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Cleaning and Disinfection of Poultry Facilities

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Having an effective cleaning and disinfection program is a crucial step in every poultry biosecurity program. A cleaning and disinfection program should be instituted after a poultry building has been depopulated and before restocking occurs on the farm. The main purpose of a cleaning and disinfection program is to reduce the number of pathogens (disease-causing agents) in the environment. By reducing pathogen numbers, we can reduce the potential for diseases to occur in our poultry flock.

What Disease Agents Should We Be Concerned About?

The disease agents we are concerned about include viruses, bacteria, fungi, and parasites. It is important to identify the pathogens we want to eliminate. Some disinfectants are ineffective against certain disease agent(s) that we want to eliminate or reduce on the farm.

What is the First Step in a Cleaning and Disinfection Program?

The first step in any cleaning and disinfection program is cleaning. Cleaning is the physical removal of organic material (i.e. manure, blood, feed, and carcasses). It is important to remove these organic materials before the disinfection process begins because disease agents are often protected in these materials and can survive the disinfection process. Hence, it is important to thoroughly clean a building before the disinfection process. The cleaning process can include a dry cleaning and a wet cleaning step.

What are the Differences Between Dry Cleaning and Wet Cleaning?

Dry cleaning involves the physical removal of organic material, such as the removal of feed, litter, and manure. The process of dry cleaning physically removes the organic material before the actual wet cleaning can occur. Wet cleaning, as its name implies, involves the use of water. There are four basic steps in the wet cleaning process – soaking, washing, rinsing and drying. Although not necessary, detergents (wetting agents) can be used in the wet cleaning process. However, it is more important to have pressure washers with the proper pressure (500-800 psi) to ensure all the organic materials are removed from the facilities.

The final step of ensuring a proper clean-up is having the wet areas of the building dried quickly. If the building is not dried properly, the excess moisture can result in bacteria multiplying to higher levels than seen before cleaning. Thus, if you are going to clean, make sure the cleaning procedure is done properly as an improper cleaning can actually do more harm than good! If done properly, a good cleaning can remove 90% of the pathogens.

What Do I Do After Cleaning?

The last step in a cleaning and disinfection program is the disinfection process. This process involves the use of a disinfectant that

will reduce or kill the pathogens. There are several types of disinfectants, and the one chosen should be effective against the disease agent(s) you are targeting.

What are the Main Types of Disinfectants That Can be Used?

The main types of disinfectants that can be used are:

- Aldehydes (i.e., formalin, formaldehyde, and glutaraldehyde)
- Chlorine-releasing agents (i.e., sodium hypochlorite, chlorine dioxide, sodium dichloroisocyanutrate, and chloramine-T)
- Iodophores (i.e., providone-iodine and poloxamer-iodine)
- Phenols and bis-phelols (i.e., triclosan and hexachlorophene)
- Quaternary ammonium compounds
- Peroxygens (i.e., hydrogen peroxide and peracetic acid)

Aldehydes, like formalin and formaldehyde, are considered sterilants; are carcinogenic; and require special precautions. Peroxygens, at the recommended dilution for their use, are caustic and dangerous. Some of the newer formulations of peroxygens and peracetic acid compounds have been used in large scale outbreaks. Some of these compounds are considered non-irritants and are approved for specific uses. It is suggested that one should always follow the recommended usage provided by the manufacturer.

How Susceptible are the Disease-causing Agents to Various Disinfectants?

Disinfectants are effective against bacteria, viruses, and fungi. Disinfectants were not designed to be effective against parasites. In general, the descending order of resistance of disease agents is:

1. Spores (i.e., clostrial diseases like botulism) and acid-fast bacteria (i.e., mycobacteria like *Mycobacterium avium* [avian tuberculosis])
2. Gram-negative bacteria (i.e., *Pseudomonas, E. coli, Salmonella)*
3. Fungi (i.e., *Candida* [crop mycosis] and *Aspergillus* [aspergillosis])
4. Non-enveloped viruses (i.e., enteroviruses and adenoviruses)
5. Gram-positive bacteria (i.e., *Staphylococcus aureus*)
6. Lipid enveloped viruses (i.e., avian influenza virus).

Thus, spore-forming bacteria are harder to destroy by disinfectants than viruses. Table 1 illustrates the effectiveness of various disinfectants on pathogens. Avian parasites (i.e. lice, mites, and endoparasites) are best treated using insecticides or the different poultry parasiticides. However, it has been reported that ammonia and phenolic disinfectants have been effective in reducing the numbers of coccidial oocysts.

Are There Certain Conditions That Can Affect the Effectiveness of Disinfectants?

Yes, there are certain conditions that can maximize the effectiveness of the disinfectants you use. As mentioned earlier, the presence of organic material can influence the cleaning and disinfection program. Other factors include temperature, pH, and the use of soaps or detergents. Table 2 illustrates the effect of different factors on disinfectant effectiveness.

Special Conditions for Cleaning and Disinfection on Premises

When applying cleaning and disinfectant agents, always ensure that the person applying these chemicals is wearing the appropriate personal protective equipment as cleaning and disinfectant agents can be hazardous via inhalation, skin contact, and ingestion.

Table 1. Effectiveness of Various Disinfectants on Pathogens

Disease Name	Disease Agent	Type of Agent	Chlorhexadine	Chlorine-Releasing Agent	Iodopbor	Phenol and Bisphenols	Single* Ammonium Compound	4-way** (Quatemary Ammonium Compound)
Salmonellosis	*Salmonella* species	Gram-negative bacteria	+++	+++	+++	+++	+	+++
Pullorum Disease	*Salmonella pullorum*	Gram-negative bacteria	+++	+++	+++	+++	+	+++
Fowl Typhoid	*Salmonella gallinarum*	Gram-negative bacteria	+++	+++	+++	+++	+	+++
Paratyphoid Infection	*Salmonella* species	Gram-negative bacteria	+++	+++	+++	+++	+	+++
Arizonosis	*Salmonella arizonae*	Gram-negative bacteria	+++	+++	+++	+++	+	+++
Colibacillosis	*Escherichia coli*	Gram-negative bacteria	+++	+++	+++	+++	+	+++
Pasteurellosis	*Pasteurella multocida*	Gram-negative bacteria	++	+++	+++	++	+	+++
Pseudotuberculosis	*Yersinia pseudotuberculosis*	Gram-negative bacteria	++	+++	+++	++	+	+++
Riemerella anatipestifer Infection	*Riemerella (Pasteurella) anatipestifer*	Gram-negative bacteria	++	+++	+++	++	+	+++
Tuberculosis	*Mycobacterium avium*	Acid-fast bacteria	-	+	+	+++	-	+++
Infectious Coryza	*Haemophilus paragallinarum*	Gram-negative bacteria	++	+++	+++	++	+	+++
Mycoplasmosis	*Mycoplasma gallisepticum Mycoplasma synoviae Mycoplasma meleagridis*	Bacteria lacking cell walls	++	++	++	++	++	++
Campylobacteriosis	*Campylobacter jejuni*	Gram-negative bacteria	+	+++	+++	+++	+	+++
Erysipelas	*Erysipelothrix rhusiopathiae*	Gram-negative bacteria	++	+++	+++	-	++	+++

Table 1. (continued) Effectiveness of Various Disinfectants on Pathogens

Disease Name	Disease Agent	Type of Agent	Chlorhexadine	Chlorine-Releasing Agent	Iodopbor	Phenol and Bisphenols	Single* Ammonium Compound	4-way** (Quatemary Ammonium Compound)
Ulcerative Enteritis; Necrotic Enteritis; or Gangrenous Dermatitis	*Clostridium colinum; Clostridium perfringens Types A or C; Clostridium septicum; or Clostridium perfringens Type A*	Gram-positive, spore-forming bacteria	-	++	++	-	-	-
Botulism	*Clostridium botulinum*	Gram-positive, spore-forming bacteria	-	++	++	-	-	-
Bordetellosis (Turkey Coryza)	*Bordetella avium*	Gram-negative bacteria	+	++	++	++	-	+++
Staphylococcosis	*Staphylococcus aureus*	Gram-positive bacteria	-	+++	+++	+++	+++	+++
Streptococcosis	*Streptococcus sp.*	Gram-positive bacterial	-	+++	+++	+++	+++	+++
Chlamydiosis	*Chlamydia psittaci*	Obligate intracellular bacteria	++	++	++	++	++	++
Aspergillosis	*Aspergillus fumigatus; Aspergillus flavus*	Fungus	+	+++	+++	++	+/-	+++
Candidiasis (Thrush)	*Candida albicans*	Fungus	+	+++	+++	++	+/-	++
Marek's Disease	Marek's disease virus	Herpesvirus (enveloped DNA virus)	+/-	+++	+++	-	-	++
Lymphoid Leukosis	Avian Leukosis virus	Retrovirus (enveloped RNA virus)	+/-	+++	+++	-	-	+++
Infectious Bronchitis	Infectious bronchitis virus	Coronavirus(enveloped RNA virus)	++	+++	+++	-	-	+++

Table 1. (continued) Effectiveness of Various Disinfectants on Pathogens

Disease Name	Disease Agent	Type of Agent	Chlorhexadine	Chlorine-Releasing Agent	Iodopbor	Phenol and Bisphenols	Single* Ammonium Compound	4-way** (Quatemary Ammonium Compound)
Infectious Laryngotracheitis	Infectious laryngotracheitis virus	Herpesvirus (enveloped DNA virus)	+/-	+++	+++	-	-	+++
Newcastle Disease	Newcastle disease virus	Paramyxovirus (enveloped RNA virus)	+/-	+++	+++	+	-	+++
Adenovirus Infection	Adenovirus	Adenovirus (non-enveloped DNA virus)	-	+++	+++	-	-	+++
Pox	Avian pox virus	Poxvirus (enveloped DNA virus)	+/-	+++	+++	+	-	+++
Duck Viral Hepatitis	Duck hepatitis virus	Piconavirus (non-enveloped RNA virus)	-	+++	+++	-	-	+++
Duck Virus Enteritis	Duck Virus enteritis virus	Herpesvirus (enveloped DNA virus)	+/-	+++	+++	-	-	+++
Reovirus Infection	Reovirus	Reovirus (non-enveloped RNA virus)	-	+++	+++	-	-	+++
Infectious Bursal Disease	Infectious bursal disease virus	Birnavirus (non-enveloped RNA virus)	-	+++	+++	-	-	+++
Chicken Anemia	Chicken Anemia virus	Circovirus (non-enveloped DNA virus)	-	+++	+++	-	-	+++

- Not an effective Agent
+/- May or may not be effective
+ Weakly effective
++ Effective
+++ Very Effective
* Older generation such as Roccal and Zephiran®
** Newer generation, read label for specific organism effectiveness

Table 2. Factors That Can Influence the Effectiveness of Disinfectants

Factors Affecting Disinfectants	Aldehyde	Chlorine-Releasing Agent	Iodophor	Quatemary Ammounium Compound	Phenols and Bisphenols	Peroxygen
Organic matter	inhibits effectiveness	inhibits effectiveness	some inhibition of effectiveness	inhibits effectiveness	slightly inhibits effectiveness	inhibits effectiveness
Low temperature	inhibits effectiveness	slightly inhibits effectiveness	slightly inhibits effectiveness	inhibits effectiveness	inhibits effectiveness	slightly inhibits effectiveness
pH needed for maximum effectiveness	alkaline	acid	acid	acid	alkaline or acid	acid
Residual effects	yes	no	yes	no	yes	no
Interaction with soaps	compatible	not compatible	compatible	not compatible	compatible	compatible

Revised in 2019 from Original Resource. Revised 2019: Morishita, T.Y. and J.C. Gordon. Cleaning and disinfection of poultry facilities. Veterinary Preventive Medicine. The Ohio State University Extension, Factsheet #VME-13-02, 2002.