Effective Selection of Disinfectants in Swine Barns: Biosecurity Best Practices

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TAKE HOME MESSAGES:

1. Pathogens survive on barn surfaces even when they look clean, so disinfectant choice matters.
2. The right disinfectant depends on pathogen coverage, surface compatibility, and barn conditions.
3. Success comes from correct application and validation, not just product selection.

Why Clean and Disinfect?

Throughout the production cycle of a swine barn, surfaces may visually appear clean, but pathogens such as porcine reproductive and respiratory syndrome virus (PRRSV), porcine epidemic diarrhea virus (PEDV), E. coli, and Salmonella can persist on floors, mats, feeders, waterers, walls, and equipment. These microorganisms, if not eliminated between groups of animals within a barn, can infect later groups, resulting in reduced growth, poorer feed efficiency, and economic losses. Although there are many other factors to consider such as feed trucks and footwear that may transport disease, it's important to consider the barn's environment as a reservoir of disease. For this reason, the effectiveness of the sanitation program is critical, and even more so the selection of the disinfectants chosen to implement.[1]

Along with disinfectant selection, it's important to hit every step of a cleaning procedure. Removing organic matter and pre-soaking both set up the disinfectant to do it's job more efficiently, given there's less interruption between the chemical and surface. More information is available in a corresponding factsheet to further detail the important steps of this process. Ensuring the following steps are conducted is the key to giving a disinfectant the best chance it can have at doing its job.

1. Manure, litter and feed must be removed.
2. Pre-soaking.
3. Power washing using high pressure and temperature water.
4. Application of selected disinfectant.
5. Allow facility to dry and stay empty for correct amount of time, prior to restocking.

Choosing the Right Disinfectant

There are several important factors to consider when selecting a disinfectant, but the process gets easier once pathogens in the barn are known. Different pathogens– bacteria, fungi, and prions – respond differently to disinfectants.

Selecting a disinfectant starts with considering pathogen coverage. Although targeting a single organism might be more effective during specific disease challenges such as PRRSV or PEDV, considering a broad-spectrum disinfectant is more practical when protecting against multiple organisms. Even so, the choice of which disinfectant to use is situational to each farm.[2]

Surface compatibility is another key factor. Some disinfectants may work well on concrete, but if transitioned to metal or plastic, it can damage different surfaces. Additionally, contact time and environmental conditions are different for every product. The minimum exposure period correlates directly to performance which makes temperatures, humidity, and organic material key factors to consider.

For more information covering the disinfectant classifications, see Table 1 below, provided by Iowa State University.

Research Findings

Scientific studies consistently show that detergent pre-soak significantly lowers microbial loads before chemical disinfectant application.[4] Using a detergent can improve the effectiveness of sanitation and importantly help break down biofilms produced by bacteria but also can help increase the speed and ease of barn washing.

Antimicrobial Spectrum of Disinfectant Classes

This table provides general microbial spectrums for disinfectant chemical classes. Antimicrobial activity and characteristics vary with formulation and concentration.

Always read and follow directions on the product label.

Most susceptible → Most resistant: General susceptibility of microorganisms to chemical disinfectants

Disinfectant Class	Acids	Alcohols	Aldehydes	Alkalis	Chlorine Compounds	Peroxygen Compounds	Phenols	Quaternary Ammonium Compounds
mycoplasmas (e.g., *M. gallisepticum, M. bovis*)	+	++	++	++	++	++	++	+
enveloped viruses (e.g., coronavirus, herpesvirus, influenzavirus)	+	++	++	+	+	+	+/-	+/-
gram-positive bacteria (e.g., *Staphylococcus, Streptococcus*)	+	++	++	+	+	+	++	++
gram-negative bacteria (e.g., *Salmonella, E. coli*)	+	++	++	+	+	+	++	+ [G]
vegetative fungi (e.g., *Candida, Aspergillus*)	+	+	+	+	+	±	+	+
fungal spores (e.g., *Trichophyton, Microsporum*)	+/-	+/-	+	+	+	+/-	+	+/-
non-enveloped viruses (e.g., parvovirus, picornavirus, calicivirus)	– [A]	–	+	+/-	+	+/-	–	–
mycobacteria (e.g., *M. bovis, M. paratuberculosis*)	–	+	+	+	+	+/-	+/-	–
protozoal oocysts (e.g., *Cryptosporidium, Giardia*)	–	–	–	+/- [D]	–	–	+/- [E]	–
bacterial endospores (e.g., *Bacillus* spp., *Clostridium* spp.)	+/-	–	+/- [C]	+/-	+	+/- [F]	–	–
prions (e.g., BSE, scrapie, CWD)	– [B]	–	– [B]	– [B]	– [B]	– [B]	–	–

Table legend: ++ = highly effective; + =effective; +/- =varies with product; – = (no/limited) activity; N=no information available

A. FMD virus is susceptible to acids, aldehydes, alkalis, peroxygens
B. high concentrations of some disinfectants can be effective
C. formaldehyde is sporicidal; glutaraldehyde is not
D. ammonium hydroxide only
E. some have activity against coccidia
F. peracetic acid and hydrogen peroxide are sporicidal
G. QAC are generally not effective against *Pseudomonas*

The Center for Food Security & Public Health
Iowa State University

Data compiled from: Maillard JY. 2013. Factors Affecting the Activities of Microbiocides. IN: Fraise AP et al. (eds). *Russell, Hugo & Ayliffe's Principles and Practice of Disinfection, Preservation and Sterilization*, 5th ed. 2013; McDonnell G. 2020. Microorganisms and resistance. IN: *Block's Disinfection, Sterilization, and Preservation*, 6th edition; Quinn PJ et al. Disinfection and biosecurity in the prevention and control of disease in veterinary medicine. IN: *Block's Disinfection, Sterilization, and Preservation*.

For more information on disinfection in animal health settings, visit the CFSPH disinfection website.

Table 1: Susceptibility of Disease Pathogens to Different Disinfectant Classes.[3]

A biosecurity assessment performed in Europe revealed major gaps in practice: many farms implement cleaning and disinfection, yet very few validate the outcomes following these procedures. Low-cost validation tools such as testing for adenosine triphosphate (ATP) on environmental surfaces can help bridge this gap to validate disinfectant selection and techniques.[5]

During the summer of 2025, a disinfection trial was conducted at the Kansas State University Swine Enteric Health Research Center to evaluate the effectiveness of four disinfection treatments. A luminometer was used to measure surface ATP levels in relative light units (RLU) as an indicator of bacterial presence after cleaning. The trial aimed to determine which treatment most effectively reduced bacterial load on surfaces, underscoring that product selection can't be overlooked. Within this study, it was found that hot water pressure washing with disinfection using Virkon (Lanxess Corporation, Pittsburgh, PA) resulted in the lowest surface ATP levels. The use of surface ATP residues may be a quick, cost-effective method to quantify the efficacy of sanitation procedures to remove organic residues from barn surfaces. to quantify the efficacy of sanitation procedures to remove organic residues from barn surfaces.

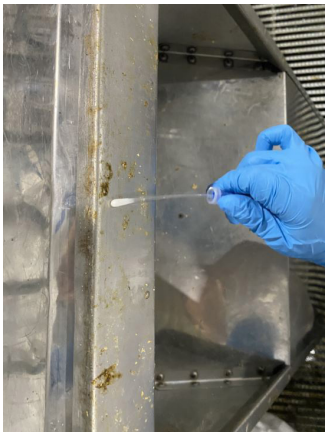

Figure 1. Swabbing of a feeder during KSU disinfection trial.

Practical Implications & Recommendations

The first step in selecting a disinfectant is understanding the pathogens present in the herd. Veterinary diagnostics can help identify which organisms are relevant, this information can then be used to guide product choice. In most systems, a broad-spectrum disinfectant is the best starting point, while targeted products can be layered in when a specific challenge arises.

Once a product is selected, label guidelines should be followed closely for concentration requirements,

temperature thresholds, minimum contact times, and specific surface information. Staff training is essential, ensuring products are mixed and applied correctly. This investment in training is just as important as investing in the chemistry being used, especially in harder to clean areas such as the feeder lips that require more attention to detail to not only get organic material removed from, but also bacteria. Ultimately, the best disinfectant is one that matches the specific needs and risks, fits a barn's environment, and is used correctly. Once a product is selected, label guidelines should be followed closely for concentration requirements, temperature thresholds, minimum contact times, and specific surface information. Staff training is essential, ensuring products are mixed and applied correctly. This investment in training is just as important as investing in the chemistry being used, especially in harder to clean areas such as the feeder lips that require more attention to detail to not only get organic material removed from, but also bacteria. Ultimately, the best disinfectant is one that matches the specific needs and risks, fits a barn's environment, and is used correctly.

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