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## **Sanitation-Disinfection Basics**

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Disinfection refers to the reduction of pathogens (disease causing organisms), while sanitation refers to the quality of cleanliness.

### **Why is disinfection important?**

Reducing the load of pathogens in the environment of your flock will decrease the risk of disease. Disinfectants are chemical agents that can kill pathogens on contact. Cleaning prior to disinfection exposes the pathogens to the disinfectant.

### **How do I disinfect my premises?**

First, clean.

1. Remove all bedding, feed, and manure.
2. Sweep out loose dirt, cobwebs, etc.
3. Scrub all surfaces with a detergent/ disinfectant\*.
4. Rinse all detergent and organic matter from surfaces\*.

\*a high-power sprayer may be helpful

Next, disinfect.

1. Apply the disinfectant.
2. Allow the disinfectant to dry completely.
3. Reapply the disinfectant and allow it to dry a second time (optional).
4. Bed the area with fresh materials and clean, disinfect, rinse, and dry all water and feeding equipment before refilling them.

### **How do I choose a disinfectant?**

The lethal action of disinfectants for various pathogens (viruses, bacteria, fungi, protozoa) depends on the chemical composition of the disinfectant and the make-up of the organism. When choosing a disinfectant, consider these characteristics:

- Cost
- Efficacy (killing efficiency against viruses, bacteria, fungi)
- Activity with organic matter
- Toxicity (relative safety to animals)
- Residual activity
- Effect on fabric and metals
- Activity with soap
- Solubility (acidity, alkalinity, pH)
- Contact time
- Temperature

The relative importance of these characteristics will depend on your individual situation, but efficacy and toxicity to animals are always important concerns. No disinfectant works instantaneously. All require a certain amount of contact time to be effective. Temperature and concentration of disinfectant influence the rate of killing of microorganisms. Using the recommended concentration of disinfectants is important. The activity of many disinfectants improves markedly if the temperature is increased.

All disinfectants are less effective in the presence of organic material, i.e., you can't disinfect dirt. Organic matter interferes with the action of disinfectants by: coating the pathogen and preventing contact with the disinfectant; forming chemical bonds with the disinfectant, thereby making it inactive against organisms; or reacting chemically with and neutralizing the disinfectant. Cleaning before the application of the disinfectant is essential!

**Disinfectants can be divided into the following classes based on their chemical composition:**

- Phenols
- Hypochlorites (chlorine)
- Iodophors (iodine)
- Quaternary ammonium
- Formaldehyde
- Alkali (lye)
- Chlorhexidine (Nolvasan)
- Oxidizing Agents (peroxide)

### **Phenols**

Phenols are coal-tar derivatives. They have a characteristic pine-tar odor and turn milky in water. Phenols are effective antibacterial agents, and they are also

effective against fungi and many viruses. They also retain more activity in the presence of organic material than iodine or chlorine-containing disinfectants. Common uses in commercial animal production units include: hatchery and equipment sanitation, and footbaths. Examples: Lysol, Pine-Sol, Cresi-400, Environ, and Tek-Trol.

### **Quaternary Ammonium**

Quaternary ammonium compounds are generally odorless, colorless, nonirritating, and deodorizing. They also have some detergent action, and they are good disinfectants. However, some quaternary ammonium compounds are inactivated in the presence of some soaps or soap residues, so careful product selection is important. Their antibacterial activity is reduced in the presence of organic material. Quaternary ammonium compounds are effective against bacteria and somewhat effective against fungi and viruses. These compounds are widely used in commercial hatcheries. Examples: Roccal, Germex, Hi-Lethol, San-O-Fec, Warden, and Zephiran.

### **Iodophors**

Iodine compounds are available as iodophors, which are combinations of elemental iodine and a substance that makes the iodine soluble in water. They are good disinfectants, but do not work well in the presence of organic material. Iodophors are effective against bacteria, fungi, and many viruses. In hatcheries, iodine is used on equipment and walls, and for water disinfection. Iodine is the least toxic of the disinfectants discussed here. Many iodine products can stain clothing and porous surfaces. Examples: Betadine, Iofec, Isodyne, Losan, Tamed Iodine and Weladol.

### **Hypochlorites**

Chlorine compounds are good disinfectants on clean surfaces, but are quickly inactivated by dirt. Chlorine is effective against bacteria and many viruses. These compounds are also much more active in warm water than in cold water. Chlorine solutions can be somewhat irritating to skin and corrosive to metal. They are relatively inexpensive. Examples: Clorox, Chloramine-T, and Halazone.

### **Oxidizing Agents**

Hydrogen peroxide and other oxidizing agents, like peracetic acid and propionic acids or acid peroxygen systems are used in commercial poultry operations. They are active against bacteria, bacterial spores, viruses, and fungi at quite low concentrations.

## **Natural Disinfecting Agents**

The natural forces that reduce the pathogen load in the environment are important and can often be used to our advantage. These include sunlight, heat, cold, drying (desiccation) and agitation. The ultraviolet rays of sunlight are tremendously potent in killing microorganisms. This is very helpful outside of buildings, but unfortunately the ultraviolet rays can't pass through glass or roofs or dust. Drying from fresh air and wind will also kill pathogens, particularly when they are exposed in the process of cleaning. In soil, microorganisms that do not cause disease (nonpathogenic bacteria and fungi) produce substances that inhibit the growth or kill pathogenic organisms. Extremes of temperature (below freezing or above 85°F) will kill microorganisms, although susceptibility to temperature changes varies widely.

### **How do I disinfect my drinking water?**

Chlorination is commonly used as a disinfectant for drinking water at a concentration of 3 parts per million (ppm). Concentrations up to 10 ppm have been reported to be well-tolerated by chickens. Five ppm are required for slime control. Chlorination can be done by various methods, however, liquid sodium hypochlorite is the most practical. Household bleach is diluted sodium hypochlorite. Products vary from 5 to 15 percent sodium hypochlorite. Clorox is about 5%.

### **Preparing a Stock Solution**

For water chlorination add 1 ounce of Clorox, (or 2 teaspoons of liquid bleach at 15% sodium hypochlorite) to 1 gallon of clean water. A larger batch of stock solution can be made by adding 1 cup of Clorox or 1/3 cup of 15% sodium hypochlorite liquid bleach to 8 gallons of water. Mix in a plastic container that can be sealed shut. A clean plastic garbage can with a lid is suitable.

For slime control, use 1.5 to 2 ounces of Clorox or 3 teaspoons of 15% liquid bleach per gallon of water.

### **Water Chlorination**

Add 1 ounce of either stock solution to 1 gallon of drinking water.

### **Other Tips on Chlorination**

- Organic matter quickly inactivates chlorine. Clean waterers before adding fresh chlorine solution (daily).

- The pH of the water should be below 8.5. The ideal pH for effective chlorination is 6.0-8.0.
- Low temperatures slow disinfection action. Aim for 65°F and above for best results. Reducing temperatures by 18°F will increase necessary exposure 2 to 3 times.
- Water should be chlorinated continuously.
- Hardness (up to 400 ppm) does not effect disinfecting activity.
- Stop chlorination 2 days prior to any vaccination with live virus vaccines or bacterial vaccines via drinking water. Chlorination can be continued 4 hours after completion of vaccination.
- Recommended drinking water chlorination does not significantly alter the nutritional chlorine intake.
- Caution! Concentrated hypochlorite solutions and chlorine gas are corrosive to metals. Keep chlorine solutions away from metal, and especially from electric parts.

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