

Sanitation in animal shelters

Proper sanitation is vital to keeping pets healthy, and shelters face unique sanitation challenges. Here are details about what, when, and how to clean, plus suggestions for creating a cleaning protocol.

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Introduction

In the world of human health, prevention of hospital-acquired disease is the subject of scores of articles, journals, and textbooks. Just a quick search on the subject of hand sanitation alone locates a listing of over 650 articles. The challenge of preventing disease transmission in a veterinary or shelter setting is potentially even greater.

Unlike most people, our patients roll around on floors and surfaces and subsequently lick themselves all over, effectively coating themselves with and ingesting a myriad of environmental and salivary pathogens. Caring for animals is a full-contact sport: we cradle animals against our bodies for restraint, for transportation and out of affection. Whatever is on their fur is readily transferred to our hands, arms and clothing, and if we are not careful, from there to the remainder of the animals we care for that day.

The challenge of disease control in most shelters is even greater than that

faced by veterinary clinics. Many animals enter shelters in poor health, malnourished, stressed and with no history of vaccination. Some animals will already be shedding various harmful pathogens, with or without showing any signs of disease. With all this disease around and so many opportunities for transmission, one might think that ubiquitous disease spread is nearly inevitable.

However, there is reason for hope. Even if infection control is less than perfect, we can support animals' own immune response through attentive vaccination practices, stress reduction, wholesome food and clean water and other measures to support well-being. And a well thought out, comprehensive plan for sanitation can reduce the dose of exposure to one the animals' immune response can handle in many cases. In the best case scenario, shelter sanitation prevents illness in both animals and people and creates a pleasant, welcoming environment where the public is more likely to come and adopt an animal.

Developing a sanitation plan

Clearly, the last thing we want for animals that come to us for care and a safe haven is to acquire illness while in our facility. A well-crafted plan is needed to guard against such disasters and must be tailored to each particular shelter's situation.

First, we need a comprehensive picture of all the areas and objects in a facility that require periodic sanitation. For each of these, a plan needs to address removal of organic matter (cleaning); application of a chemical product to inactivate pathogens (disinfection) if necessary; and drying of the surface afterwards. When choosing a disinfectant, we must consider the spectrum of effect, constraints against efficacy (such as presence of organic matter), method of delivery and time to effect.

Cleaning and disinfecting agents must be safe, cost effective, and practical given a particular organizations strengths or limitations in staff training or facility design. Finally, everything must be in writing, staff must be trained, and periodically checks must be made to ensure the whole process is working properly.

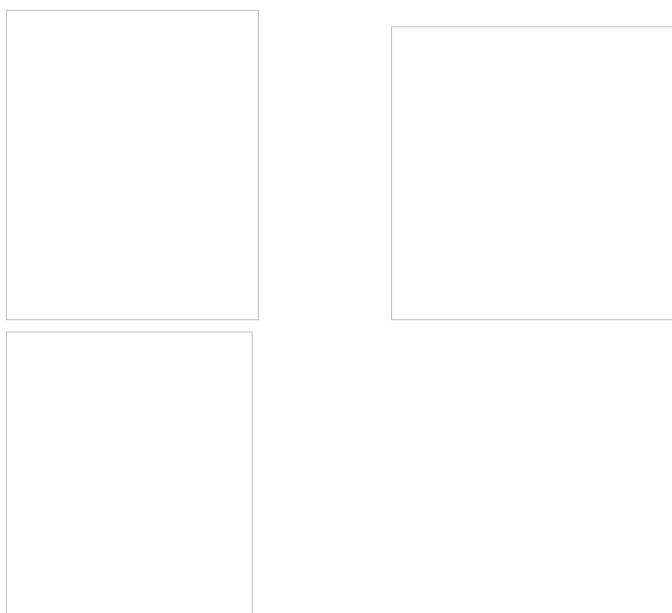
To make sure all the above is accomplished, someone needs to be the mastermind of the shelter sanitation plan. Oftentimes the shelter or kennel manager will bear ultimate responsibility for this, but whoever it is, clear responsibility and authority needs to be designated – and the person has to have enough time to research, write, train and oversee that plan. Ideally, a veterinarian familiar with shelter medicine should provide advice and input. Certainly manufacturers of disinfectant and cleaning products

can provide input about particular products, but may have some bias towards the products they carry. Even if they have a fine product, disinfectant vendors should not be relied on as the sole advisors for development of a comprehensive sanitation plan.

What needs to be cleaned?

When we think of sanitation protocols, often the focus is on cleaning cat cages and dog kennels. However, germs are tracked by human and animal traffic throughout any shelter. Additionally, germs are spread by hands, on doorknobs, clothing, carriers, exam tables, instruments, animal transport vehicles, and so on. Some of these are a much more likely source of disease transmission than the cages or kennels themselves; after all, a kennel will only contain the germs belonging to the animal housed there at the time (as long as it is well-sanitized between animals) but a visiting room or exam surface may be contacted by many animals throughout a day.

For example in the three pictures below, by far the cleanest surface was the back of a clipboard hanging on a freshly cleaned cage (first slide), while the floor of the visiting room (middle slide) and the inside of an animal control vehicle compartment (third slide) were much more heavily contaminated by potentially harmful pathogens.



Extra care should be taken to fully disinfect the following:

- High-contact surfaces (those that many animals will touch), whether that be clothing, hands, or a countertop (e.g. in the medical and

- intake rooms)
- Surfaces that will touch juvenile animals or those not protected by vaccination (e.g. transport vehicles and carriers, intake counters, clothing of intake staff)
- Surfaces that have had contact with an ill animal, before allowing contact with a well animal (e.g. clothing or tools that have been used in areas housing sick animals or during the euthanasia process)

Below, in no particular order, is a list of some areas and items to consider. If no specific guidelines exist, it's likely that cleaning some of the listed areas will be overlooked in a busy shelter. It might be helpful to print this out and add any items specific to your organization, or make a list of your own. For each area or object to be disinfected, at least a brief protocol should be developed as noted below in the section on (surprise!) written protocols. Obviously more care needs to be taken for areas and objects that regularly contact animals – especially animals in uncertain health – but even areas off limits to animals can be subject to disease tracked in by staff and visitors, and may need attention beyond general cleanliness especially during outbreaks of highly transmissible disease.

List O' Objects and Areas to be Disinfected:

- Office areas
 - Those that contain animals at times
 - Those that do not but still need to be periodically disinfected
- Main lobbies and hallways
- Animal housing areas, including central walkways, walls, doorknobs, gates, etc.
- Medical/surgical areas, including instruments and equipment
- Other indoor animal areas, such as grooming, treatment rooms, intake rooms, visiting rooms, training areas, etc.
- Exercise yards or other outside animal areas
- Vehicles
- Carriers and transport cages
- Hiding boxes
- Furniture
- In animal housing areas (e.g. in group cat rooms or canine real life rooms)
- In the shelter generally
- Hands
- Shoes
- Employee and volunteer clothing
- Bedding
- Dishes
- Litter pans

- Toys
- Tools, such as poop scoopers and mops
- Storage areas (especially food storage)
- Entire building, especially door knobs, phones, keyboards, and other frequently handled items

What products should be used?

There is no single answer to this question. Just as a single antibiotic is insufficient for all circumstances, no single product is appropriate for every situation. Factors to consider include cleaning (detergent) versus disinfecting activity, the spectrum of effect for disinfection, activity in the face of organic matter, speed of action, method of application, cost and safety. As with choosing an antibiotic, scientific research and veterinarians experienced in shelter medicine should be consulted as well as claims of manufacturers or vendors. For a concise summary of disinfectant products, refer to our [handy table of disinfectant products](#). For details, read on!

Un-enveloped viruses are among the most common and challenging small animal pathogens requiring our attention. These include the notorious parvoviruses (canine and feline), as well as feline calicivirus and canine adenovirus. These viruses provide an interesting illustration of the perils of choosing a disinfectant based solely on label claims.

Back in 1980, researchers at Cornell noticed that feline calicivirus seemed to spread in their research facility in spite of using a disinfectant labeled effective against that virus. This triggered a research study testing the efficacy of quaternary ammonium and other commonly used disinfectants against enveloped (e.g. canine distemper, feline herpes) and un-enveloped viruses (e.g. canine parvovirus, feline panleukopenia, feline calicivirus) [1]. Disappointingly enough, the quaternary ammonium compounds - labeled effective against un-enveloped viruses - utterly failed to inactivate feline panleukopenia and only partially inactivated the troublesome calicivirus. The authors concluded that "A 0.175% sodium hypochlorite solution was the most effective and practical broad-spectrum virucidal product used alone or in combination with other disinfectants/detergents". Good old household bleach diluted at ½ cup per gallon outperformed the others in this study.

Over the years, subsequent studies continued to disprove label claims of quaternary ammonium compounds against un-enveloped viruses, in 1995 [2], in 2002 [3], and again in 2009 [4]. It may be that a quaternary ammonium disinfectant will eventually be independently proven reliable against the un-enveloped viruses, but until then it is probably wise to at

least follow these products with another, independently documented product when these viruses are present or suspected to be.

Even the mighty bleach is not without its flaws. It has no cleaning properties whatsoever and is significantly inactivated by organic matter. Application of bleach to a contaminated surface is unlikely to have the desired effect. Although stable when stored in light proof containers for at least 30 days [5], heat and exposure to light can substantially compromise the disinfectant properties of bleach solutions.

Bleach-related compounds, such as calcium hypochlorite (e.g. Wysiwash®) and Sodium dichloroisocyanurate (e.g. Bruclean®), likewise have no cleaning activity and limited effect when organic matter is present.

The quaternary ammonium compounds, in spite of their weak performance against un-enveloped viruses, have strengths that contrast with many of bleach's weaknesses: they do have some ability to act as a cleaner as well as a disinfectant (depending on concentration and formulation), they have better – though not complete – activity in the face of organic matter, and they are relatively stable in solution.

More recently additional disinfectants have become available that share bleach's reliability against un-enveloped virus, with reportedly better cleaning activity, better activity in the face of organic matter contamination, and more rapid action. These include potassium peroxymonosulfate [3] (e.g. Trifectant®, Virkon®) and Rescue™ (accelerated hydrogen peroxide, formerly branded as Accel®) [6]. Potassium peroxymonosulfate is stable for 7 days in solution, and Rescue™ is stable for 90 days (a significant advantage especially in areas where frequent remixing is impractical, such as on animal control vehicles).

The bottom line is that no single disinfectant will be sufficient for all situations. Accelerated hydrogen peroxide or potassium peroxymonosulfate may be the best choice to decontaminate a grassy area soiled by parvovirus, while quaternary ammonium may be a fine choice for daily cleaning/disinfection of dog kennels where parvovirus is not a concern. Each veterinary clinic should have a small arsenal of disinfectants on hand for various eventualities. Ringworm is a particular challenge to eradicate through disinfection.

As for the un-enveloped viruses, product label claims have not always been supported by independent studies. For instance, potassium peroxymonosulfate is labeled effective against ringworm, but in one study it was only 87% effective (translating to 9/70 contaminated hairbrushes

still containing viable spores after treatment) [7]. Another study found that of the commonly used disinfectants, only bleach at 1:10, applied twice at an interval of 24 hours, was reliably effective [8]. Given the importance of ringworm as a zoonotic and infectious agent in shelters, the backbone of decontamination must be thorough mechanical cleaning (3 times with a detergent then 1 time with a disinfectant such as Rescue™) followed by verification via environmental culture [9].

Whatever disinfectant and cleaning agents are used, do not mix them unless directed by the manufacturer or supported by research. Mixed willy-nilly, disinfectants and detergents can cancel each other's efficacy or even create toxic fumes.

The correct concentration

Once you have chosen the products that best fit your circumstances, the next step is to choose the right process for application, including dilution, contact time, and application method. Make sure that disinfectants are used at the correct concentration. Going by smell, color or "eyeballing" it just is not sufficient. Make sure your protocols include clear instructions on how to dilute all disinfectants in use correctly and ensure that equipment is present and in good working order. Outbreaks of disease or disinfectant toxicity have been traced to something as simple as lost or broken disinfectant dispensers.

Contact time

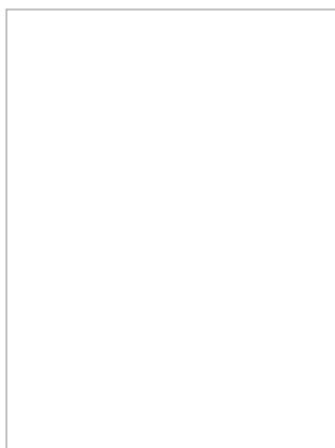
Most folks are familiar with the general idea that disinfectants require ten minutes of contact time for best effect. In fact, it is not quite as simple as that. Some disinfectants, such as Rescue™ and potassium peroxymonosulfate, will be substantially effective in as little as a minute under ideal conditions [6], while factors such as low temperature and organic matter contamination will increase the amount of time needed for any disinfectant. Ten minutes contact time at room temperature on a clean surface remains a good general rule, but it is not a bad idea to leave disinfectant in contact for up to an hour or more when organic contamination cannot be removed or at very low temperatures (e.g. cleaning outdoor runs in the winter time).

The timing of application is also important: disinfectant will work best when applied to a freshly contaminated surface. For instance, disinfectant applied to an exam table immediately after use is likely to work better than disinfectant applied just prior to the next use when what-ever has been sneezed, smeared or otherwise left on the table has had time to dry.

Finally, consider the “expiration date”, the time the disinfectant will lose its efficacy after mixing. Some disinfectants have quite a long shelf life (90 days for Rescue™), while others need to be remixed as often as once a week (7 days for potassium peroxydisulfate). Storage temperature and method can also affect stability. For instance, bleach stored in a light proof container retains its efficacy for at least a month, while it is more rapidly inactivated is stored in transparent containers.^[5] Check with the manufacturer regarding recommended shelf life and storage method. Discard disinfectants properly if the shelf life is passed; not only can they become ineffective, some can become quite noxious. Consider shelf life when choosing a disinfectant for each purpose within your facility. For an area where disinfectant is infrequently used, a more expensive product with a longer shelf life will be a better choice than a cheaper product that needs to be thrown out often.

Application systems

Put a disinfectant that is inactivated by organic matter in a bucket with a mop or rag, mix in some dirt and feces, and you have a recipe for disaster. The method of application is just as important as choice of disinfectant. When at all possible, avoid mops and buckets. For small cleaning jobs, bottles with “squirt tops” rather than spray tops are ideal to decrease the amount of disinfectant aerosolized into the environment (this is important to protect animal and human respiratory health).



“Squirt top” bottle to minimize aerosolization of disinfectant.

As noted above, use opaque containers for bleach and store other disinfectants as directed by the manufacturer. Label all bottles with the identity of the disinfectant, all required safety information, and the date and initials of the person who made up the solution. (This will permit

accountability and retraining should disinfectant be incorrectly formulated.)

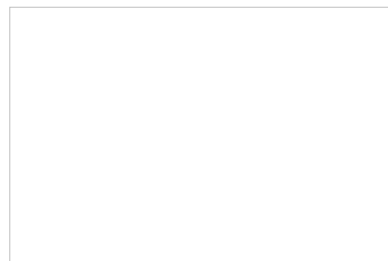
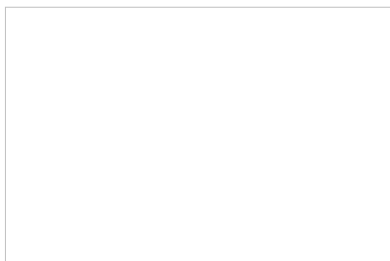
For larger cleaning jobs, hose-end foamers, specially designed or built-in dispensing systems are preferred. Some disinfectants, such as calcium hypochlorite (e.g. Wysiwash®) and Sodium dichloroisocyanurate (e.g. Bruclean®) come with specially designed dispensing equipment.

For large facilities, built in central systems are ideal. Disinfectants that come in liquid concentrate, such as Rescue™, are ideal for this use. For in-between jobs or where use of a hose is impractical, a hand-held or back-pack style pesticide applicator can be used. If mops or rags n' buckets MUST be used, choose a disinfectant with minimal inactivation by organic matter (e.g. not bleach). Contamination of the disinfectant can be minimized by rinsing the mop or other applicator in a clear water bucket between each application of disinfectant. Two sided buckets are available from janitorial supply houses, or you can simply use two buckets. Separate cleaning supplies should be used for each area to be cleaned.

The importance of drying

Whatever disinfectant and method of application is used, one key decontamination step – the importance of which is often underestimated – is drying the environment. Most pathogens prefer a moist environment, and if they happen to have slipped past your chemical disinfectant and mechanical removal, they will happily persist for hours or days in a damp corner.

Fatal bacterial pathogens have been cultured from pools of water lingering in kennels that had been completely cleaned and disinfected, and even from the disinfectant dispensing system itself in one shelter outbreak. Attention to drying is especially important when the surface to be cleaned is uneven (leaving pools of water even after use of a squeegee) or in humid climates where air drying may not occur.



Bacteria were cultured out of a puddle remaining on the rough surface of a dog kennel even after cleaning and disinfection had just been completed.

Hand sanitation

Cleaning contaminated environmental surfaces is less than half the battle. Even if we put an animal onto a perfectly clean exam table, if the hands that hold the animal are dirty, the animal will soon take in whatever was on those hands. Hands also make their way into human mouths (and noses). So, keeping hands clean is important for protection of human as well as animal health. There are basically three methods for managing hands: gloves, washing with soap and water, and hand sanitizers.

Gloves are the most fool-proof choice for preventing germ transfer on hands, provided they are actually changed before and after every animal. Although gloves can be a nuisance, time consuming and relatively costly, there are times when it is clearly worth the effort. A change of gloves between every animal is indicated when handling animals that may be infected with particularly environmentally resistant germs, when a zoonotic infection is suspected, or during any outbreak of unknown disease. For handling that does not require great dexterity (such as carrying cats) a cheap, relatively easy alternative to latex gloves are lightweight food preparation gloves - basically plastic bags with fingers. These can be found for less than a penny a pair and are quick and easy to take on and off. Always wash hands after removing gloves, especially if you have been handling an animal with a serious or zoonotic illness (hands can become contaminated through small breaks in the gloves or in the process of taking them off).

It had been widely believed that hand washing was the next best choice when gloves are impractical. However, current research suggests that hand sanitizers are preferable in many circumstances ^[10]. It is true that proper hand washing has the significant advantage of removing even the most resistant pathogens, and is therefore required under certain circumstances (e.g. when hands are contaminated with feces, blood or bodily fluids, are visibly soiled, or after suspected exposure to a durable pathogen such as parvovirus or ringworm). But it is surprisingly hard to wash hands correctly, and compliance may not be all one could wish for. Ineffective hand washing may actually be less helpful than correct use of a good hand sanitizer ^[11]. According to the Center for Disease Control, proper hand washing technique consists of the following:

1. Wet hands with warm running water
2. Lather with soap
3. Scrub all surfaces for a minimum of 20 seconds
4. Rinse
5. Thoroughly dry hands using two single use paper towels for 10

seconds each – if cloth towels are used, a fresh one must be used for each hand washing episode. Hands should be dried for 10 seconds on one area, then 10 seconds on a fresh area of the towel.

As with environmental decontamination, the drying step is especially important. Moisture on hands may actually facilitate pathogen survival and transfer^[12]. Clients and staff should have ready access to hand washing stations stocked with soap and paper towels at all times.

The third strategy for dealing with contaminated hands are those convenient hand sanitizer gels. Even though the spectrum of effect may be limited, a slightly less effective method, used consistently and correctly, will provide better results than the theoretically-ideal choice. In one study that compared the bacterial levels on vet students' hands after performing an exam on a horse, bacterial counts were actually lower on the hands of those who used a hand sanitizer compared to those who washed and dried ^[11]. The basics of hand sanitizers are as follows:

- Use hand sanitizers that contain 60-80% ethanol or isopropyl alcohol (due to better efficacy against feline calicivirus). Hand sanitizers should also contain an emollient to protect skin.
- Provide and clearly label hand sanitizers in all animal areas and position them within 3 feet of animal exam stations

Use hand sanitizers according to directions, which usually involves rubbing for at least ten seconds, then allowing hands to air dry. For a video that makes hand sanitation seem incredibly fun and glamorous, check out this clip:

- Avoid alcohol free products in shelters: in addition to being less reliable against calicivirus^[13], some of these contain phenol (Triclosan) or quaternary ammonium (benzylalkonium) compounds, which can be toxic to animals at too high a concentration
- Remember, no hand sanitizer is effective against the most durable pathogens, such as the parvoviruses or ringworm. When these pathogens are suspected, gloves and hand washing are a must.

Some shelters have reported using Accelerated Hydrogen Peroxide (Rescue) wipes when access to hand washing is unavailable and exposure to parvovirus or other unenveloped virus has occurred (e.g. on animal control vehicles, in areas of the shelter that are remote from sinks, etc.). Rescue has proven activity against parvovirus and have been labeled for use without gloves and so might become the best option in those specific cases.

However, that is not to say that hand sanitizers do not have their place in animal shelters!

Foot sanitation

In human health care, hands are the primary culprit in disease transmission. For those of us in veterinary medicine, it is not quite so simple. Our patients – especially dogs – often sit on the floor of the waiting or exam room. The way many dog kennels are set up, caretakers must walk in and out for cleaning, carrying with them whatever happens to be on the soles of their shoes. Cats, on the other hand, often make their way through a clinic from carrier (or lap) to exam surface to a cage off the ground, consequently leaving them less vulnerable to “foot-borne” disease.

Luckily, if the basic environmental cleaning program is effective, the risk of transmitting disease via footwear is probably not all that high. While it is true that some pathogens may get tracked into a room when staff enters to clean it, if the last step is application of a good disinfectant, whatever was tracked in will be inactivated. If staff change footwear after cleaning and wear separate footwear for isolation areas, this risk will be further reduced. Foot sanitation should be a greater concern under a few special circumstances: before entering areas where vulnerable animals (puppies and kittens) are housed on the ground, when entering and exiting isolation areas where animals are being treated for conditions caused by particularly durable pathogens (such as parvovirus or ringworm), and during an outbreak of unknown cause.

There are two general options to prevent disease transmission via footwear: foot baths or dedicated boots/shoe covers. The obvious advantage of foot baths is that they are much more convenient than special shoes or covers. Every single person entering a given area can easily step into a foot bath on their way in and out of the room. The disadvantage of foot baths, however, is a big one: they just do not tend to work very well, if at all.

All disinfectants require some amount of contact time for optimal effect, and this will not be achieved with a quick dip in a foot bath. Often disinfectant foot baths are not of sufficient depth or used in such a way as to remove gross organic matter contamination of shoes, further compromising efficacy, and chemicals used may not be effective under the circumstances. One study found that only potassium peroxydisulfate was effective in reducing the bacterial count on boots after use, while the more commonly used quaternary ammonium disinfectants did not even have that effect.^[14] Discouragingly enough,

even potassium peroxymonosulfate foot baths, correctly used, did not lead to a significant reduction in bacterial contamination of floor surfaces beyond the foot bath [\[15\]](#), and incorrectly used foot baths can actually increase the spread of disease. [\[16\]](#)

Therefore foot baths may not be the best tool to prevent disease spread, can be a headache to use and maintain correctly, and may cause harm. When we consider that most foot baths currently in use are not likely effective and may create needless risk, there is little justification to use them in general shelter animal housing areas.

When serious disease is suspected, use dedicated shoes or shoe/boot covers. Rubber over-soles are fairly easy to step in and out of and can be kept in a variety of sizes directly outside of areas housing ill or quarantined animals.

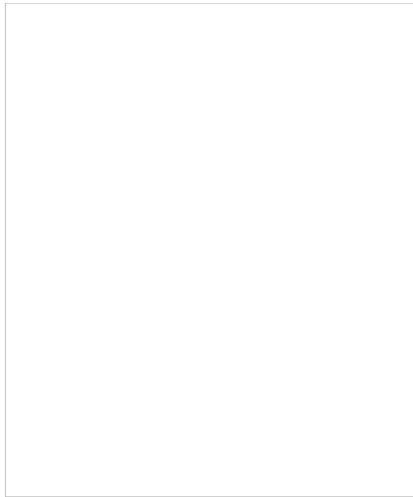
IF footbaths are used, minimize the risk of harm by:

- Choose a disinfectant proven effective in this context and with good activity in the face of organic matter (e.g Rescue™, not bleach or quaternary ammonium)
- Make the foot bath deep enough to cover treads of shoes
- Use a brush to remove organic matter on the bottom of shoes
- Change the foot bath daily or more often as it becomes contaminated

Clothing and disease transmission

So now we have dealt with hands and feet, leaving only the troublesome expanse of clothing in between. Even in the human health care world disease transmission on clothing is a big concern. For instance, one study found potentially harmful pathogens present on almost half of doctors' neckties [\[17\]](#).

The picture below demonstrates that clothing-borne disease transmission is a very real concern in veterinary medicine as well. The culture plate depicted was taken from a technician's scrub top after just a few hours of routine work.



The risk of disease transmission on clothing is enhanced by our patient's propensity to shed hair onto our clothing - hair that is potentially coated with everything from the animal's saliva and environment. Some pathogens may even cluster around hair follicles, facilitating spread on clothing. Ringworm is an obvious culprit, but virulent systemic feline calicivirus also may concentrate around hair follicles. This may in part explain the spectacular ease of fomite spread associated with some strains of calicivirus.

One of the most important – and reasonably easy – infectious disease control procedures is to have staff change clothing or wear protective garments for “dirty” activities such as cleaning and treatment of sick animals. Although it is obviously not practical to indulge in a full change of outfit with every animal, spare scrub tops or protective smocks should be freely available and used whenever interacting with a potentially infectious or high risk animal (e.g. juveniles, ringworm infected animals). Discarded surgery gowns are ideal for this purpose, as the long sleeves provide full covering for arms which can otherwise escape both hand-washing and gloves.

Laundry basics

What do you do with all those smocks and tops we encourage you to use so freely? Good news here: the vast majority of the time, all that is required is washing in either a regular or commercial washing machine and fully drying on a heat cycle.

One of the most important aspects of effective laundering is the mechanical removal of debris, so be sure to shake off large debris before

washing. It is essential not to overload washers and dryers and make sure that clothing and hands do not become contaminated by dirty laundry and then transmit germs to freshly laundered articles. Keeping the laundry room free of clutter and storing clean laundry in a separate room from the washer and dryer are also important laundry practices.

A [2016 study published in the Journal of Feline Medicine and Surgery](#) by Dr. Moriello evaluated the efficacy of laundering to remove dermatophyte spores and found that washing twice in cold water (30 degrees C) was adequate to remove spores as long as the washer was not overloaded and the wash cycle was 14 minutes or longer.

Although myths persist about bleach being inactivated by laundry detergent or hot water, this is not the case. As long ago as 1938, high-temperature laundering with bleach was found to be an effective method of sanitizing hospital linens, and subsequently, it was found that bleach used with water temperatures as low as 48 degrees C (118 degrees F) was sufficient ^[.19]. No more bleach than the usual amount for a given size of washing machine is needed (half a cup for an average household washer).

An additional measure of safety is provided by the heat and desiccation of drying; for this reason, hanging laundry to dry is not recommended, especially if not in an area exposed to direct sunlight (e.g. indoors or in cloudy weather).

Order of cleaning

Even if you use a good application system and practice good precautions of changing clothes and controlling transmission via hands and feet, some germs may still be passed as cleaning staff move through the shelter. In order to further reduce this risk, clean the areas housing healthy animals first, followed by stray holding areas, and finally isolation areas where sick animals are housed.

Within each area clean youngsters before cleaning adults. It is also fine to simply have different staff clean each area. What you want to avoid is having staff backtrack, such that they proceed from cleaning sick adults to

cleaning healthy youngsters awaiting adoption. A general order of cleaning is as follows:

1. Juvenile animals in adoption areas
2. Adults in adoption areas
3. Juvenile animals in stray holding areas
4. Adults in stray holding areas
5. Sick juvenile animals
6. Sick adults

Putting it in writing: developing protocols for sanitation

As noted above, everything that needs to be cleaned/disinfected needs a plan, and that plan needs to be written down somewhere readily available to those who will use it. It is not uncommon to visit a shelter or clinic that has excellent procedures in theory, only to find that in reality the practice was quite different.

The process for disinfectant dilution and application should be clearly written out, posted, periodically reviewed, and every step observed. Measurements should be clearly marked on containers as well as posted. Staff should be signed off after training, periodically re-evaluated, and all members of the veterinary team should be encouraged to reward good disinfection control behavior when they see it as well as report any problems.

At minimum, each written protocol needs to include:

- How often the area/object is to be cleaned/disinfected (after each use, daily, weekly, annually, during or after an outbreak?)
- What cleaning and disinfection products are to be used and how should they be applied? (Including, in detail, the correct process for dilution and contact time)
- Who is responsible for writing the protocol, following the protocol and ensuring the protocol is being followed?
- How, and how often, will you check to make sure the process is being done correctly?

To clean or not to clean?

One possibility that needs to be considered in disinfection programs is the possibility that, in the process, animals will be stressed and more germs will actually be transmitted than prevented. In some cases daily cleaning

and chemical disinfection is not necessary and may be harmful.

For an animal that is remaining in its cage or kennel, simply tidying the cage on a daily basis (“spot cleaning”) is often preferable to thorough cleaning and disinfection. This reduces stress and disruption for the animal and frees up staff time to focus on cleaning and disinfecting thoroughly between animals. Spot cleaning tends to work well for cats because they generally confine their urination and defecation to a litter pan. This method can also work for dogs provided the kennel is not soiled with urine or soft feces. For more information, download sample protocols for spot cleaning [cat cages](#) and [dog kennels](#).

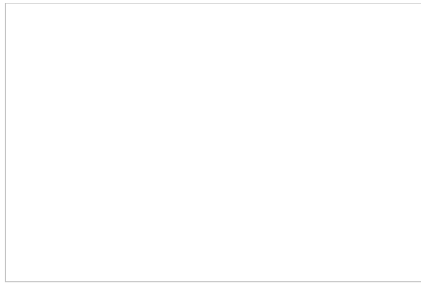
Verifying success

Occasionally reviewing the efficacy of a shelter disinfection program can be a powerful educational and motivational tool for staff. It can save staff from spending enormous amounts on a process that simply does not work, and can help management acknowledge and reward successful efforts.

One simple method is to streak bacterial culture plates from cages, exam surfaces and scrub tops. A sterile environment is not expected, but comparison of culture numbers to a known “clean/disinfected” surface can be helpful. Another fun tool is “glo-germ”, a product which fluoresces under an ultraviolet light and which is designed to mimic the spread of germs (available at www.glogerm.com for under \$20 a bottle). This can be used in many ways: for instance staff can handle a glo-germ-spiked stuffed or clinic cat, then wash hands as usual and check for residual “germs”; or it can be secretly sprinkled in the backs of cages prior to cleaning, and staff can be rewarded if they successfully get it all out.

Treating toxicity

Like many active chemicals, disinfectants are not without the potential for harm. At minimum, use of disinfectants at excessively high concentrations can create respiratory irritation for animals and staff, and some chemicals (such as quaternary ammonium and phenol disinfectants, e.g. Pine-sol®) can actually be fatal when applied incorrectly ^[20-22]. Disinfectant toxicity in shelters can cause dramatic, widespread episodes of severe oral ulceration, high fever, respiratory signs and pneumonia. Sometimes these are reported as suspected virulent calicivirus outbreaks but happily are much easier to resolve.



A cat with severe oral ulceration from quaternary ammonium toxicity.

If disinfectant toxicity is suspected, bathe the animal and rinse the environment to remove all disinfectant residue. If the animal has ingested disinfectant, check with poison control or the manufacturer for treatment. Offering emetics can cause more harm than good as the disinfectant may be caustic coming back up. Treat with broad spectrum antibiotics and pain control if the animal has suffered from ulcerations. Often animals will recover surprisingly quickly from truly awful looking lesions, so do not despair even if it looks pretty bad!

To learn more watch Dr. Hurley's wonderful presentation on sanitation in animal shelters at Tony La Russa's Animal Rescue Foundation's 8th annual "The Business of Saving Lives" conference -

For further information, see [Dr. Karsten's lecture slides on sanitation from the 2015 CVC conference in Washington DC.](#)

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