Introduction to Disinfectants

Dr. Bruce Hunter,[1] Ashley Whiteman,[1] Dr. Babak Sanei,[2]and Al Dam[2]

The **Cleaning and Disinfecting** factsheet (3.3) has already described the rational 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. Sporicidal 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 sporicidal 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

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

FACTSHEET 3.4

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Biosecurity Education Initiative

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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?

Compendium of Veterinary Products
http://pic.naccvp.com/?u=country&p=msds

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

University of Guelph [1]

Ontario [2]

CONTACT

OMAFRA's Agricultural Information Contact Centre:

1-877-424-1300