Disinfection of Swine Barns

A number of important criteria must be considered when selecting an appropriate and effective disinfectant. Disinfectants should:

1. Be free of strong and objectionable odours;
2. Not be corrosive;
3. Not remain strongly toxic after their application nor excessively irritating;
4. Be effective at ordinary temperatures when diluted with water, and readily mix with water;
5. Be packaged in such a form and concentration that they are easy to transport, mix and economical to use; and
6. Have a high fast-acting antimicrobial potency even in heavily contaminated areas.

A single disinfectant rarely fulfills all of these criteria and the choice of disinfectant must be based upon the inter-relationship of factors such as type of surfaces to be cleaned, mechanical or scrubbing action occurring, and a knowledge of the micro-organisms that are causing a risk of disease.

The following is a brief description of several of the more widely used disinfectants.

The effectiveness of all of the disinfectants discussed here is greatly improved by a thorough pre-cleaning of all surfaces with a high pressure sprayer with a good detergent.

In order to appropriately discuss the subject of disinfection, a brief definition of terms is necessary. Sterilization is the use of a physical or chemical procedure to destroy all forms of microbial life. Disinfection is generally a less lethal process in that bacterial endospores are often not inactivated without very long exposure to highly concentrated disinfectant chemicals. An antiseptic is defined as a germicide that is used on living tissue for the purpose of inhibiting or destroying micro-organisms. Some germicides can be used both as disinfectants and as antiseptics.

**Formaldehyde** can be used as a fumigant to decontaminate all surfaces of a building, if that building can be tightly sealed. It has a broad spectrum of activity and is highly effective, however it must be used carefully due to the irritating fumes and potential explosiveness. The facility must be completely depopulated. Paraformaldehyde, a solid polymer, is heated on an electric pan to 204C, producing formaldehyde gas. Use 5 gm per cubic meter of building.

The electricity for the heating pan needs to be controlled from outside the building and the building must be sealed for 24 hours. Do not enter until it has been thoroughly ventilated. Formaldehyde gas is one of the few agents effective against coccidiosis and cryptosporidiosis. Other ways to produce the fumigant includes aerosolizing a 20% solution of formalin at 10 litres per 1000 m3 of space or reacting potassium permanganate (620 gm) with formalin (1240 ml) for each 100 m3 of space. The building should be at about 20oC and all surfaces should be wet down immediately prior to fumigation so the relative humidity is 80 - 90%, but do not leave pools of water which will absorb the formaldehyde.

**Chlorine (Bleach)** is inexpensive and widely used as a disinfectant. Hard water does not interfere with activity but surfaces soiled with organic material consumes the chlorine rendering it ineffective. It can be corrosive to some surfaces. Decomposition occurs rapidly in warm temperatures. It should never be used in conjunction with formaldehyde or other acids. Surfaces should be thoroughly cleaned of organic material before using chlorine. A 1:10 dilution of household bleach (5.25% sodium hypochlorite)
is adequate for most disinfectant needs including being sporidal.

**Quaternary Ammonium Compounds:** Significant advances in the development of fourth and fifth generation chemicals and combinations thereof, have broadened the spectrum of bio-cidal activity, and increased their effectiveness in presence of organic material. They are just as efficacious as other disinfectants for sanitation of non-porous hard surfaces and a highly desirable feature is the cleaning ability of the detergent like activity. While they have good bactericidal, viricidal and fungicidal activity, they are not sporidical. Residual chemical has little toxicity for animals.

**Phenolic Disinfectants** are widely used. Cresol and chlorophenol are useful for disinfecting dirty surfaces because they are not inactivated by organic matter. However, bacterial spores are resistant. The phenolics are generally not compatible with detergents and often a combined product would precipitate in hard water. Phenolics are highly toxic and leave lingering odors.

**Hydrogen Peroxide** is considered to be an oxidant disinfectant and would include others such as ozone, and potassium permanganate. Hydrogen peroxide must undergo a complex chemical reaction, not fully understood, forming highly reactive hydroxyl radicals which attack cell membranes. Commercially available preparations of 3% hydrogen peroxide are relatively stable and effective when used on inert surfaces, but contact must occur for as long as 20 minutes to have anti-fungal activity. Indications are that concentrations need to be in the 10-25% range, with a longer contact time to be sporidical. Hydrogen peroxide would be inappropriate for disinfection of large surface areas which could not be submerged in the solution.

**Virkon:** This is a trade name of a newer disinfectant/cleaner containing potassium monopersulfate as the active ingredient. It has a wide spectrum of viridical, bacteridical, and fungidical activity due to the strong oxidizing system of activity. The surfactant and organic acid components enhance this affect. Virkon is sold as a powder and needs to be mixed fresh prior to use. When used in a foot bath or for other purposes, diluted Virkon remains stable for only two weeks. It is not corrosive, and has a low toxicity. It can be applied manually, sprayed or fogged in a premises occupied at the time. Contact of the powder to skin or eyes or inhalation of the powder must be avoided. It has good detergent properties as well, however a thorough pre-cleaning is still the best prior to fogging. Fogging equipment is available from the manufacturer. Virkon is widely used in the UK to wash down the sows prior to going to the farrowing crates. Normally, a 1% solution is used and is prepared by mixing 10 gms of powder to 1 litre of water.

**Alcohols** need to be of a concentration of 70% or greater. They evaporate rapidly resulting in very short contact times, as well as lack the ability to penetrate residual organic material. Small tools to be disinfected need to be pre-cleaned then totally submerged for 10 minutes. Alcohols are often used as antiseptics on the skin prior to surgery.

**Other:** Chemicals such as chlorhexidine, iodine, and iodophors are primarily used as antiseptics (used on skin to inhibit organisms). Iodine compounds lack sporidical activity.

The application of some of these disinfectants may mean the careful calibration of high pressure washer equipment in order to achieve the desired concentration.

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**Addendum regarding internal helminth (worm) parasites:**

The major mod of transmission of worm parasites is via contamination of food or the environment with infected feces. Eggs of ascarid worms for example, stick to concrete surfaces and the usual disinfectants used on farms do not kill these eggs. The best method of decontamination is a thorough cleaning with detergent and steam.

The following is a summary of the steps to properly clean and disinfect a premises:

1. All manure, litter, and unused feed should be removed.
2. All surfaces should be thoroughly cleaned with a high pressure (preferably steam) washer with a good detergent, including feeding utensils.
3. All surfaces should be sprayed with a liberal amount of appropriate disinfectant.
4. In some cases, it may be necessary to rinse the disinfectant off all surfaces.
5. If the premises cannot be adequately disinfected by spraying, consideration should be given to fumigation.
6. Allow the facility to dry and remain vacant for several days before restocking.

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