INVESTIGATIONS INTO OPTIMAL WASHING AND DISINFECTION TECHNIQUES FOR PIG PENS

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Washing of pens or barns is a routine part of pig production. The reasons are numerous, but the main one is that washing removes bacteria, viruses and parasites left behind from the previous batch of pigs. Most diseases are dose dependent; meaning, the more pathogens pigs are exposed to, the sicker they will get. Washing the pens reduces the number of disease causing organisms and so the animals grow better and are healthier. In Table 1 below are the survival times of some common pig pathogens. The length of survival is dependent on degree of initial contamination, protection by organic matter and exposure to drying and sunlight (Hurnik, 1997). Generally, warm temperatures, drying and sunlight will kill pathogens, and moisture, darkness and cold (especially freezing) will preserve them.

Table 1. Survival times of common pig pathogens.

Agent	Survival in Environment
Mycoplasma Hyopneumoniae	Up to 7 days in organic matter
Actinobacillus Pleuropneumoniae	Few days in organic matter
Bordetella Bronchoseptica	
Pasteurella Multocida	8 days in water 6 days in liquid manure
Hemophilus parasuis	Short
Streptococcus suis	25 days @ 9 ^{o}C 100 days @ 0 ^{o}C
Salmonella sp	Years in manure, 115 days water 120 days in soil
Serpulina Hyodysenteriae	61 days @ 5 ^{o}C 7 days @ 25 ^{o}C
Lawsonia intracellularis	?
E coli	11 weeks in manure
PRRSv	3 weeks in organic matter 11 days in water
Pseudorabies virus	18 days on steel, manure 2 days, urine 14 days, well water 7 days,
TGE/PRCV	Low summer, stable when frozen
Influenza virus	24 - 48 hours
Ascaris suum	Years

Cleaning and disinfection, while critical to disease prevention, have not been given as much analysis as they could. Of all the chemicals used inside pig buildings, disinfectants are probably the most potentially hazardous. Listed below are the common disinfectants used in pig production and their characteristics (Table 2).

Table 2. Properties of common disinfectants (Linton et al., 1987).

Disinfectant	Range of Activity	Toxicity
Acids	Bacterial spores, vegetative cells, some viruses	Corrosive
Formaldahyde/ Gluteraldehyde	Bacterial spores, vegetative cells, viruses, fungi, acid-fast bacteria	Potential carcinogen
Iodines	Bacterial spores, vegetative cells, viruses, fungi, acid-fast bacteria	-
Chlorines	Bacterial spores, vegetative cells, viruses, fungi, acid-fast bacteria	-
Hydrogen Peroxide	Vegetative cells, some viruses	_
Phenols, cresols	Vegetative cells, fungi, acid-fast bacteria, some enveloped viruses	Accumulates in body, neurotoxic
Quaternary Ammoniums	Vegetative cells, Gram positive bacteria, fungi, acid-fast bacteria, enveloped viruses	Non-toxic

Disinfectants may be sold in combinations and sometimes with soaps which will improve their activity. It is critical to follow directions and safety warnings. Some disinfectants such as chlorines may react with other disinfectants, and should not be mixed. This paper will present findings from some trials we have done to evaluate washing and disinfection methods.

Cleaning of a barn is of critical importance as no disinfectant will work in an unwashed barn. Hot water pressure washers offer the use of hot water for washing which has the potential of cleaning more efficiently, however they are more expensive and require more energy and maintenance. Presoaking the pens is used by some producers to help with the washing process which increases the washing time and may increase the water requirements. The use of soap is suggested because it breaks down the biofilm and waxy residues which water alone will not remove (www.cqa-aqc.ca/downloads/producer_manual/PMD3eng.pdf). This paper will describe washing pig pens in a commercial finishing barn and compare the use of hot water to cold, presoaking the pens prior to pressure washing, and the use of soap under Canadian conditions with the aim of providing information to make washing a more efficient process.

EXPERIMENTAL DESIGN

20 pens were washed alternating hot water, cold water or a soap and the study was repeated with all the pens presoaked with water before beginning the washing process. All pens were of equal size (9'x22') fully slatted with one two space wet-dry feeder in each pen. All the pens were dirty from the previous fill of pigs and required washing and disinfection prior to

placement of the next group of pigs. The time required to wash each pen was recorded. Once the pens were washed and allowed to dry one of two disinfectants was applied and compared to four pens which were washed only. The cleanliness was measured with a commercial sanitizing test kit (www.millipore.com/catalogue.nsf/docs/MTSK10025).

The pens were filled with 9 week old feeder pigs from one source and placed on a common diet. All pigs were weighed on entry (9 weeks of age) and on marketing.

RESULTS

Table 3. Average wash time per pen with varied washing protocols.

WASH PROCEDURE	Time to wash pen (minutes)	Difference (Minutes)	Time Savings %
Cold Water No Soap No Presoak	68.03	0	0
Cold Water Soap	59.80	-8.23	12.1
Cold Water Presoak	41.39	-26.64	39.1
Cold Water Presoak Soap	36.38	-31.65	46.5
Hot Water No Soap No Presoak	52.61	-15.42	22.6
Hot water Soap	46.24	-21.79	32.0
Hot Water Presoak	32.01	-36.02	52.9
Hot water Presoak Soap	36.81	-31.22	45.9

Table 4. Bacterial swab counts after washing and disinfection.

Disinfectant	Number of bacterial colonies per swab
None	28.4[a]
Disinfectant 1 Hydrogen Peroxide	13.2[b]
Disinfectant 2 Quaternary Ammonium	19.6[a,b]

Table 5. Pig growth rate.

Washing Method	Days to Market 25 kg to 110 kg
No Disinfectant	98.14 [a]
Disinfectant 1	95.40 [b]
Disinfectant 2	95.11 [b]
Soap Only	95.59 [b]
Soap and Disinfectant 1	92.96[c]
Soap and Disinfectant 2	92.66[c]

DISCUSSION AND CONCLUSIONS

Overall, the use of hot water decreased washing time about 22%, except in the case of presoaked pens where there was no decrease in wash time compared to cold water. Also, while hot water was more comfortable to apply, it created a fog that made it harder to see. Presoaking the pens with water to loosen manure appeared to cut washing time almost in half. The use of a soap decreased washing time about 8 minutes a pen (about 12%).

The use of Disinfectant number 1, a Hydrogen Peroxide based product, was able to reduce bacterial load of the pens compared to undisinfected pens. This indicates that to complete the washing process, certainly the use of a disinfectant is beneficial. There may be some variation due to choice of disinfectant.

The use of hot water had no effect on growth rate, but both disinfectants and the use of soap did. While the use of soap did not appear to lower bacterial counts, it did improve the performance of the pigs. The sanitation swab test kits measure only some bacteria, and would not detect difference in viral load or detect difficult bacteria to grow such as *Lawsonia intracellularis* which have a known effect on pig growth and efficiency.

Soap acts like a degreaser, and looses dirt and dissolves the waxy biofilm that can coat pen floors and walls. The biofilm can protect bacteria and viruses from washing and disinfection. The biofilm can be hard to remove except with a soap, which helps dissolve it.

It appears that washing and disinfection protocols can have a significant impact on productivity. Where possible, producers can evaluate their washing methods to see if they can be optimized.

LITERATURE CITED

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