Keep It Clean

Infection Control and Biosecurity in Veterinary Medicine BY THE NUMBERS

VIROX™ ANIMAL HEALTH

Contents

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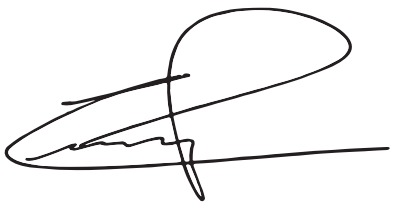
Infection prevention and biosecurity are an essential part of patient care and should play an important role in the daily practice of veterinary medicine. All veterinary practice team members, from veterinarians to kennel attendants, must maximize measures to prevent the spread of infectious pathogens as part of the care they provide to their patients and clients. An effective infection prevention and biosecurity program is an integral part of the One Health Initiative, a movement put into place to protect humans, animals, and the environment from the negative impact of pathogens.

Infectious disease outbreaks are costly and have devastating short- and long-term effects for animal health professionals and animal care facilities. An infection control and biosecurity plan provides an established mechanism to protect against outbreaks and disease transmission, not just between animals but also between animals and those tasked with caring for them. Environmental surfaces, fomites, and medical devices play an important role in the transmission of pathogenic microorganisms, as many of these pathogens can survive on these surfaces for prolonged periods of time. Developing and implementing an effective infection prevention and biosecurity plan requires a committed team trained to execute a clear, sequential set of well-timed tasks, with each member having assigned areas of accountability.

Cleaning and disinfection of environmental surfaces, fomites, and medical devices is a vital part of any facility's infection prevention and biosecurity program. Choosing the right disinfectant can both ensure the overall success of a biosecurity program and have a dramatic impact on facility maintenance costs and employee health. This booklet will guide you in the selection of the ideal disinfectant and assist you in establishing and maintaining proper protocols to prevent the spread of pathogens within your facility.

Developing an infection prevention and biosecurity program can be distilled into seven simple steps:

1. **Clarifying the roles and responsibilities** within your veterinary practice team
2. **Identifying levels of biosecurity risk** for different areas of your facility
3. **Accounting for the mode of transmission** for possible pathogens
4. **Choosing the right disinfectant** for your practice's needs
5. **Training your entire staff** on proper use of the specific disinfectant you choose
6. **Making the disinfectant** you choose readily accessible
7. **Setting up routine quality-control measures**



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A note from AAHA: *AAHA recognizes the need for veterinary professionals to be educated about the most current research and information relative to infectious disease control and biosecurity. AAHA is working with Virox Animal Health to provide you with the most effective advice relative to biosecurity for veterinary practices. This booklet is the first of our communications and educational materials on this subject in the years to come. These materials will empower your practice's infection prevention team to review and improve current protocols on a regular basis. We feel strongly that infectious disease prevention and control is important to veterinary medicine and the health of our pets.*

The Importance of Infection Control and Biosecurity

Comprehensive infection control and biosecurity play an increasingly important role in the daily practice of veterinary medicine.

Veterinary teams already make critical efforts toward infection control. Using standards of practice and other veterinary guidelines, your team already does everything from vaccination to hospitalization, including isolation of infected patients, systematic hand-washing, use of personal protective equipment, and instrument sterilization. Teams also provide education to families with pets and infection surveillance to county, state, and federal disease control officials.

Keeping pets, families, veterinary professionals, and communities safe from pathogens requires a comprehensive approach. Biosecurity in veterinary medicine is part of the One Health concept—it approaches human, animal, and ecosystem health as related, not separate, issues for the future of everyone and everything on the planet.

However, there is one element of infection prevention and control that can be overlooked in the hubbub of a typical day at a veterinary facility: strict and effective cleaning and disinfection.

It's easy to think a practice's cleaning protocols are good enough if you're not seeing the spread of infectious diseases or hospital-associated infections (HAIs). But just one patient catching an infection while at your facility often ends up costing more than using a state-of-the-art disinfectant and proper protocols for prevention. One of the most documented instances of an animal hospital incurring significant financial costs due to the outbreak of an infectious disease is that of a large animal veterinary teaching hospital. Direct costs of approximately $4.12 million resulted from a single large outbreak of salmonellosis, which was attributed to an ineffective infection control program.[1]

In addition, the potential costs to clients also should not be overlooked. Let's take canine parvovirus and canine influenza as examples. In addition to patient suffering and the emotional stress placed on families, clients could face significant treatment costs if their pet picks up either of these viruses at the hospital:

- Average cost of parvovirus per canine: $1,467
- Most expensive case of canine parvovirus: $11,063
- Average cost of influenza per canine: $534
- Most expensive case of canine influenza: $5,147[2]

Careful evaluation of disinfectants and implementation of proper cleaning practices can prevent these kinds of infections and the added costs associated with treating them.

A Brief History of Disinfectants

Disinfection inside an active veterinary practice might seem like the lowest-tech part of a high-tech job, but disinfectant technologies continue to become more advanced. If thinking of disinfection only brings to mind chlorine bleach, you might be surprised at how disinfectants have changed over the past 100 years.

Each kind of disinfectant—single active ingredient or combined chemicals—carries its own advantages and disadvantages. Chlorine bleach, which was used back in the 1920s, offered broad germicidal efficacy, but was also unstable, a poor cleaner, and came with health hazards for staff and patients.

DISINFECTANTS BY DECADE: PLUSES & MINUSES

1920s

Chlorine
- (+) broad efficacy
- (–) unstable, poor cleaner, health hazards

1940s

Alcohol
- (+) safe
- (–) slow acting, poor cleaner

1950s

Phenolics
- (+) kills TB
- (–) health hazards

Biguanides
- (+) broad efficacy
- (–) human and environmental health hazards

1960s

Aldehydes
- (+) broad efficacy
- (–) health hazards, environmental issues

1970s

Hydrogen Peroxide
- (+) safe, sustainable
- (–) unstable

Organic Acids
- (+) safe, sustainable
- (–) limited efficacy

QUATs
- (+) broad efficacy, safe
- (–) slow acting

1990s

Peracetic Acid
- (+) fast acting
- (–) health hazards

2000s

Accelerated Hydrogen Peroxide
- (+) broad efficacy, fast acting, safe, sustainable

(+) indicates the pros of using this type of disinfectant, (–) indicates the cons of using this type of disinfectant

So-called quats (quaternary ammonium compounds), which were first introduced in the 1970s and are still widely used today, work great on influenza, *Salmonella, Staphylococcus*, and fungi, but don't work as well on heartier nonenveloped viruses like canine parvovirus. Quats also require longer disinfection contact times (the length of time the surface needs to remain wet to be disinfected). Furthermore, the active agent in quats is known to bind to cotton cloths, which causes the disinfectant chemical to stay on the cloth rather than transfer onto the surface being wiped.

In addition, research has shown that some disinfectant chemistries can leave behind a sublethal concentration of the active ingredient after evaporation. This has the potential to lead to antibiotic resistant, and potentially chemical-resistant, organisms. We haven't seen chemical-resistant strains in the real world the same way we see antibiotic resistance, however, the potential for chemical resistance has been noted in research settings.

Jumping to the 1990s, when contact time became more of a concern, we saw the introduction of disinfectants using peracetic acid, which is much faster acting, but we find cases of healthcare workers developing occupational asthma and even chemical pneumonia.

Chemical safety is an important issue as work-related asthma accounts for approximately 16% of the total reported asthma cases in the United States.[3]

Some products, like triclosan (from the phenolics category of disinfectants), have already been banned from consumer cleaning products because of links to cancer and endocrine disruption in people. Despite its dangers, triclosan is still used in commercial cleaning products.

Increasing consumer awareness and changing expectations about disinfectants drives innovation in the chemical technology space. People, including veterinary practice staff members, want products that work well but don't put anyone at risk. For example, a children's hospital in Toronto learned its cleaning staff members were avoiding the use of a new disinfectant selected by the hospital leadership, fearing it was dangerous to the young patients.[4] In fact, the new product had been chosen specifically for both its efficacy and safety around kids. Once hospital leadership communicated the safety and efficacy of the disinfectant, compliance among hospital staff rose dramatically.

In the early 2000s, accelerated hydrogen peroxide (AHP) came onto the market—first in Canada, then in the United States. Human hospitals, concerned with costly hospital-associated infections, and the cruise industry, whose customers can have an expensive vacation ruined by highly transmissible pathogens such as norovirus, were the first to use AHP for its short contact time, effectiveness, and safety profile. AHP carries a Category IV rating, which designates the lowest toxicity rating given by the U.S. Environmental Protection Agency (EPA).

"Accelerated" in accelerated hydrogen peroxide simply means that it has been enhanced with safe, commonly-used, synergistic ingredients that allow AHP to kill pathogens much faster and clean much better than regular hydrogen peroxide. It typically takes 75 minutes of wet contact time to kill poliovirus with 3% hydrogen peroxide found in most homes. AHP cuts that contact time down to one minute for ready-to-use formulations or five minutes when mixed from concentrate in a healthcare facility.

Increasing consumer awareness and changing expectations about disinfectants drives innovation in the chemical technology space.

AHP users in animal health, including food producers and animal shelters, as well as large- and small-animal veterinary hospitals, are now seeing considerable success in infection prevention. While AHP requires gloves and eye goggles when handling the concentrate, no personal protective equipment is needed for the diluted solution, the premoistened disinfecting wipes, or the ready-to-use solution.

Concentrates are typically a more cost-effective solution. However, they carry some risks, such as

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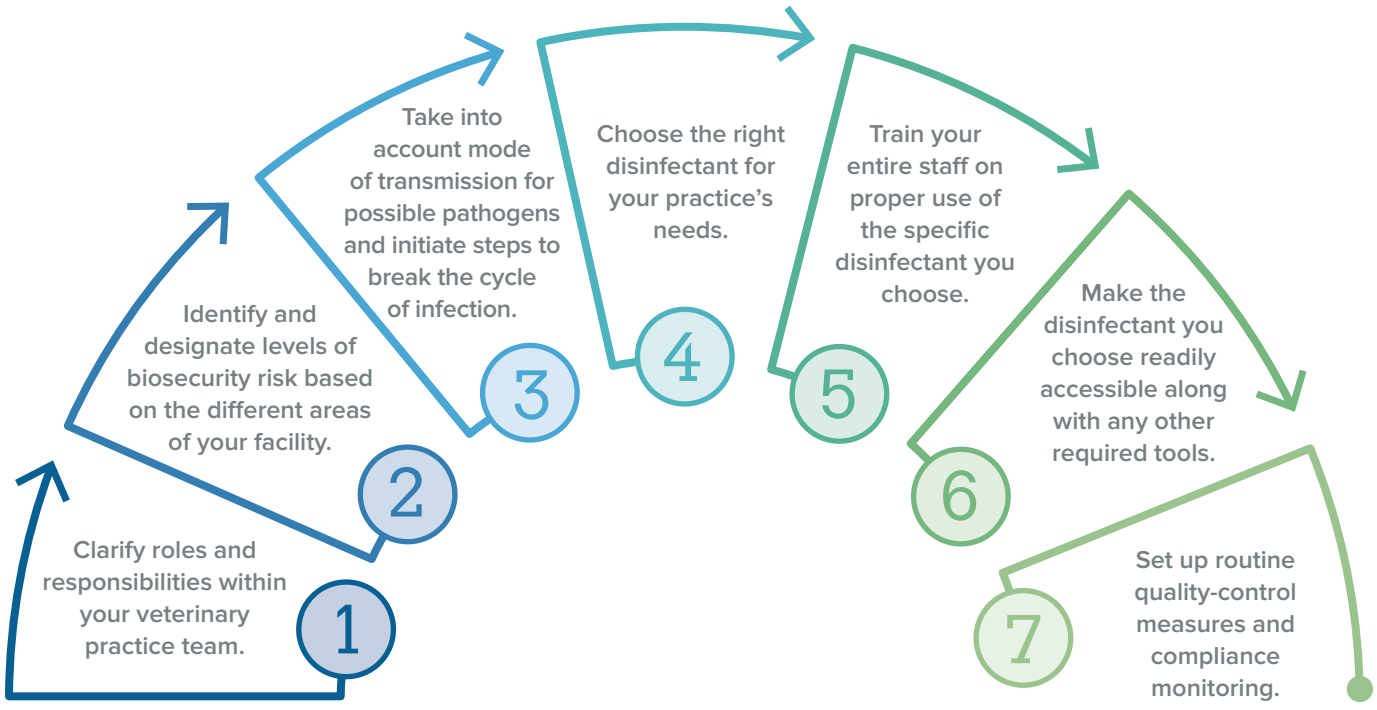
People, including veterinary practice staff members, want products that work well but don't put anyone at risk.

inaccurate dilution, leading to expensive overuse (too much concentrate), or over-dilution (too little concentrate) increasing the risk of an outbreak. That's why, in some cases, a premoistened or premixed disinfectant is a better choice. For example, ready-to-use AHP products have a one-minute kill time for most pathogens, including tough-to-kill viruses like parvovirus in dogs and norovirus in people.

The efficacy of AHP has been supported by more than 30 clinical studies, articles, and research abstracts. A recent study by Alfa et al. showed that daily use of AHP applied to patient care high-touch environmental surfaces with a minimum of 80% cleaning compliance led to a 20% reduction in HAIs, including MRSA, VRE and *Clostridium difficile*, and significant cost savings to the facility.[5] Another study by Maillard et al. demonstrated how AHP was able to produce at least a 7-log reduction (99.99999%) against *Staphylococcus aureus* and *Acinetobacter baumannii*.[6] In addition, AHP was the only disinfectant used in the study that was able to prevent the transfer of bacteria to other surfaces, which is an important component in reducing the transmission of harmful pathogens and reducing HAIs. Furthermore, a study by Rutala et al. illustrates AHP's superiority in comparison to standard hydrogen peroxide and quats, as it was able to produce a 6-log reduction (99.9999%) in 30 seconds against MRSA, VRE, and *Acinetobacter baumannii*.[7]

7 Steps to Good Infection Control

You do not need to be an award-winning chemist or microbiologist to be good at infection control in a veterinary setting. Yes, the chemical and its proper use is critical, but think about infection control with the big picture in mind. It's a team effort based on several unique considerations for each veterinary practice.



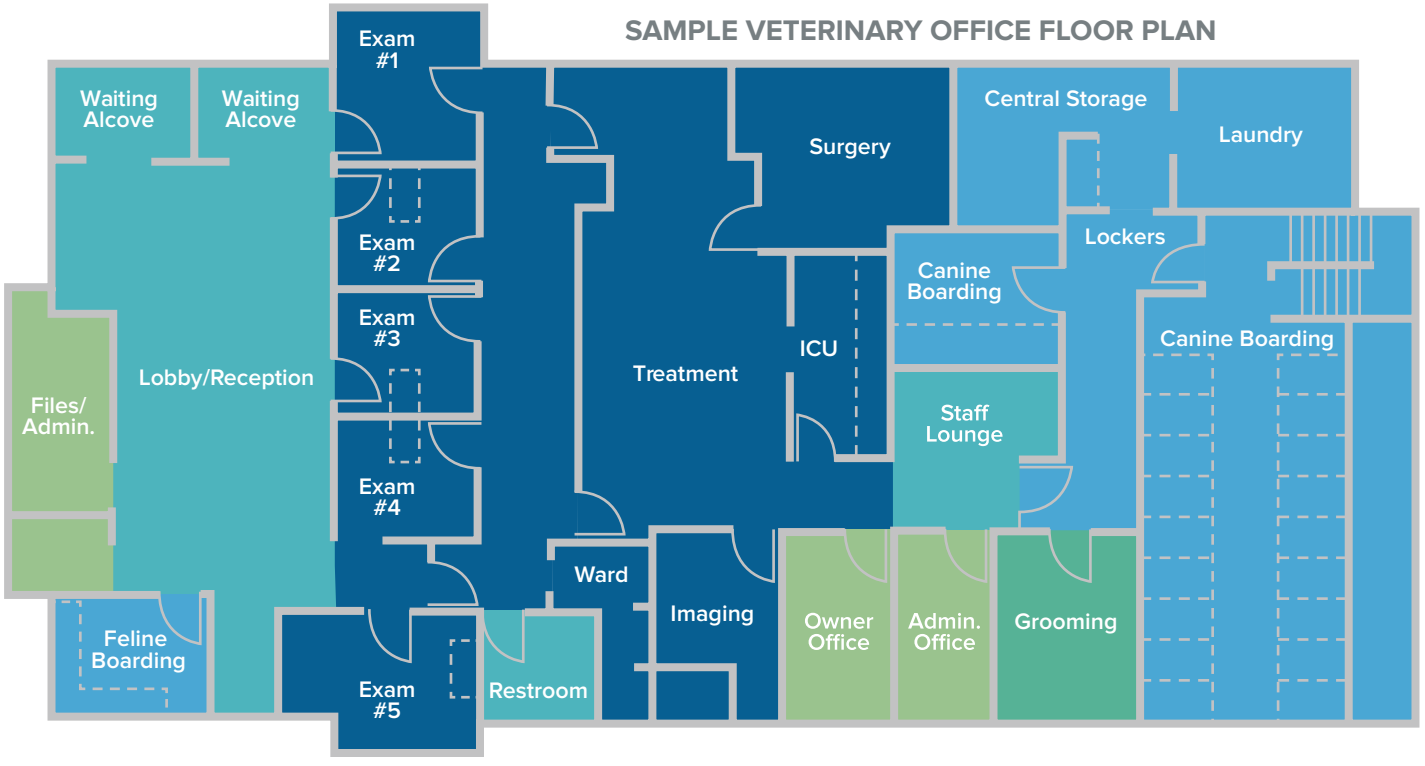
STEP 1: Clarify roles and responsibilities within your veterinary practice team.

Everyone needs to understand the protocols and processes involved as well as which team members will complete which parts of the infection control work. Create a functional group responsible for cleaning the animal care environments and equipment. Determine together who is responsible for cleaning each surface and piece of equipment in all patient rooms, treatment areas, surgical suites, and public areas, including the lobby and restrooms. Develop a schedule for cleaning frequency. If this division of responsibilities does not occur, surfaces or devices will be overlooked.

How you divide up these tasks depends greatly on the size of your facility and your staff. Large practices often include staff members whose only job is cleaning and disinfection, whereas smaller ones must assign these tasks across various job descriptions. Here is one possible scenario.

JOB TITLE	CLEANING / DISINFECTION RESPONSIBILITIES
Receptionist / front office staff	Lobby and other public areas
Veterinary assistant or kennel assistant	Hospitalization and boarding areas
Veterinary technician	Exam rooms, treatment area, surgical suite, diagnostic equipment
Office or practice manager	Offices and administrative areas
Groomer	Grooming and bathing areas
Veterinarians	Personal equipment, such as stethoscope

SAMPLE VETERINARY OFFICE FLOOR PLAN



STEP 2: Identify and designate levels of biosecurity risk based on the different areas of your facility.

Different areas of a veterinary facility pose different levels of biosecurity risk. You could use numbering or color codes to designate these areas of risk. Often colors can be more quickly and easily understood by everyone involved with the care of animals within the hospital, including those responsible for cleaning and disinfection. For example, a kennel with a red tag hanging on the door tells the person cleaning that an animal with an infectious disease stayed in the kennel. This means the cleaning and disinfection process must be more stringent before another patient gets placed inside.

Also, consider the movement of equipment and personnel between different biosecurity level areas. You would not want items from a red area regularly being taken into green areas.

Communication about each patient's status needs to be flexible as well. As a pet's condition changes, so might the infection control strategies required to maintain biosecurity in the veterinary practice.

Small-Animal Hospital	Biosecurity Level		
	Level 1	Level 2	Level 3
Outpatient exam room	●		
Emergency admission rooms		●	
Sick patient's exam room		●	●
Surgery suites	●	●	
Dental procedures	●		
Patient's ward	●	●	
Isolation ward			●
Intensive care unit		●	●
Oncology area		●	●

STEP 3: Take into account the mode of transmission for possible pathogens and initiate steps to break the cycle of infection.

Many decisions the team needs to make will be based on the mode of transmission of various possible pathogens.

Once an infectious pathogen enters a veterinary facility, it's up to the veterinary team to break the infectious cycle through cleaning and disinfection. Next steps include the following:

- Removing fecal matter and other body fluids or biofilms
- Cleaning all surfaces before disinfecting
- Disinfecting surfaces with properly concentrated disinfectant

A mistake in diluting the disinfectant or not following required contact times can lead to the pathogenic organism spreading rather than being contained and eliminated. Once you've removed visible soiling, start cleaning and disinfecting at the cleanest area working toward the dirtiest area of the item or space. This lessens the risk of contaminating surfaces as you work.

The major sources of environmental contamination are the patient's endogenous flora and the hands of healthcare workers.[9, 10]

STEP 4: Choose the right disinfectant for your practice's needs.

Your team will need to determine your disinfectant needs:

- Will you use one product for cleaning and another product for disinfecting? There are different products and processes, and some disinfectants only work after the surface is already visibly clean, while others will disinfect in the presence of organic matter. Cleaners are not necessarily disinfectants and disinfectants are not necessarily cleaners. However, one-step cleaner-disinfectants do exist.
- Will you use one disinfectant for daily use, then switch to another in cases of serious infectious issues? Or will you use something that's more protective all the time? For example, practices that see a lot of emergencies likely need a disinfectant with a broader spectrum of kill than a more wellness-focused practice that primarily does check-ups, vaccinations, and routine surgeries. Some products offer multiple dilutions to meet the needs of different facilities.
- What form of the chosen disinfectant will you use (ready-to-use solution, concentrate you will dilute, ready-to-use disinfectant wipes)?

Your answers to these questions will depend on the kinds of surfaces you need to disinfect as well as the possible pathogens you come across in your

TRANSMISSION PRECAUTIONS FOR DOGS AND CATS[8]

Precautions	Pathogen	Transmission Precautions
Airborne	*Mycobacterium tuberculosis* *Yersinia pestis* *Francisella tularensis*	Isolation, ideally negative pressure room Wear N95 respirator mask Barrier nursing
Droplet	Canine Infectious Respiratory Disease Complex Infectious feline upper respiratory tract disease	Isolation Space animals four feet apart or more Barrier nursing
Contact	Multi-drug resistant bacteria Dermatophytes *Leptospira spp* *Salmonella spp* Parvovirus	Warning signage on the cage Barrier nursing Dedicated equipment Isolation for certain pathogens (see table at left) Limit movement of affected animals Hand hygiene precautions Proper cleaning, disinfection and disposal

Most Difficult	Micro-organism
	Bacterial spores
	Mycobacteria
	Small nonenveloped virus
	Fungal spores
	Gram negative bacteria
	Large nonenveloped virus
	Gram positive bacteria
	Enveloped virus
Least Difficult	Mycoplasmas

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patient population. Some are much harder to kill with disinfectants than others.

STEP 5: Train your entire staff on proper use of the specific disinfectant you choose.

You can get everything you need to know, including training materials and even onsite workshops or lunch-and-learns, from the disinfectant manufacturer or sales reps. Make sure everyone reads the OSHA-mandated Safety Data Sheets (SDS) as well. Typically, you'll find the information you need about a product's safety profile, hazards, and toxicology data in Section 2 and Section 11 of the SDS.

Pay attention to dilution calculations and required contact times so that whatever disinfectant you use works to the best of its ability.

STEP 6: Make the disinfectant you choose readily accessible along with any other required tools (such as measuring devices, bottles, buckets, clean cloths, and so on).

Even staff members with the best training and intentions will do things their own way if you don't make following the cleaning and disinfecting protocols as convenient as possible. Depending on the size of your veterinary facility, this means setting up several stations to keep cleaning and disinfection supplies handy. Moving around the facility less during cleaning lowers the chance of accidentally contaminating other areas.

STEP 7: Set up routine quality-control measures and compliance monitoring.

Examples include marking expiration dates on disinfectant concentrates and diluted product and maintaining cleaning logs where staff make notes about what they've cleaned and when (date/time).

When you spot-check staff's adherence to protocols, use your results to provide positive feedback when a job is done well. Perhaps more importantly, take the opportunity to coach and improve cleaning practices if you find issues.

Identifying the Ideal Disinfectant: Characteristics and 6 Questions to Ask

While no disinfectant is perfect, The Centers for Disease Control and Prevention (CDC) lists the following properties as ideal characteristics.

PROPERTIES OF AN IDEAL DISINFECTANT, ACCORDING TO THE CDC[11]

- **Broad spectrum**
- **Fast acting**
- **Not affected by environmental factors**
- **Nontoxic**
- **Surface compatibility**
- **Odorless**
- **Soluble**
- **Stable**
- **Cleaner**
- **Environmentally friendly**
- **Economical**
- **Easy to use**

With this knowledge in hand, veterinary practices can make decisions based on a handful of criteria in the search for the best disinfectant to use:

1. Does the disinfectant provide good cleaning properties and remain active even when organic matter (fecal matter, blood, saliva, and so on) is present?
2. Does it exhibit germicidal efficacy against a broad spectrum of microorganisms and possible pathogens?
3. How realistic is the product's required contact time to reach efficacy?
4. Is it nontoxic, with low irritancy and allergenic properties? Or will a fume hood or other ventilation protections be needed to use safely? What is its safety profile for veterinary caregivers and patients?
5. How does it affect the environment upon disposal?
6. Is it compatible with a wide variety of materials, without causing damage or deterioration of metals, rubbers, plastics, or other materials?

What Clean Smells Like

Are you surprised this list of disinfectant criteria does not include a pleasant smell? In actuality, what we associate with the smell of clean has nothing to do with how well the product works. What's your scent of choice? Lemon? Pine? Floral? Straight-up bleach?

Many times, if a veterinary hospital or any kind of facility for pets (grooming shop, boarding facility, training center) does not smell clean, it simply means the location is not being cleaned right or frequently enough—not necessarily that the disinfectant product isn't working well.

In some cases, relying on the smell of cleaners and disinfectants creates a false sense of security about how clean your veterinary facility really is. Just because something looks clean or smells clean doesn't mean it has been properly disinfected.

Odor free and scent free veterinary hospitals can play an important role in practicing Fear Free℠ veterinary medicine. Strong smells, even those that we may find pleasant, can overwhelm pets' senses for as long as a couple of days. When their sensitive noses become flooded with an unnecessary scent, it limits their ability to assess the environment, which raises their levels of fear, anxiety, and stress. It's much better for veterinary patients to have a neutral or comforting sensory experience than an overwhelming wall of scent.

In addition, avian and exotic pets can be adversely affected by an environment's air quality, so be particularly careful choosing cleaning products if you see these more sensitive and fragile patients.

9 Common Disinfection Mistakes

During training and any later staff coaching on infection control expectations and protocols, pay attention to these common mistakes:

1 Eyeballing disinfectant solution mixtures.

Always follow label instructions for dilution and use of a disinfectant. Measure everything. The tendency is to go light on the disinfectant, either due to incorrect measurements or an attempt to save money by using less product. Both strategies can lead to a disinfectant solution that is too weak to work properly.

2 Failing to reach designated contact time.

In other words, the surface being cleaned does not stay wet with the right level of diluted disinfectant for the full length of time required for efficacy.

3 Confusing sanitized with disinfection.

To claim something is sanitized, the product must have reduced the pathogen load by 99.9% (also called a 3-log reduction). Disinfecting basically doubles that amount to a 6-log reduction, reducing the pathogen load to 99.9999%. See additional information about log reduction on page 17.

4 Not knowing the shelf-life of the disinfectant being used.

In addition to knowing the shelf-life of the concentrated disinfectant, it's important to know how long the disinfectant, once diluted, will continue to work properly. The diluted shelf-life for some disinfectants may only be 24 hours, or as much as 90 days, so be sure you're not wasting product by mixing up too much at once or using expired product.

5 Topping off diluted disinfectant bottles, rather than starting each time with a cleaned bottle and fresh batch.

Making this mistake means you've just mixed old disinfectant with new. This can lead to an overdiluted or inactivated mixture. In other words, it won't work as well.

6 Mixing cleaning chemicals.

In addition to the potential for dangerous interactions, there's a chance that adding one chemical to another will cause the disinfectant to not work properly. For example, if you add a scented product to your disinfectant simply because you like the smell better, there's a chance the chemical mixture won't be as potent as it needs to be.

7 Spraying a surface and then wiping it with a dry cloth.

Contact times for disinfectants mean how long the surface needs to stay wet with disinfecting solution for full efficacy. If you wet a surface down via spray bottle and immediately wipe the surface dry, it won't be effective. In addition, spray bottles increase the risk of a pathogen getting blasted onto another surface. It's better to spray the disinfectant onto the cloth to wet it down, then use physical friction to apply the product to the surface. This helps pick up any soil or debris microbes you cannot see and provides a more even distribution of the disinfectant solution onto the surface than random splatters from the spray bottle. When the disinfectant air dries you have a better chance of achieving the designated contact time.

8 Not giving or receiving product-specific training to veterinary team members.

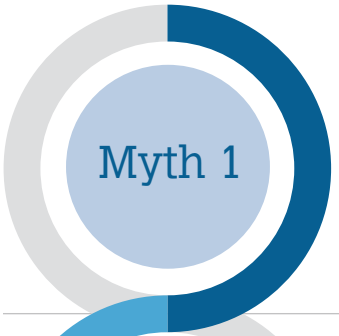
Just because you learned how to clean from a family member at home doesn't mean you know how to properly clean and disinfect in a veterinary healthcare setting. And, just because you know how to use one disinfectant does not mean you know how to use another one. Different disinfectants work in different ways with various dilution rates, contact times, and safety precautions. Disinfectant manufacturers or sales reps can provide training materials or lead staff training sessions. Just ask.

9 Not getting buy-in from team members on a switch to a new product.

Change can be hard for individuals and teams. If people do not like or do not understand a new disinfectant product, your infection control program can be at risk of failing.

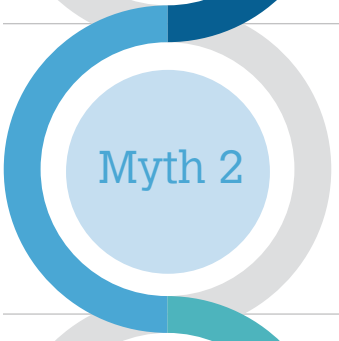
In any medical setting, infection control strategies must be part of everyone's job even if they don't do the cleaning itself.

5 Disinfection Myths



Cleaning and disinfecting are the same thing.

Not true. Cleaning uses detergents and surfactants to break up soils (visible or not) on surfaces, but disinfectants kill or inactivate microorganisms and pathogens in various ways, depending upon the disinfectant used. Some penetrate the outer layer of a pathogen's cells, which weakens it. Others sort of blow the cells apart, almost like a bomb.



All disinfectants are created equal.

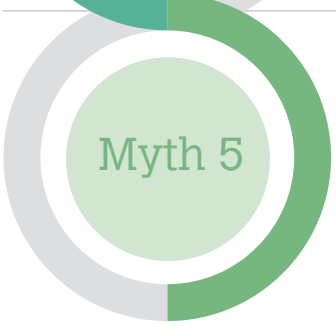
Not even close. In the United States and Canada, you'll find more than 8,000 registered disinfectant products for sale, and there are several variations between them.

All disinfectants can be used in the same way.

Among the six most common chemistries used for disinfection, especially in healthcare settings, you'll find vast differences in concentrations, contact times, and personal protection needed for proper usage. In addition, many disinfectants require you to clean a surface first with a product containing detergents before you can use a disinfectant on the surface.

Cleaning and disinfection is not *my* job.

In any medical setting, infection control strategies must be part of everyone's job even if they don't do the cleaning itself. It's an important part of maintaining a safe and functional veterinary facility.



If a disinfectant kills most germs, it must be toxic.

Historically, this was true. In the past 10–15 years, however, companies have been working to bring safer and more environmentally sustainable disinfectants to market.

If you're using an older type of disinfectant product, be sure to provide training on protocols for safe use. Safety Data Sheets (SDS) are your best resource on toxicities and risks. See Section 2 and Section 11 on the SDS for details. Some products do indeed contain chemicals that are known carcinogens, known respiratory irritants (causing occupational asthma or chemical pneumonia), known skin sensitizers, known to release volatile organic compounds (leading to poor air quality), or known to contain nonylphenol ethoxylates (hormone-mimicking agents that can act as endocrine disruptors in the body).

Small Steps, Big Reasons

Done well over time, cleaning and disinfection protocols lead to a decrease in the environmental bioburden inside a veterinary facility. Effective cleaning and disinfection also create a space that is free of odor and pathogens, making it a better place for animal caregivers to do their work and for pets to get the care they need.

While roles and responsibilities remain important to biosecurity, in the end, it's less about who does the cleaning and disinfecting than it is about how everyone in a veterinary practice works together to maintain a clean and safe environment. Everyone should be thoughtful and deliberate in the use of cleaners and disinfectants and cognizant of the ways infectious pathogens can get accidentally transferred from surface to surface, room to room, and patient to patient.

You're already doing so many important things. Simply take a little extra time and energy to further formalize your disinfection efforts.

What Does Log Reduction Mean?

Logs are a form of mathematical "shorthand" that scientists use when describing the numbers of microorganisms present as a way to distinguish when a surface is sanitized versus disinfected and to track the various levels required in different medical and other scenarios.

The number of zeros after the "one" equals the log reduction.

100	=	10 to the power of 2 (10^2)	=	2 log
1,000	=	10 to the power of 3 (10^3)	=	3 log
10,000	=	10 to the power of 4 (10^4)	=	4 log
100,000	=	10 to the power of 5 (10^5)	=	5 log

1 million or 1,000,000 or "1 followed by 6 zeros" can be written as "6 log."

Log Reduction vs. % Kill

Some test reports use "log reductions" to describe results. Some use "% kill" or "5-log reduction." How do we compare the two?

1-Log reduction	=	90% kill
2-Log reduction	=	99% kill
3-Log reduction	=	99.9% kill
4-Log reduction	=	99.99% kill
5-Log reduction	=	99.999% kill
6-Log reduction	=	99.9999% kill
7-Log reduction	=	99.99999% kill
8-Log reduction	=	99.999999% kill
9-Log reduction	=	99.9999999% kill
10-Log reduction	=	99.99999999% kill

As with logs, there is a trick to doing the conversion easily. The number of the log reduction is the same as the number of nines in the percentage reduction. Therefore, a 5-log reduction gives five nines in the percentage reduction = 99.999% reduction.

Glossary of Disinfection and Biosecurity Terms

Alcohol-based hand rub: an alcohol-containing preparation designed for application to the hands for reducing the number of viable microorganisms on the hands. In the United States, such preparations usually contain 60–95% ethanol or isopropanol. These are waterless antiseptic agents that do not require the use of exogenous water. After applying such an agent, the hands are rubbed together until the agent has dried.

Antiseptic: a germicide that is used on skin or living tissue for the purpose of inhibiting or destroying microorganisms. Examples include alcohols, chlorhexidine, chlorine, hexachlorophene, iodine, chloroxylenol (PCMX), quaternary ammonium compounds, and triclosan.

Bioburden: the microbiological load (i.e., number of viable organisms in or on the object or surface) or organic material on a surface or object prior to decontamination, or sterilization, also known as "bioload" or "microbial load."

Chemical sterilant: chemicals used for the purpose of destroying all forms of microbial life including bacterial spores.

Cleaning: the removal of visible soil, organic, and inorganic contamination from a device or surface, using either the physical action of scrubbing with a surfactant or detergent and water or an energy-based process (e.g., ultrasonic cleaners) with appropriate chemical agents.

Contact time: period of time during a sterilization or disinfection process in which items are exposed to the sterilant or disinfectant at the parameters specified by the manufacturer (e.g., time, concentration, temperature, pressure).

Contaminated: state of having been in contact with microorganisms. As used in health care, it generally refers to microorganisms capable of producing disease or infection.

Decontamination: a process or treatment that renders a medical device, instrument, or environmental surface safe to handle. According to OSHA: "the use of physical or chemical means to remove, inactivate, or destroy bloodborne pathogens on a surface or item to the point where they are no longer capable of transmitting infectious particles and the surface or item is rendered safe for handling, use, or disposal" [29 CFR 1910.1030].

Detergents: compounds that possess a cleaning action and have hydrophilic and lipophilic parts. Although products used for handwashing or in an antiseptic handwash in a healthcare setting represent various types of detergents, the term "soap" is used to refer to such detergents in this publication. Detergents make no antimicrobial claims on the label.

Disinfectant: a chemical agent used on inanimate objects (e.g., floors, walls, sinks) to destroy virtually all recognized pathogenic microorganisms, but not necessarily all microbial forms (e.g., bacterial endospores). The EPA groups disinfectants on whether the product label claims "limited," "general," or "hospital" disinfectant.

Disinfection: the destruction of pathogenic and other kinds of microorganisms by physical or chemical means. Disinfection is less lethal than sterilization, because it destroys most recognized pathogenic microorganisms, but not necessarily all microbial forms, such as bacterial spores. Disinfection does not ensure the margin of safety associated with sterilization processes.

Fomite: inanimate object capable of carrying a pathogen from one location to another when it gets

moved or used throughout a veterinary practice:

- Stethoscopes or other small diagnostic tools (e.g., thermometers)
- Brushes and shaving tools
- Food and water bowls
- Litterboxes
- Toys
- Scales
- Any technology you carry—smart phones, tablets, laptops
- Clipboards
- Shoes

Germicide: an agent that destroys microorganisms, especially pathogenic organisms. Other terms with the suffix "-cide" (e.g., virucide, fungicide, bactericide, tuberculocide, sporicide) indicate an agent that destroys the microorganism identified by the prefix. Germicides may be used to inactivate microorganisms in or on living tissue (antiseptic) or on environmental surfaces (disinfectants).

Hand hygiene: a general term that applies to handwashing, antiseptic handwash, antiseptic hand rub, and surgical hand antisepsis.

Hospital-associated infection (HAI): any infection associated with a medical or surgical intervention.

Hospital disinfectant: a germicide that is registered by the EPA for use on inanimate objects in hospitals, clinics, dental offices, or any other medical-related facility. Efficacy is demonstrated against *Salmonella choleraesuis, Staphylococcus aureus,* and *Pseudomonas aeruginosa.*

Log reduction: a 10-fold (one decimal) or 90% reduction in numbers of live bacteria.

Noncritical: the category of medical items or surfaces that carry the least risk of disease transmission. This category has been expanded to include not only noncritical medical devices but also environmental surfaces. Noncritical medical devices touch only unbroken (intact) skin (e.g., blood pressure cuff). Noncritical environmental surfaces can be further divided into clinical contact surfaces (e.g., light handle) and housekeeping surfaces (e.g., floors, countertops).

Personal protective equipment (PPE): is specialized clothing or equipment worn by an employee for protection against a hazard (e.g., gloves, masks, protective eyewear, gowns). General work clothes (e.g., uniforms, pants, shirts, or blouses) not intended to function as protection against a hazard are not considered to be personal protective equipment.

Sterilant: a liquid chemical germicide that destroys all forms of microbiological life, including high numbers of resistant bacterial spores.

Sterilization: the use of a physical or chemical procedure to destroy all microorganisms including large numbers of resistant bacterial spores.

Surfactants: surface-active agents that reduce surface tension. They help cleaning by loosening, emulsifying, and holding soil in suspension, which can then be more readily rinsed away.

Surgical hand scrub: an antiseptic-containing preparation that substantially reduces the number of microorganisms on intact skin; it is broad spectrum, fast-acting, and persistent.

Transmission-based precautions: a set of practices that apply to patients with documented or suspected infection or colonization with highly transmissible or epidemiologically important pathogens for which precautions beyond the standard precautions are needed to interrupt transmission in healthcare settings.

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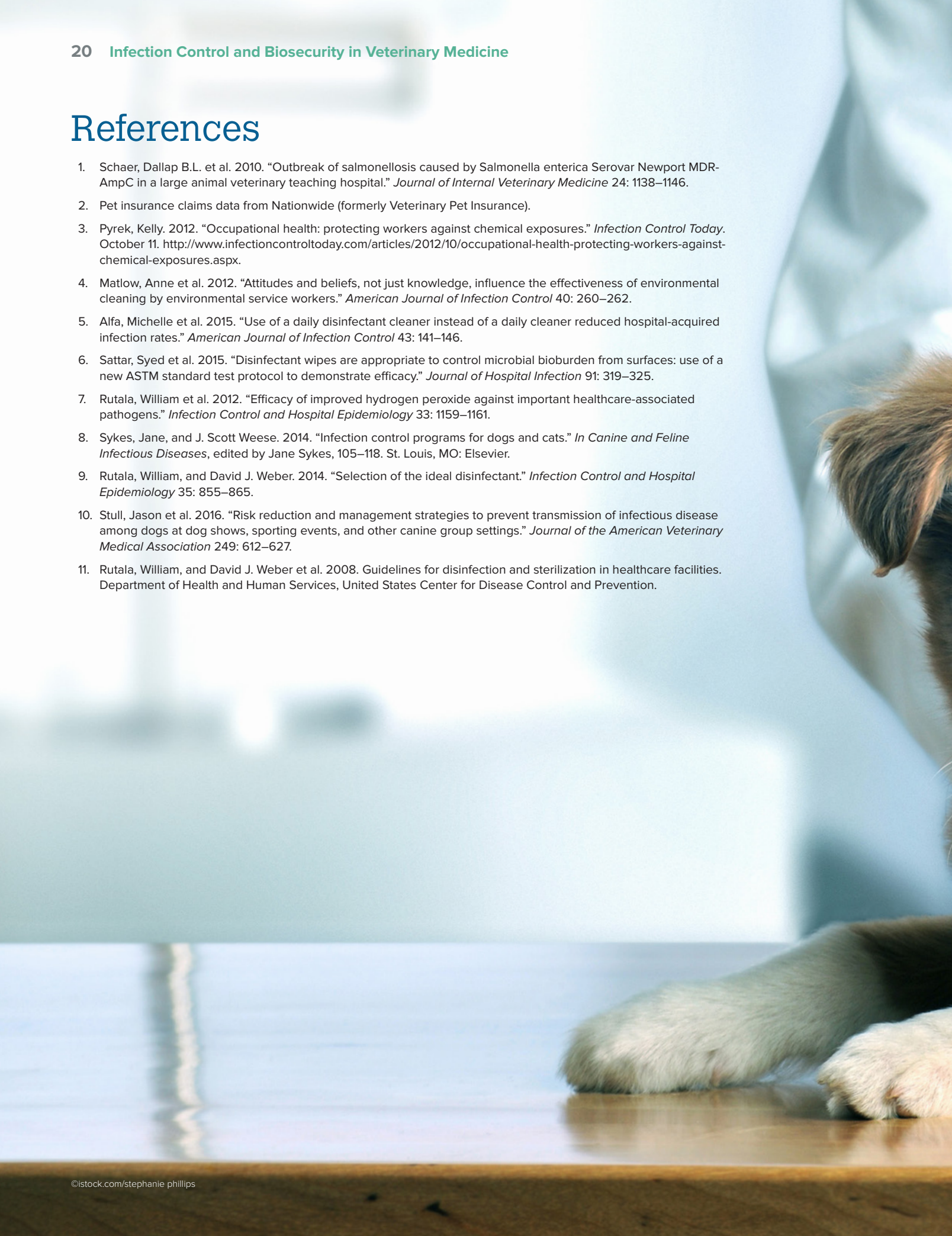

Virox Animal Health, a division of Virox Technologies Inc., is the global manufacturer of accelerated hydrogen peroxide–based disinfectants to serve infection prevention professionals in human and animal health. Virox Animal Health is dedicated to providing support to the companion and farm animal health community via a team of technical experts and staff veterinarians on all things related to disinfection for infection prevention and biosecurity. Virox Animal Health presents a deliberately different approach to biosecurity and infection prevention with a revolutionary chemical disinfection technology combined with in-use protocols to optimize effectiveness. As an industry leader in human healthcare since 1998, Virox is ISO 9001 and ISO 14001 certified and was the first chemical manufacturer to achieve LEED Silver Certification in environmental responsibility.

The American Animal Hospital Association is an international organization of nearly 6,000 veterinary care teams comprising more than 48,000 veterinary professionals committed to excellence in companion animal care. Established in 1933, AAHA is recognized for its leadership in the profession, its high standards for pet health care, and, most important, its accreditation of companion animal practices. For more information about AAHA, visit aaha.org.