological disease.
 - 6 Clean and remove dust as frequently as possible. Set up a cleaning schedule and follow it.
 - 7 Keep feed bins in good repair and rodent proof lids on feed storage containers and quickly clean up any spillage.
 - 8 Remove old equipment, lumber or debris that encourages hiding or nesting.
 - 9 Keep records of all of these activities. These records become the basis for effective on-farm biosecurity programs.
- All animals are potential carriers of pathogens. Key pests on bird farms include rats, mice, darkling beetles, mites, flies, wild birds, weasels, raccoons, skunks, and stray cats and dogs. Know what pests are present in your facility and for each type of pest find out about their life cycles, where they are found and how they could have arrived at your farm. Then design a monitoring regiment and an effective eradication and control plan.

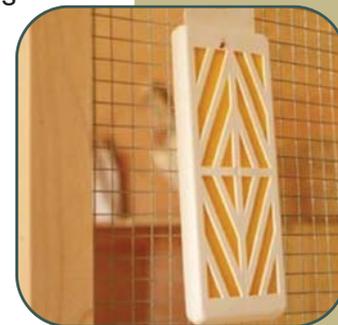
Bait traps should be checked often. They should be kept away from the bird pens to avoid causing harm to your birds.



Rodents (rats and mice)

Rodents are major vectors and reservoirs of bacteria and viruses. Map your facility and identify the severity of the infestation. Watch for droppings, rodent runs, burrows, gnawing marks, odours, and other signs of activity. Obtain baiting stations or traps and choose the bait that is applicable to your problem. Bait stations can be bought from feed supply stores, from rodent control companies, or they can be home-made. The most common one is a simple 18" x 3" diameter PVC pipe. Bait stations keep the rodenticides protected from the elements and away from non-target animals. These bait stations should be placed about 20-60 feet apart (depending on severity of problem) around the perimeter of the building, in the attic, entry rooms, or even near fences. Bring the baits to the rodents! Baits should be monitored for activity and always kept available, dry, and fresh (no moulds, dust, stale bait). Wear gloves when handling them.

Baiting is most effective if your bird housing area is empty (i.e. during periods when birds have been sold, moved or between flocks) as you can intensify the effort during these periods. Once feed becomes unavailable, bait acceptance is enhanced. A good description of rodenticides available in Ontario can be found in the OMAFRA factsheet #07-009: **Rodent Control in Livestock and Poultry Facilities**, which is in the Supplementary factsheets (4.3).



Insect bait.

Darkling Beetles (*Alphatobius diaperinus*)

Darkling beetles (adults) and lesser mealworms (larvae) have been found to carry *Salmonella* and other organisms including some viruses. They shed them in their droppings for up to 28 days. Examine used bedding and floor wall junctions for larvae and adult beetles after a flock is removed or pens are being cleaned. Monitoring traps can be made from PVC tubes, 12" x 1-1.5" diameter containing 12" x 12" piece of paper towel. Roll this and place it inside the tube. Place traps along the walls and near feeders for 1-2 days or even longer if the manure is still in the barn. After the sampling, dump the trap contents and count the insects. Score can range from slight (0-9) to severe (100+) infestation. Apply an insecticide after cleaning and disinfecting the premises. There are many insecticide products on the market. The total amount of solution to be used will depend on the types of surface being sprayed. Always read and follow the product instructions carefully.

Flies

Flies are best controlled through:

- Proper management of feed, manure, and facilities;
- Use of beneficial insects (tiny wasps) that feed on immature fly eggs and larvae;
- Use of chemicals including various fly baits and papers.



Keep pools fresh and remove any stagnant water that will attract insects.

Monitor the severity of the fly infestation using sticky tapes, speck fly counting, or baited jug traps. Fly traps with bait (i.e. dichlorvos) are usually the best way to use baits. Flies may also develop resistance, so switching to other compounds maybe necessary. Some chemicals have residual activity. Some of the products available* include: Disvap Spray, Vapona, Ectiban (permethrin), Tempo, Larvadex, Rabon, etc. Most of these can be obtained through local retail outlets, feed suppliers, farm supply stores or commercial pesticide companies.

Mites and lice

There are two main types of mites that occur in poultry in Ontario: red mites (*Dermanyssus gallinae*) and Northern fowl mites (*Ornithonyssus sylviarum*). Both types feed on blood and are found close to the skin. Due to the birds' feathers, penetration of insecticide to the site of infestation is often difficult. Spraying or direct contact application with a rag is necessary. Chemicals like permethrin (Ectiban), carbaryl (Sevin), malathion (Malathion 50) and dichlorvos (Ravap) have been used successfully. Other species of birds such as pigeons and ratites have their own species of mites, but the same chemicals have been found to be effective.

Pest Management in Bird Production



Insects

Insects such as mosquitoes and black flies can also be important transmitters of disease. Mosquitoes are well known to carry avian pox viruses as well as West Nile Virus. Blackflies can transmit bird malaria. Usually chemical means do not control these pests, but good facility maintenance, removing all possible sources of stagnant water and selected use of screening may help reduce the problem.

Cats

Cats can carry organisms pathogenic to birds and therefore should not be allowed entry to the restricted area. In many cases the food and water left out for the cat may be the reason there is a rodent problem. In some commercial operations cats have been used for rodent control. They should be regularly tested to be free of certain pathogens, (i.e. *Salmonella*), and not allowed access outside the barn once living indoors.

Other Pests

Weasels, foxes, skunks, raccoons, opossums and predatory birds like members of the accipiter hawks (Sharp-shinned hawk, Cooper's hawk and Goshawk) are common predators in pigeon lofts, back yard flocks and game bird operations. Proper fencing and netting, secure penning and screening of windows will help prevent these pests from entering. If these species become a problem contact a pest control professional.

Moles, gophers, ground hogs and squirrels may damage facilities. The best defense is to minimize habitats which they find comfortable for nesting and make certain they do not have access to feed. There should be no wood or garbage piles in the area and there are some mechanical repellants available including irritants, water sprayer, and sound devices. Erazze, Mole and Gopher Bait, Ground Squirrel Bait, and Tomcat are some chemical preparations that can be used.

Be aware of Human Safety Concerns

Be aware that all rodent and pest control products have biological, environmental, food safety, welfare, occupational safety, and regulatory implications. Always consult with pest control professionals and regulatory bodies to ensure that these issues are covered. Everyone that handles these products should be educated and trained.

SUGGESTED REFERENCES

Rodent Control in Livestock and Poultry Facilities. OMAFRA factsheet #07-009 (4.3) in the Supplementary factsheets:

<http://www.omafra.gov.on.ca/english/livestock/dairy/facts/07-009.htm#rodenticides>

A Guide for managing Poultry Insects
<http://www.ianrpubs.unl.edu/epublic/pages/publicationD.jsp?publicationId=499>

**Mention of trade names is not an endorsement for the products.*

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Small rodents and mammals can cause severe damage and are a disease risk. Lowering suitable habitats like brush and long grass will reduce risks. Humane removal (such as this raccoon in a live trap) of pests is recommended.



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Understanding Antibiotics

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An antibiotic is a drug generally used to treat infections caused by bacteria. Originally, an antibiotic was a substance produced by one microorganism that selectively inhibits the growth of another. For example, in 1926, Alexander Fleming discovered penicillin, a substance produced by fungi that appeared able to inhibit bacterial growth. Synthetic antibiotics, usually chemically related to natural antibiotics, have since been produced that accomplish comparable tasks.

Despite all of our efforts to keep our birds healthy through good husbandry practices and good biosecurity, it is inevitable that at some point a disease problem will occur on your farm. When this happens many producers immediately begin to medicate their birds with an antibiotic in the hope that this will restore the birds to a healthy state. Very often the drug choice is inappropriate and depending on the cause of the disease, for example a disease caused by a virus, the use of an antibiotic may not be warranted at all. Antibiotic misuse is leading to increasingly more stringent controls on over-the-counter antibiotic sales. Antibiotics have an important place in maintaining bird health, but they must be used carefully and judiciously.

Producers are encouraged to take the livestock medicine education program offered by the University of Guelph, Ridgetown Campus that fosters the safe use and handling of medicines on farm (www.ontariolivestockmed.com).

Improper use of antibiotics in livestock has been linked to drug resistance in pathogens affecting humans and the development of “Super bugs”. Human health concerns are driving new regulations on antibiotic use in livestock throughout the world. This problem is not restricted to commercial livestock, but is also a significant problem in back yard flocks, non-regulated poultry industries, our pets and even misuse of drugs in human medicine.

Bird producers should be aware of a number of important facts about the use of antibiotics:

- 1 Antibiotics are not effective against viruses, fungi, external or internal parasites. They are only effective against bacterial pathogens.
- 2 Every bacterial pathogen has a different sensitivity pattern to antibiotics, i.e. not every antibiotic is effective against all pathogens. The proper antibiotic has to be carefully chosen and this should be based on having first obtained an accurate diagnosis so that you know exactly what you are attempting to treat. A diagnostic laboratory can run antibiotic sensitivity panels on bacteria isolated from sick or dead birds. These sensitivity panels are the key to choosing the correct antibiotic for the problem. Consult your veterinarian to get a correct diagnosis and directions on the choice and proper route of administration of the antibiotic.
- 3 Using the proper dose and duration of treatment is critical. In order to be effective, critical target levels of the antibiotic have to be attained and maintained for a sufficient time to control the pathogen. If appropriate and consistent levels of antibiotic are not achieved it will be ineffective in treating the problem. Always give a full course of antibiotic treatment.
- 4 Bacteria can develop resistance to any antibiotic. This is usually the result of improper use of antibiotics. For example, using an ineffective antibiotic (i.e. the organism is not sensitive to it); by using too low a dose (i.e. below the therapeutic level); using the drug repeatedly at low levels; or by treating for too short a period of time. Antibiotic drug resistance and how it develops is a complicated story, but once drug resistance develops it can be transferred from one type of bacteria to another via gene swapping. Drug resistance problems can build up on your farm over time. If this happens then that class of antibiotic will no longer be an effective treatment option on your farm.
- 5 Zoonotic organisms (i.e. ones that can be transferred directly from animals to people) like *Salmonella* may cause significant human health problems. If these bacteria have also developed drug resistance, treatment options for humans become more limited.
- 6 Antibiotic resistance is becoming a larger and larger issue in human medicine with the development of “Super Bugs” that are resistant to multiple antibiotics. There are already “Super Bugs” in Canada that are resistant to all currently available and registered antibiotics for use in people. Woe to the person that becomes infected with these organisms. Pressure from Health Canada is increasing to regulate drug use in livestock production.
- 7 All antibiotics have an expiry date. Using old, outdated antibiotics will not effectively treat or control disease.
- 8 Antibiotics can be destroyed by heat and sunlight. Some require refrigeration. Improper storage of antibiotics renders them ineffective.

- 9 Antibiotic residues (either the parent drug or metabolites of that drug) will accumulate in the meat or eggs of medicated birds. Each antibiotic has a scientifically established withdrawal time (length of time for drug residues to disappear in meat or eggs after the drug has been removed) before the meat or eggs can be consumed. These withdrawal periods must be adhered to. Many people have drug allergies and residues are a serious concern. Drug residues in food also lead to drug resistance as discussed above.
- 10 The route of administration of antibiotics is critical. Some drugs must be injected, others can be used in the feed or water systems. Syringes and needles must be sterile. Many diseases are transmitted from bird to bird during the treatment if dirty equipment is used or if needles are not changed between animals. Many drugs are not soluble enough in water to remain dissolved and will precipitate out in the water. Some drugs have a bitter taste and birds will refuse to eat the medicated feed or drink the medicated water. Most water soluble drugs are destroyed by water bio-films or high mineral content in the water. Dosing birds in their water requires that you know the daily water consumption of your flock to calculate an accurate drug dose.
- 11 Antibiotics are used to kill bacteria. We should not be surprised that antibiotics can also be toxic to the birds if used at levels that are too high or used in the wrong age of bird. For example: tetracyclines used in young birds can cause bone development problems; chloramphenicol causes abnormal blood cell development in young, growing birds; sulfa drugs can cause serious kidney damage if used at too high a dose or in birds that are dehydrated.
- 12 A number of antibiotics and antimicrobial agents (including wormers and booster packs etc.) can be purchased at local farm supply stores. Farmers often medicate their animals themselves without knowing the diagnosis or the appropriate treatment. The misuse of antibiotics either by using the incorrect drug or using the wrong levels is extremely common in livestock farms in Ontario.
- 13 The sale of antibiotics is controlled. Certain antibiotics at certain dosage levels have been cleared for use in livestock feeds for growth promotion or prevention of target diseases and can be added by the feed mill. Using antibiotics at a dosage level higher than these accepted levels (i.e. using treatment or therapeutic levels) requires a prescription from your veterinarian.
- 14 Using drugs “off-label”, i.e. using it in ways that are different from the claim on the label of the bottle, must be done carefully as most drugs have never been tested in species other than chickens or turkeys. There are significant differences in how drugs are metabolized and therefore they have different toxicity levels and withdrawal times between species. The use of drugs off-label should be done under veterinary supervision only.



C o n c l u s i o n

Based on the facts listed above, bird owners should be extremely careful on how antibiotics are chosen and administered to their birds. Antibiotics should be used only when necessary so they maintain their effectiveness.

Antibiotics should never be your “first line of defense”. Good husbandry, good biosecurity, rapid and accurate disease diagnosis and a solid disease prevention program is more effective in controlling disease than using antibiotics.

In certain provinces like Quebec, all drugs used in livestock require a veterinary prescription. This has not yet occurred in Ontario. Bird producers are strongly encouraged to seek the advice of their veterinarian when deciding on when and how to use antibiotics. There is strong national and international pressure to ban the routine use of antibiotics for growth promotion and disease prevention in commercial livestock production. Controls on antibiotic availability and sales will tighten over the next few years. Establish a relationship with your local veterinarian ... it will prove to be an asset in keeping your birds healthy.

SUGGESTED REFERENCES

Antibiotic / Probiotic Trends and Transitions in the Poultry Industry
<http://www.thepoultrysite.com/articles/706/antibiotic-probiotic-trends-and-transitions-in-the-poultry-industry>

Responsible Disposal of Unwanted Medicines and Sharps:
<http://www.omafra.gov.on.ca/english/livestock/animalcare/amr/facts/05-051.htm>

Feed Medications:
http://www.poultryindustrycouncil.ca/compendium-feed_meds.html

Water Medications:
http://www.poultryindustrycouncil.ca/compendium-water_medications.html

Antimicrobial Resistance:
<http://www.poultryindustrycouncil.ca/compendium-antimicrobial.html>

Antimicrobial Resistance in Agriculture:
<http://www.omafra.gov.on.ca/english/livestock/animalcare/amr/facts/04-081.htm>

**Mention of trade names is not an endorsement for the products.*



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