Peracetic Acid

Livestock

Identification

Chemical Name(s):
peroxyacetic acid
ethaneperoxic acid

Other Names:
PAA, per acid, periacetic acid

CAS Number:
79-21-0

Other Codes:
NIOSH Registry Number: SD8750000
TRI Chemical ID: 000079210
UN/ID Number: UN3105

Summary Recommendation

Synthetic / Non-Synthetic:	Allowed or Prohibited:	Suggested Annotation:
Synthetic (consensus)	*Allowed (consensus)*	For facility and processing equipment sanitation (barns, milking parlors, processing areas). Direct application to animals may be made only in the event of documented injuries or illnesses, under the direct supervision of a licensed veterinarian. *(consensus)* From hydrogen peroxide and fermented acetic acid sources only. *(Not discussed by livestock reviewers--see discussion of source under Crops PAA TAP review.)*

Characterization

Composition:
$C_2H_4O_3$. Peracetic acid is a mixture of acetic acid (CH_3COOH) and hydrogen peroxide (H_2O_2) in an aqueous solution. Acetic acid is the principle component of vinegar. Hydrogen peroxide has been previously recommended by the NOSB for the National List in processing (synthetic, allowed at Austin, 1995).

Properties:
It is a very strong oxidizing agent and has stronger oxidation potential than chlorine or chlorine dioxide. It is liquid, clear, and colorless with no foaming capability. It has a strong pungent acetic acid odor, pH is acid (2.8). Its specific gravity is 1.114 and weighs 9.28 pounds per gallon. Stable upon transport.

How Made:
Peracetic acid (PAA) is produced by reacting acetic acid and hydrogen peroxide. The reaction is allowed to continue for up to ten days in order to achieve high yields of product according to the following equation.

$$\underset{\text{acetic acid}}{CH_3\text{-}\overset{\overset{O}{||}}{C}\text{-}OH} + \underset{\text{hydrogen peroxide}}{H_2O_2} \longrightarrow \underset{\text{peroxyacetic acid}}{CH_3\overset{\overset{O}{||}}{C}\text{-}O\text{-}OH} + H_2O$$

Due to reaction limitations, PAA generation can be up to 15% with residual levels of hydrogen peroxide (up to 25%) and acetic acid (up to 35%) with water up to 25%. Additional methods of preparation involve the oxidation of acetaldehyde or alternatively as an end product of the reaction of acetic anhydride, hydrogen peroxide, and sulfuric acid.

Additional methods of preparation involve the oxidation of acetaldehyde (Budavari, 1996). Another method involves the reaction of tetraacetylethylenediamine (TAED) in the presence of an alkaline hydrogen peroxide solution (Davies and Deary, 1991). These sources appear to be used more frequently in pulp, paper, and textile manufacture (Pan, Spencer, and Leary, 1999).

Specific Uses:

Peracetic acid is primarily used to clean equipment, milking parlors, barns, stalls, and veterinary facilities. It is used as a topical disinfectant on animals, for example, to treat papillomatous digital dermatitis (Hernandex, Shearer, and Elliot, 1999). Peracetic acid is also used in the handling and processing of livestock products as a dairy equipment sanitizer, as a meat and poultry disinfectant (Kurschner and Diken, 1997), and as an egg wash.

Action:
The primary mode of action is oxidation. PAA disinfects by oxidizing the outer cell membrane of vegetative bacterial cells, endospores, yeast, and mold spores. (See Question 2 under OFPA criteria for more information).

Combinations:
Peracetic acid usually occurs with hydrogen peroxide and acetic acid in an aqueous solution. Stock commercial preparations usually contain a synthetic stabilizer, such as 1-hydroxyethylidene-1,1-diphosphonic acid (HEDP) or 2,6-pyridinedicarboxylic (dipicolinic) acid to slow the rate of oxidation or decomposition (Kurschner and Diken, 1997).

Status

OFPA
Falls under Production Aid and Medication (7 USC 6517(b)(1)(C)(i)).

Regulatory
External / topical use as an antimicrobial covered under EPA regular section 3 registration (40 CFR 152.25(a)). Not included separately in 21CFR for feed use, but co-products acetic acid (21 CFR 582.1005) and hydrogen peroxide (21 CFR 582.1366) are listed as FDA GRAS in animal feeds.

EPA/NIEHS/Other Appropriate Sources
OFPA 6518 (l)(1) states, "In establishing the National List or proposed amendments to the National List, the Board shall review available information from the Environmental Protection Agency, the National Institute of Environmental Health Studies, and such other sources as appropriate, concerning the potential for adverse human and environmental effects of substances considered for inclusion in the proposed National List."

EPA: It is on EPA's Extremely Hazardous Substances list (US EPA, 2000).

NIEHS: See National Institute of Environmental Health (NIEHS) attachment.

Other sources: See New Jersey Department of Health and Senior Services attachment.

Status Among U.S. Certifiers
Variable. Some appear to allow all livestock facility cleaners, equipment disinfectants, and/or animals drugs with restrictions. Others have a list of allowed materials. No standards examined explicitly allow PAA for livestock use.

Historic Use
Acetic acid and hydrogen peroxide both have a longer history of use in livestock production than commercial preparations of peracetic acid, but the substance has, in effect, been used by farmers who combine vinegar and peroxide in a cleaning solution. Peracetic acid is a relatively recent development, but has been used to clean stalls and to disinfect livestock, particularly dairy cattle.

International
Codex Alimentarius allows chemical allopathic veterinary drugs or antibiotics to be used "under the responsibility of a veterinarian" if the use of alternative methods are "unlikely to be effective in combating illness or injury." Withholding periods are required to be double of those required by law with a minimum of 48 hours (Codex, 2000). The European Union has a similar standard (EC 1999). European Commission Regulation (EC) No. 1433/96 amended Annex II of EC 2377/90 to establish maximum residue limits of peracetic acid in foodstuffs of animal origin. IFOAM allows conventional medicines "when no other justifiable alternative is available" (IFOAM, 2000).

OFPA 2119(m) Criteria

1. *The potential of such substances for detrimental chemical interactions with other materials used in organic farming systems.*
   This material is a strong oxidizing agent. It can react violently with acetic acid anhydride, olefins (e.g., mineral oil), and organic matter (NTP, 2000). PAA works synergistically with hydrogen peroxide, decreasing the amount of

hydrogen peroxide needed to reduce microorganisms (Lambert et al., 1999).

2. *The toxicity and mode of action of the substance and of its breakdown products or any contaminants, and their persistence and areas of concentration in the environment.*
Toxicity high via oral for guinea pigs; moderate via oral and dermal routes for rats and rabbits (Sax, 1979). Skin and Eye Irritation Data: skin-rabbit 500 mg open SEV; eye-rabbit 1 mg SEV (NTP, 2000). An experimental neoplastinogen (tumor-causing agent) via dermal route (NTP, 2000). It is on EPA's Extremely Hazardous Substances list (US EPA, 2000).

Peracetic acid is an irritant of the skin, eyes, mucous membranes, and respiratory tract (NTP, 2000; Budavari, 1996; Lenga, 1985). When heated to decomposition it emits acrid smoke and toxic fumes of carbon monoxide and carbon dioxide. The vapor is heavier than air and can travel a considerable distance to a source of ignition and flash back (NTP, 2000). Breakdown products are acetic acid (same acid found in vinegar at 5% level) and hydrogen peroxide that breads down to O_2 and H_2O.

The primary mode of action is oxidation. The mechanism of oxidation is the transfer of electrons, therefore the stronger the oxidizer, the faster electrons are transferred to the microorganism and the faster the microorganism is inactivated or killed.

Table 1
Oxidation Capacity of Selected Sanitizers

Sanitizer	**eV***
Ozone	2.07
Peracetic Acid	1.81
Chlorine dioxide	1.57
Sodium hypochlorite (chlorine bleach)	1.36
*electron-Volts	

Therefore PAA has a higher oxidation potential than chlorine sanitizers but less than ozone.

3. *The probability of environmental contamination during manufacture, use, misuse, or disposal of such substance.*
Production from hydrogen peroxide and acetic acid would depend on the process used. Hydrogen peroxide is commonly produced by the electrolysis of water (Kirchner, 1981). Acetic acid may be produced by fermentation (vinegar) or distillation from plant sources. However, acetic acid may also be synthesized by hydrolysis of acetylene or oxidation of acetylaldehyde (Budavari, 1996). Acetylene and acetaldehyde are generally produced from petrochemical sources. The environmental consequences of petroleum production and refining are beyond the scope of this TAP review.

Misuse at the processing level would cause a bleaching out effect on the color of meat and poultry, resulting in loss of quality that could be visually detected. Under normal use and disposal conditions, PAA decomposes into acetic acid, oxygen, and water.

4. *The effect of the substance on human health.*
Peracetic acid is an irritant of the skin, eyes, mucous membranes and respiratory tract (NTP, 2000; Budavari, 1996; Lenga, 1985). When heated to decomposition it emits acrid smoke and toxic fumes of carbon monoxide and carbon dioxide. The vapor is heavier than air and can travel a considerable distance to a source of ignition and flash back (NTP, 2000).

The product is registered for use as a hospital disinfectant and to clean kidney dialysis machines (EPA, 2000).

5. *The effects of the substance on biological and chemical interactions in the agroecosystem, including the physiological effects of the substance on soil organisms (including the salt index and solubility of the soil), crops and livestock.*
The substance is used *because* of its biological and chemical interactions and its physiological effects on microorganisms, including many that are naturally found in a soil environment. Among the model organisms that show significant reductions in populations after exposure to PAA are *Bacillus cereus* (Blackiston et al., 1999); *B. subtilis* (Leaper, 1984; Blackiston et al., 1999; Lindsay and von Holy, 1999); *B. stearothermophilus* (Blackiston et al., 1999); *Clostridium botulinum* (Blackiston et al., 1999); *C. butyricum* (Blackiston et al., 1999); *C. sporogenes* (Blackiston et al., 1999); *Ditylenchus dipsaci* (Hanks and Linfield, 1999); *Enterococcus faecium* (Andrade et al., 1998); *Escherichia coli* (Arturo-Schaan et al., 1996), including *E. coli* O157:H7 (Farrell et al., 1998), *Fusarium oxysporum* (Hanks and Linfield, 1999);

Gluconobacter oxydans (Winniczuk and Parish, 1997), *Lactobacillus plantarum* (Winniczuk and Parish, 1997), *L. thermophilus* (Langeveld and Montfort-Quasig, 1996); *Leuconostoc mesenteroides* (Winniczuk and Parish, 1997); *Listeria monocytogenes* (Mosteller and Bishop, 1993; Restaino et al., 1994); *Pseudomonas aeruginosa* (Restaino et al., 1994; Lambert et al., 1999); *P. fluorescens* (Mosteller and Bishop, 1993; Lindsay and von Holy, 1999); *Saccharomyces cerevisiae*(Winniczuk and Parish, 1997); *Salmonella typhimurium* (Restaino et al., 1994); *Staphylococcus aureus* (Restaino et al., 1994; Lambert et al., 1999); *Streptococcus delbreuckii* subsp *bulgaricus* (Langeveld and Montfort-Quasig, 1996); and *Yersinia enterocolitica* (Mosteller and Bishop, 1993).

The immediate effect against soil organisms would be broad-spectrum and, if mishandled, potentially violent. The toxic effects would be short-lived, and somewhat selective, favoring acid-tolerant and aerobic bacteria. For example, experimental evidence indicates that *Bacillus* spp. would likely be less affected and would recover more quickly than *Clostridium* spp. (Blackiston et al., 1999). However, at least one study indicates no difference in the susceptibility between plasmid-containing *E. coli* strains and those strains that do not contain plasmids (Arturo-Schaan, 1996). The breakdown products--oxygen, water, and acetic acid--are all part of the agroecosystem. Acetic acid is produced in nature as a function of acetobacter species of microorganism found in soil, and is part of the natural carbon cycle (Alexander, 1991).

It may be of benefit to livestock health in certain applications (Hernandez et al., 1999).

Salt Index: The salt index has not been calculated for this substance.

Solubility: Water: 100mg/ml at 19°C. (freely soluble). Also soluble in alcohol.

6. *The alternatives to using the substance in terms of practices or other available materials.*
For teat dips and udder washes, the NOSB has recommended iodine (Orlando, 1995), glycerin, chlorhexidine, and lanolin (D.C., 1999) be on the National List for livestock uses.

For cleaning stables and stalls, there is water, hydrogen peroxide, chlorine solutions, and iodine solutions.

For topical disinfection, copper compounds, hydrated lime, and iodine-based compounds can be used. PAA itself may be an alternative to topical antibiotics (Hernandez et al., 1999).

The TAP and NOSB have reviewed a number of items for crop and/or processing that are commonly used in cleaning livestock facilities. These have not been considered for livestock facilities, including soap, hydrogen peroxide, sodium carbonate, and sodium phosphates (specifically trisodium phosphate). Detergents for crops use were tabled.

7. *Its compatibility with a system of sustainable agriculture.*
Broad-spectrum synthetic biocides are generally considered incompatible with sustainable agriculture. However, proper farm sanitation and the protection of the public health from food-borne pathogens merits special consideration. Substances are needed to clean milking machines and keep livestock facilities from harboring food-borne pathogens. While sustainable systems should minimize the use of such substances, they should not be eliminated unless and until suitable alternatives are found.

TAP Reviewer Discussion

TAP Reviewer Comments

OMRI's information is enclosed in square brackets in italics. Where a reviewer corrected a technical point (e.g., the word should be "intravenous" rather than "subcutaneous"), these corrections were made in this document and are not listed here in the Reviewer Comments. The rest of the TAP Reviewer's comments are listed here minus any identifying comments and with corrections of typos.

Reviewer #1
[Analytical chemist with animal production experience.]
What is animal drug status of PAA?
Listed uses that I've been able to find so far include all aspects of sterilizing equipment and buildings in processing for all manner of produce, dairy, hog operations, etc. and, many listings for fruit, grain and vegetable dips. There are several references to PAA as a sterilant for both processing and livestock byproducts, including manures. Uses on animals

include a variety of internal uses, mostly dealing with uterine infections. So far, I haven't seen a listing for udder wash specifically, although there are several commercial products on the market that include PAA.

EPA defines PAA as an "anti-microbial pesticide" (CFR June 24, 1998). It clearly has more uses than strictly topical, so I don't think it can be defined entirely in that manner. In fact, I can see the need for listings for equipment/barn washes, topical uses, and internal uses.

From the CFR June 24, 1998, EPA declares PAA exempt from the requirement of a tolerance up to 100ppm (EPA, 1998).

[Where do we draw the line between the farm and the processor in dairies?]
With animal operations that include "byproducts" (eggs, milk), it is difficult to define where the farm stops and the processor starts. Maybe the easiest way of doing so is to define the processing as beginning "downstream" of contact with the animal. In other words, milk collection from the cows would be considered "farm", and everything downstream of that would be considered "processing". Certainly the sanitation problems change significantly at that point.

On the farm side, one deals with excreta, feed, animal disease, the animal as pathogen incubator. Once the milk is collected and removed from the presence of the animal, sanitation problems becomes more clearly that of processing (thermophyllic bacteria, mesophyllic bacteria, machine molds, lurking spores, the microherd residing in the product being processed).

The interface in dairy is less clear than in most operations, because of the processing-type equipment used in the milking parlor. However, a pretty clear line can be drawn, if the animal-containing environment is used to define "farm."

Other situations where farm/processor lines are blurred: on-farm washing operations (i.e., dirt off of carrots, stripping cabbage or lettuce and packing for shipping). On-farm drying, cooking, or other preparing operations are far more clearly on-farm processing, and the line is pretty clear between the two.

Further, the processing-type machinery in the milking parlor should be treated as processing equipment, except where it comes in contact with the cow. For instance, cleaning solutions in the teat cups should be compatible with skin contact. Again, this is the animal interface. It would seem appropriate that the rest of the equipment be cleaned by whatever approved processing cleaners necessary.

[What is the appropriate overall approach to cleaning agents on farms?]
I think that the animal contact question might be a good yes/no for farm/livestock use. In most cases, this tends to test out. There are some situations where harsher cleansers might be appropriate (for instance, broiler/layer operations where the chickens are removed and the entire building is sterilized, or periodic cleaning of milking parlors from the bottom up), because the animals are not present. In these cases, there would need to be some certainty that there'd be no residues that would come in contact with the animals when they were returned to the facility.

Areas such as processing sheds, bunkers, storage areas, barns, that come in contact with crops and/or livestock may need periodic rigorous cleanings. It would seem that more aggressive cleaning solutions could be employed during these periodic cleanings as long as all contact with produce or livestock is avoided. However, there should be either no trace cleaner residue, or the cleaner should be listed as OK for direct contact with produce/livestock.

I would agree that the currently approved materials for crops and processors (soaps and peroxide) should generally be OK for livestock. However, anything, including currently approved crops/processing materials should be looked at individually before any specific listing for livestock, due to the possibility of residues of general cleaning or from direct applications; could at the very least cause dermatitis.

[Regarding the OFPA criteria]
1. Potential of explosive reactions with organic and basic materials. Very strong irritant, will burn to third degree on contact. However, solutions are generally sold as pretty dilute solutions. I didn't actually see strong dilutions in any of the livestock products that I perused. The strong oxidizing reaction is the desirable component of this compound; this is what fries the little buggies.

2. Concentrated solution is very toxic in terms of contact, ingestion and inhalation. Irritant and burns. This would be true of undiluted cleaning solutions. There would be some hazard during the dilution process, requiring protective clothing. However, concentrations during actual use are generally very dilute.

Mode of action is strong oxidation.

3. Byproducts are water and acetic acid. Acetic acid is a "weak" acid, and occurs naturally in a variety of situations. The product is moderately unstable, and will break down pretty quickly if a stabilizer isn't included.

Direct consequences of misuse of concentrated solutions could be catastrophic; explosions, serious burns, etc. Indirect consequences are minimal, as breakdown into acetic acid and water happens rapidly.

Proper use should have minimum consequences, due to the dilute nature of the solutions, although the possibility of irritation of mucous membranes and skin is possible. Therefore, good chemical practices should be followed when using PAA.

Manufacture: Acetic acid is a "weak" organic acid; therefore, the potential for harm is significantly lower than the inorganic acids. Fermentation and distillation seem to have low environmental impacts. Hydrogen peroxide mfr seems to be moderately low impact as well. However, acetic acid from petroleum sources may be problematic. Do we need to know from which source the acetic acid comes?

4. Direct: burns, inhalation and ingestion injuries.
Indirect: breakdown products: acetic acid is an irritant, and can cause burns as well.
Minimal secondary effects, as the breakdown products are pretty benign. EPA exempts this product from requiring a tolerance up to 100 ppm.

5. Initially, a strong oxidizer. It's what it's used for. Spills could have nasty initial consequences, until oxidation reactions are complete. All microorganisms, and many "macroorganisms" would be killed outright. Organic matter would be oxidized. After that, there would be some acidification that may need neutralizing, and that would be it.
Acetic acid does occur naturally, just not at those concentrations.

6. Facility and equipment cleaning: High-pressure water, steam, mechanical removal (brushing of residues), chlorine, detergents, TSP. PAA stacks up well in terms of environmental consequences, efficacy.

Udder wash and teat dip: It looks like there are a number of organic acid (lactic, succinic)/sodium salt/glycerine products on the market that might be considered OK for organic use. Iodine and chlorhexadine alone would also be potential irritants. I don't know how they stack up in speed of kill to PAA, but PAA seems to stack up favorably with other products on the market.

Topical sanitation: hydrated lime??? This would seem to me to be really irritating! Don't use along with PAA! Seems a good alternative here, too.

7. In places where thorough sanitation is required, PAA seems to be fairly low impact. It does its job, then breaks down into pretty harmless components. Unlike many other synthetics, it doesn't leave much in the way of footprints. Its biocidal properties are "mechanical," that is, they interfere with cell wall components, rather than metabolization. There are places where broad-spectrum biocides are required, sustainable ag or not. Therefore I think that used properly, PAA can be compatible with sustainable ag.

CONCLUSION:
Peroxyacetic acid appears to be compatible with organic agriculture livestock systems including the following uses:
1. Facility sanitation (barns, milking parlors, processing areas).
2. Processing equipment sanitation (milking machines, transfer tubing, fermentation tanks, milk tanks).
3. Topical antiseptic.
4. Udder wash.
5. As a veterinarian-prescribed uterine wash for various uterine infections.
6. As an ingredient in multiple ingredient solutions for the above purposes, assuming that all of the other ingredients are approved for organic production.

Reviewer #2
[Professor of food science.]
A review of the available literature indicates that peracetic acid is a broad-spectrum biocide that appears to have efficacy as an external parasiticide with anti microbial properties. It is capable of bacteriophage in activation on dairy equipment during processing of cheese whey. Therefore, since peracetic acid is considered as a broad-spectrum disinfectant, it may be used for a number of both on farm and process sanitation-disinfecting operations.

I feel food safety is critically important both at the farm and process level. Recent outbreaks of E. coli 0157:H7 in muscle foods as well as salmonella in milk have elevated the concern of both consumers and government regulatory agencies. Therefore one must take a holistic view of both farm and process sanitizing operations. Since peracetic acid breaks down rapidly to acetic acid, hydrogen peroxide and eventually to O_2 and H_20, overall risk to organic integrity may be minimal when compared to NOSB recommendations of iodine and chlorohexidine that do not break down readily. Therefore use and application of peracetic acid may be more compatible with sustainable agriculture. The overall approach to cleaning and sanitizing agents on farms should be no different than for processors. Risk reduction of food born illness must be a priority, with a focus on maintaining organic integrity. From a sustainability issue, chlorine, phenols, quats, and chloramines pose a much greater risk to organic integrity and to the environment. For example, it is well known that chlorine sanitizers have been shown to form trihalomethane pre-carcinogens and are not used for this reason in many municipal water treatment systems in favor of ozonation. Other sanitizers such as quats, and to a certain degree iodine compounds, are residual and do not break down or are easily removed after application.

Therefore I would like to make the following recommendations:

1. Peracetic acid be approved for on farm sanitizing operations of milking machines, pipes, pumps as well as tanker trucks that haul milk from farm to processor in accordance with CFR title 21.
2. Peracetic acid be approved for direct food contact surfaces in accordance with CFR Title 21 for dairy, livestock facilities, and poultry farms.
3. Peracetic acid should be regulated or used only under the responsibility of a veterinarian to treat external microbiological infections of animals designated for slaughter or for milk producing cows.

SUMMARY

Peracetic acid appears to offer outstanding sanitizing functionality at both the farm and process level. It appears to be compatible with sustainable agriculture and may pose less of a risk to organic integrity when compared to other available sanitizers. It may be used for all on farm and process sanitizing operations in accordance with CFR title 21. Therefore I recommend an allowed (A) status.

For direct treatment of external infections of farm animals (include cows, beef cattle, poultry) its use should be restricted (R) and used only under the direct supervision of a veterinarian as per Codex Alimentarius recommendations.

Reviewer #3

[Veterinarian with substantial ovine (sheep) experience and no direct interest in the product.]

Peracetic acid is a synthetic product, is caustic topically, but is extremely germicidal due to its oxidation action. I would call it bactericidal and virucidal rather than a parasiticide.

I recommend its use as a cleaning agent in barns and in milking facilities and equipment. It appears that this compound breaks down quickly in the environment, so shouldn't be a concern even if it is expelled outdoors in the wastewater. The food safety issue is an important and since the residue appears to be minimal, I don't think there needs to be any distinction with this product whether it is used in barns or on milking equipment; whether these uses are considered farm use or processing use.

I have more of a problem with it as an animal antimicrobial. I am not sure of effectiveness, based on some of the research given. Also, if peracetic acid were to be used at a stronger level than these articles state, the irritation might be greater than the benefits of using it. NOSB has recommended several compounds for teat dips and udder washes that there is more known regarding level of irritation and toxicity. Since there isn't as much known about peracetic acid's use on animals, I have a much harder time recommending it be allowed for use on animals. If there were fewer products recommended, I would be willing to consider its use. Until there is more information about the amount of irritation when being used in farm animals, I'd recommend that it be prohibited.

[OMRI e-mailed this reviewer to ask if there is agreement on the second sentence in the suggested annotation: "Direct application to animals may be made only in the event of documented injuries or illnesses, under the direct supervision of a licensed veterinarian."] This is a GREAT annotation. I felt that to say prohibited was too strong, but wasn't sure what else I could say.

Conclusion

While organic farming is not a food safety claim, it must meet laws and standards to protect the public from risks arising from both microbiological and chemical exposures. The OFPA recognizes the need to exempt synthetic substances to clean equipment. This is an undefined area between production and handling, but is usually thought of as part of the farm by farmers, certifiers, and inspectors. As such, it would fall under the livestock standards. The NOSB has reviewed few materials for use in barns, stalls, stables, and milking parlors, leaving relatively few options for producers. While these are synthetic biocides, there are public health and safety benefits from their use that need tobe considered. Physical methods, such as steam and heat, might be more appropriate, but have their disadvantages. Peracetic acid, while synthetic, might serve a role in cleaning and disinfecting livestock facilities and equipment.

While its use as a topical disinfectant is relatively new, external use appears to have promise to alleviate animal suffering.

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