Operational Guide

Sanitation and Disease Control in the Shelter Environment

AMERICAN HUMANE

Protecting Children & Animals Since 1877

About the Author

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Introduction

The humane operation of an animal shelter requires that it be a healthful and sanitary environment. Prevention of disease is typically easier and more cost effective than addressing an outbreak. Poor sanitation and insufficient preventive health programs lead to unnecessary suffering through needless disease and increased rates of euthanasia. The unhealthful shelter also risks developing a poor reputation in the community, reducing adoption rates and driving away potential adopters, volunteers and donors.

The added risk of introducing zoonotic disease into the community is of particular concern. Not only is this irresponsible, but it can be devastating to the shelter if serious illness and litigation ensues.

With new animals constantly being brought in, sanitation and disease control are an ongoing challenge, requiring constant effort and vigilance. These daily arrivals bring with them potentially unknown disease conditions and an unknown immune status. The stress of a change in environment — from home to street to an institutional kennel — can lower immune system response, causing previously asymptomatic animals to break out with disease. Some apparently healthy animals may be a Trojan horse, carrying in disease without ever expressing symptoms themselves.

In addition, shelters face other challenges, such as aging or inappropriately designed facilities, overworked staff leading to high turnover, excessive numbers of animals and budget constraints. All shelters do not face the same challenges. There are differences in philosophy and mandate which dictate different approaches to management of disease outbreaks or population control within the facility. A municipal shelter charged with caring for all stray dogs in the community faces different challenges than the limited-admission cat sanctuary. The most modern and well-designed shelter with an untrained or uncaring staff will be a sicker and less humane place than an aging building with a staff that understands disease transmission, its relationship to cleanliness and the importance of working hard to maintain high standards.

Therefore, the common thread for all animal care and control facilities is the reduction of disease transmission through:

- Proper cleaning and disinfection protocols
- Appropriate animal handling
- Good preventive medicine
- Consistent staff training
- Effective stress reduction for the animals (and humans) involved

Given the nature of sheltering work, disease outbreaks may never be eradicated, but the sooner staff notice disease symptoms and take action to isolate sick animals, the less severe the outbreak will be. (Depending on an individual facility's approach, solutions may range from isolation of the sick animal to the use of foster homes or euthanasia.

Holding and Separation Areas

Holding Areas

When they first arrive, place new animals in a holding area for the short term only — ideally, less than two hours, but no more than one day. This allows for triage of the animal and assessment of its health needs.

A veterinarian or trained animal care staff member should examine the animal for injuries or signs of suffering (pain, difficulty breathing, or abnormal or difficult labor, for example). If an animal exhibits immediate, gross outward signs of disease, move it to isolation.

Otherwise, allow the animal to settle into the holding area for an hour or so. This facilitates examination, allows the body temperature to normalize from the stress of transport and facilitates vaccine administration.

Regardless of source, scan the animal for a microchip and look for identifying tattoos. Administer initial core vaccinations and complete an initial health screening at this time (FeLV/FIV or heartworm testing, for example). Administer routine dewormers as well. This is also the best time to determine if the animal has been spayed or neutered by checking for testicles or looking for evidence of a spay scar.

If the animal appears healthy but has an unknown health history, move it to quarantine. If it has a known health history, such as being surrendered with veterinary records indicating proper care and vaccination, move the animal into a healthy holding area.

If an animal is exhibiting signs of illness or aggression, staff may make a euthanasia decision.

The early elimination of the obviously sick, the poorly conditioned and the vulnerable animal will raise the overall health level of the facility. The very stressed are the most vulnerable to disease. Depending on space limitations or shelter protocols, the nervous or flighty animal may be selected for euthanasia at this early juncture. Check state and local laws for mandated hold periods on stray animals before euthanizing.

Quarantine

Quarantine areas hold new admissions that are being monitored for the possible development of disease. Depending on the prevalent diseases and available resources, quarantine may be as short as two days or as long as six months if required by law for rabies observation in cases of bite wounds of unknown origin.

Ideally, staff should observe animals with unknown histories for approximately one week prior to moving them to adoption areas. This allows time for expression of disease symptoms or for administered vaccines to become protective. This is not realistic for most shelters, so active disease control is imperative.

Isolation

Isolation wards hold clearly sick animals for observation and treatment away from the rest of the shelter population, thereby protecting other animals from disease transmission. The ideal isolation area is in a separate building, with showering facilities and changing rooms for the staff.

Staff should care for isolation animals at the end of the work shift or shower and change before moving on to other animals.

A properly designed isolation ward will have negative pressure airflow so that air circulates out of isolation to the outside, rather than re-circulating into the remainder of the shelter.

The best isolation principles include the use of disposable gowns, gloves and booties, and bleach foot baths. Never take equipment used in isolation elsewhere in the shelter. Drainage should never flow from isolation into healthy holding areas.

Euthanasia

Euthanasia is the ultimate isolation or quarantine effort. This is the permanent removal of animals from the population, either because they express disease and risk to the remainder of the population or because they are uniquely vulnerable to disease due to stress, nutritional status or age.

When shelter population numbers reach the facility's threshold, difficult decisions are sometimes made. In these cases, staff examines the population for the riskiest individuals. Once a decision is made, carry out the euthanasia in a timely manner.

Adoption

In the adoption area, the public views and visits with animals up for adoption. It's the best place to be. Think of it this way — the adoption area is the closest to freedom; the isolation area is the closest to euthanasia.

Once an animal crosses the hurdles of evaluation and onto the adoption floor, it is significantly less likely to slide back into isolation or euthanasia. The more quickly animals can be moved through evaluation for health and behavior, the more quickly they get to the adoption floor and out of the building into a new home. Short turnover times mean decreased illnesses and increased adoptions.

Group Housing

Group housing is one option for an adoption area, or long-term holding area if necessary for the duration of a law enforcement case. Cats may be housed in colonies, and dogs may be pair housed. These arrangements alleviate stress and boredom when appropriate social matching is done.

Cat Colonies

Before being selected for group housing, vaccinate cats with core vaccines, test them for FeLV/FIV, prophylactically deworm them and treat them with a topical mitacide (flea and tick preventive). Perform a fecal analysis of each cat as well, then tailor deworming if any internal parasites are found. Staff may also perform toothbrush cultures for the presence of ringworm spores since there are many more carrier cats than there are symptomatic cases.

Form groups no larger than 10 cats or 15 kittens. Arrange the groups by age, where kittens under 3 months cohabitate, then groups of 3 to 6 months, 6 months to 5 years, and another group for the more mature, sedentary cats. The ideal colony consists of only spayed and neutered cats. Observe the colony for compatibility at the outset. Remove any members who consistently bully or cower and those who overeat or refuse to eat. Because monitoring of individual cats is difficult, weigh and briefly examine each cat weekly to look for changes.

In each feline group-housing area, allow a minimum of 10 square feet per cat. Provide perches of various heights, hide

boxes, multiple litter boxes, and multiple food and water stations.

Spot clean the provided litter boxes (three or four) throughout the day, then completely change them over and clean them once a day. If staff finds feces and urine outside the boxes, more may be needed.

Most shelters choose to build a colony of 10 or less compatible cats and introduce no new cats until the last cat has been adopted. Maintain and spot clean the colony during its run. Once the last cat is adopted, strip the room and completely clean and disinfect it.

If new cats are constantly introduced, the room must be disinfected daily, and the cats must be monitored closely for signs of infectious diseases, especially sneezing and diarrhea.

Disease Transmission via Foot Traffic

Diseases are most often carried and transmitted by fomite. A fomite is any inanimate object capable of transferring an infectious agent from one place to another. When we have an enterovirus (any virus affecting the gastrointestinal tract marked by vomiting and/or diarrhea) outbreak, the most common fomite is the shoe. With upper respiratory agents, the most common fomite is the hand.

Towels or rags, litter pans, toys, food dishes, clothing, mops and cleaning carts can all act as fomites. For this reason, it is critical to establish cleaning protocols so that the areas with the healthiest animals are cleaned before the areas with animals of unknown health status (recent arrivals). Always clean areas where the sick animals are housed last.

Staff that clean isolation areas with sick animals should either gown up or have a complete change of clothing before working with other populations.

Only allow public access to areas that house healthy animals.

Use foot baths where enterovirus outbreaks are suspected. Trifectant or another quaternary agent is recommended for foot baths. Bleach is not appropriate for foot baths because it is quickly deactivated by contaminants. Change the bath daily or sooner if the bath is visibly contaminated with dirt or debris. Make disposable gloves and wall-mounted hand-sanitizer units readily available in many locations.

Note: If using fans to blow air through the facility, always direct airflow from the healthy toward the sick.

Kennel Design and Layout

Floors and Walls

The ideal kennel enclosure is non-porous and scratchproof. Epoxy-sealed concrete floors, with caulked cracks, are the best choice for shelter flooring. Treat concrete-block walls with impervious epoxy paint as well. Wood, jute, carpet and plastic flooring can never be adequately sanitized; therefore, they should not be used. Older facilities that still have such flooring must discard it when there is any incidence of disease outbreak.

Sound Control

Constant noise is stressful for people and animals. If possible, pipe in soft classical music to provide soothing, ambient noise. Otherwise, shelter sound-mitigation choices include appropriate ceiling tiles and baffles or blankets/tapestries hung on the walls to reduce noise. Launder any blankets/tapestries regularly because they trap dust and free-floating fur.

Odor Control

Avoid deodorant sprays or air fresheners, which only mask odors. The sources of masked odors are harder to find, which means the odor-causing condition will become worse before its source is identified. This includes odors from inadequate sanitation, garbage, feces, infections or mildew. Once identified, eradicate the odor's root cause. Clean, healthy shelters have a neutral odor, rather than an offensive or perfumed odor.

Layout

As much as possible, arrange kennels so that dogs do not face one another.

HVAC Systems

Ventilation and the number of air exchanges play a key role in preventing the spread of contagious diseases. Ideally, shelters should have a separate ventilation system for each animal-housing area. At a minimum, there should be a separate system for each isolation area. A minimum air exchange rate of 10 to 12 per hour is recommended in animal-***housing areas.***

Food Storage and Pest Control

Store food in insect- and rodent-proof containers to minimize contamination and disease outbreaks. Flies can transport parvo virus, and rodents may shed disease-causing organisms in their feces. Select any necessary pest-control products carefully since shelter animals may be directly or indirectly exposed.

Sanitation, Cleaning and Disinfection

Cleaning Process

Sanitation is not sterilization, which is a complete removal of all infectious organisms. That ideal is impossible to achieve in the shelter setting. Instead, sanitation is the process of cleaning the kennel environment to effectively reduce the presence of infectious organisms. The goal is to reduce the number of infectious organisms to below the disease-transmission threshold.

Sanitation is achieved through a four step process:

1. Dry cleaning
2. Wet cleaning with a detergent
3. Wet cleaning with a disinfectant
4. Weekly degreasing

Some older sanitation protocols refer to a two-step process: physical cleaning followed by chemical cleaning. However, chemical cleaning involves two steps, scrubbing with detergent followed by disinfection, which itself takes considerable physical effort.

Once a sanitation protocol is devised, train all employees on the proper implementation of the protocol, with a special emphasis on thorough cleaning and personal protective equipment. For example, all personnel should wear protective clothing and rubber boots during sanitation work, including scrubbing and disinfecting boots for each run before moving on to the next. Safety glasses and face masks prevent staff from being exposed to airborne particles, such as chemicals and pathogens. Animal handlers must also remember to wash their hands or change gloves between animals.

Explain the goals, methods and reasons for your sanitation protocol completely. Post signs that remind employees of the step-by-step protocol.

Sanitation requires removal of the animal from the area to be cleaned. It is never appropriate, nor is it humane, to use a hose or apply disinfectants in an enclosure with an animal still present.

Generally, cat cages and cat colony rooms should be spot cleaned only on a daily basis without removing the cats. This process consists of removing and replacing any soiled bedding, providing fresh food and water, and thoroughly cleaning or replacing the litter box. Cages should be completely cleaned and sanitized when the cat leaves. Colony rooms should be completely cleaned and sanitized weekly.

Dogs should be moved to one side of a guillotine door, if there are indoor/outdoor runs or divided indoor/indoor runs. As an alternative, have a volunteer or staff member take the dogs for a walk during cleaning.

If these options are not viable, some shelters keep an empty run at all times. Ideally, each shelter environment an animal uses (i.e., run, cage) only houses that animal during its stay. Since that may not be possible, be sure to thoroughly disinfect temporary holding areas between uses by different animals.

One dog at a time is removed from its soiled run or cage and placed in the clean, empty run or cage, and then he is returned to his clean run. It is best to return animals to the same run or cage after cleaning. This is the least stressful and safest alternative because each animal returns to its own germ environment. (Remember,

even the best sanitation program drastically reduces, but does not eliminate, infective organisms.)

One habit that frequently develops among under-supervised volunteers or staff is to allow animals, especially cats, to wander while their enclosures are cleaned. Shelter management should strongly discourage this practice to prevent pooling of pathogens.

Once the animal is removed, the next step is the so-called "dry cleaning step," where staff removes everything from the cage or run, including, papers, litter box, toys, towels or blankets and food dishes.

Disinfect all of these items on a daily basis, or use disposable substitutes. Many shelters use restaurant suppliers for paper dishes or trays for litter boxes. A possible free supply may be found through your local soft drink distributor or grocery store. You may be able to convince them to save cardboard case bottoms to use as litter boxes or snuggle boxes for cats. If you do not choose to use disposable dishes and litter boxes for cats, then stainless-steel items are recommended. You can purchase stainless-steel pans from a restaurant supplier in a variety of sizes than can be used as litter pans. They are more expensive to purchase initially than plastic pans, but they will last indefinitely and can be easily cleaned and sanitized. Plastic bowls and litter pans are porous and become easily scratched, which makes them impossible to disinfect.

Ideally, stainless-steel dishes and litter pans should be run through an industrial dishwasher. The high temperature combined with the dishwasher detergent is a very effective method of disinfecting these items. If you do not have a dishwasher, then place empty dishes and litter boxes in a tub or a sink to soak in a detergent solution.

Soiled towels and bedding should be washed in a washing machine, preferably in hot water in regular laundry detergent. You can also add bleach to the laundry, but it is generally not necessary.

For reusable litter boxes, carefully lower them into the trash barrel and empty gently to avoid the dispersal of dust into the air. Carefully scoop and place in the trash all solid or semi-solid waste.

Wipe any trace material from the run or cage (e.g., litter, food, vomit, saliva, sneeze splatter marks, urine or fecal residue) with moist paper towels.

The goal is to remove as much organic material as possible. Feces cannot be disinfected. Parvoviruses can last six to 12 months or more in debris. Disinfectants only destroy a percentage of bacteria and viruses, and the smaller the population on the surface, the fewer will be left at the end of sanitation. Organic material also directly inactivates many disinfectants, and no disinfectant can penetrate organic material. Once the kennel appears "clean" to the eye, it is time to begin "wet cleaning."

Wet cleaning begins by applying a cleaner with a detergent component. Washing is the most crucial step of the disinfecting process and is best accomplished with hot water and detergent. Washing further reduces the number of microorganisms present so that the next step, disinfection, will be most effective. Efficient cleaning with detergent removes up to 99 percent of bacteria present.

In kennels with drains or a runoff system, detergent is most effectively applied with a low-pressure foamer, a device placed at the end of a hose to dilute the detergent to the appropriate ratio. This method ensures the even and thorough application of the cleaner. Foaming also provides clinging ability for vertical and hard-to-reach surfaces, and enhances product performance. For cages, apply detergent with squeeze bottles and paper towels. Avoid buckets and rags because they can be a primary conduit for transmitting disease.

Next, scrub all surfaces with a stiff brush to ensure penetration and breakdown of accumulated materials. Scrub from cleanest area to dirtiest, which usually means from top to bottom. Pay special attention to cracks, corners, cage bars and shelf lips, where debris can accumulate. Do not neglect the guillotine doors or other surfaces in the enclosure.

Rinse and disinfect the brush (a 10-minute soak) between runs. For efficiency, disinfect one or two brushes while using another so that you can rotate between several brushes to ensure that a disinfected one is used at the outset of each run or cage.

Once the entire surface has been vigorously scrubbed, rinse away all detergent material with a low-pressure hose. High-pressure systems create splatter and aerosols, which can carry infective agents into the air. Because they are not yet disinfected, the detergent solution and suspended bacteria and viruses can potentially transmit disease.

Prior to application of the next step — the disinfectant — remove excess moisture with paper towels (for cages) or a squeegee (for runs). Then properly dilute and apply the disinfectant solution. Always measure and mix chemicals. Looking for color concentration leads to wasted product and money. It can be potentially toxic as well, if the solution is too concentrated.

Read the manufacturer's labeling completely and use the product within the specified guidelines. The Occupational Safety and Health Administration (OSHA) publishes guidelines and regulations for chemical uses. It helps to know that terms ending in "cidal" mean the chemical will kill the indicated organism, whereas "static" only indicates control or suppression of growth.

Disinfectants should never be mixed because lethal combinations may result. Misuse of a chemical violates Environmental Protection Agency (EPA) regulations.

Disinfectants work best at room temperature (68° F). Cold water, along with the presence of any organic material, diminishes the disinfection activity. Some disinfectants, such as bleach, must be mixed fresh each day as the effectiveness deteriorates with time. Other disinfectants, such as Trifectant, are stable for a week or more after they are mixed.

For cage disinfectants, use squeeze bottles that emit a gentle stream rather than spray bottles that mist, because disinfectants can be a significant respiratory irritant to both employees and animals. For larger areas such as runs, a foamer is the best choice for diluting the disinfectant. A backpack-type pressurized garden sprayer is also an effective distribution tool.

Once applied, disinfectants must be allowed to contact surfaces for the appropriate length of time in order to be effective. For most disinfectants, a minimum of 10 minutes is recommended.

A chemical degreaser should be used on all cage and run surfaces weekly or whenever an animal leaves an enclosure permanently. Degreasers break down the biofilm that prevents penetration of disinfectants. Biofilm includes the accumulation of oils from the skin of animals and other moisture that supports bacterial growth. Biofilm feels slick or slimy to the touch when wet. Bacteria secrete a protective film, which also prevents complete penetration of a disinfecting agent. If this film is not broken down and washed away, it traps dust, shed skin cells and other materials. This layer becomes a rich habitat to support growth of algae, fungus and disease-causing organisms. The degreaser should be applied after the detergent is rinsed away and before the disinfectant is applied. Degreaser should be applied either with a foamer or squirt bottle, and the surface should be scrubbed using a stiff-bristled brush. The degreaser alone will not remove the biofilm without some scrubbing. The degreaser should be thoroughly rinsed away before the disinfectant is applied.

Drains should be cleaned of accumulated hair, food matter and feces daily, and disinfected along with the kennel surfaces. After cleaning cages and kennels, clean and disinfect common floor areas and counter surfaces. Where possible, use a fresh damp mop rather than brooms and vacuums, which put dust and hair into the air. Centralized vacuuming, if available, is also a good choice.

Clean and disinfect the cleaning equipment itself. This includes the hoses that may have been dragged through contaminated areas. As with all traffic patterns, it is always best to drag the hose on a clean-to-dirty path, whenever possible.

Remember, especially in times of disease outbreak, that the entire facility may be contaminated. Doorknobs, keyboards, telephones, grooming tools, medical equipment, vehicles, transport cages, traps, leashes, snares, poop scoopers, mop handles, ducts and vents, walls and floors of even non-animal areas, and storage areas require special attention after an outbreak.

Common outdoor areas can never be completely disinfected. The best disease-prevention program includes a vigilant outdoor poop-scooping effort. If feces are collected as soon as they are produced, there is no time for parasite eggs to sporulate and become infective, and there is no time for viruses to disperse. Dogs with diarrhea should be limited to a gravel walk that is then thoroughly hosed down and sprayed directly with full-strength bleach in the area of elimination. (Remember, parvovirus and panleukopenia viruses experience an upswing in times of wet weather.)

Types of Disinfectants

There are several disinfectant types to choose from. Microorganisms vary in their degree of susceptibility to disinfectants. In general, Gram-positive bacteria are more susceptible to chemical disinfectants, while mycobacteria or bacterial endospores are more resistant. The hydrophilic, non-enveloped viruses (such as adenoviruses, picornaviruses, reoviruses and rotaviruses) are more resistant to

disinfection than lipophilic, enveloped viruses (such as coronaviruses, herpesviruses, orthomyxoviruses, paramyxoviruses and retroviruses).

Pathogenic organisms also vary in their ability to survive or persist in environments (such as bedding, debris or feed) and in their potential routes of transmission. Whenever possible and especially in times of disease outbreak, work hard to identify the target organism. However, if the organism has not been identified, use a broad-spectrum approach until identification can be made.

There is no perfect disinfectant, so shelters must carefully consider their individual needs to tailor their disinfectant choice to the most useful, cost-efficient and effective type possible.

Bleach

Bleach is the most cost-effective disinfectant. At a 1:32 dilution ratio (0.5 cup of bleach to 1 gallon of water), it kills bacteria, parvovirus, panleukopenia and respiratory viruses. At a stronger concentration, 1:10 (1.5 cups bleach to 1 gallon of water), bleach kills ringworm spores.

Make sure to remove any organic waste first, as bleach is inactivated by organic material. Bleach should have at least 10 minutes of contact time before rinsing.

The drawbacks to bleach include its corrosive qualities, destruction of clothing and other fabrics, and the respiratory irritant factor. It also has a limited shelf life after it is opened and loses its power rapidly. However, nothing beats bleach in the face of a disease outbreak.

Do not mix bleach with Quat products.

Quats

Quaternary ammonium compounds (Quats) are another commonly used shelter disinfectant. Brand names include Roccal, Parvosol and Kennel-Sol. Quats differ in the presence or absence of detergents, perfumes and dyes. Highly effective against Gram-positive bacteria, quats also have good efficacy against Gram-negative bacteria, fungi and enveloped viruses. Some are not effective against non-enveloped viruses like parvo and panleukopenia or mycobacteria. Quats are considered sporostatic but not sporocidal. Most quats are only partially effective against calici viruses.

The pH or hardness of water may impact the effectiveness of a quat solution. There are various generations of quaternary ammonium compounds, some of which kill parvo and panleukopenia viruses under laboratory conditions, but they are less than effective in the shelter setting.

Avoid combination products with detergent and disinfecting quats because cleaning should always come prior to disinfection.

Oxidizing Agents

The brand names of oxidizing agents include Virkon-S and Trifectant. Oxidizing agents are effective against panleukopenia and feline calici virus. Studies also support efficacy against other unenveloped viral agents, including parvo. They are labeled as effective against ringworm, although recent reports have not borne that out. Reportedly less corrosive to metal than bleach, oxidizers have moderate activity in the presence of organic matter.

One drawback is that the chemical comes in powdered form that can be messy to

handle and mix, including clumping and caking, and a visible dusty residue sometimes remains on surfaces.

On the positive side, the mixed solution remains stable for up to seven days. Oxidizers feature colored additives that fade with the effectiveness of the cleaner, so the solution can be visually inspected to see if it is still good. These agents may be used on fabrics and carpets. They may be a good choice for disinfecting carpets and upholstery, particularly in a contaminated foster home environment.

Biguanides

Brand names include Novalsan and Chlorhexidine. These products have a narrow range of action and are expensive. Most effective against bacteria, they are often used on the skin prior to surgery rather than as a routine kennel disinfectant.

Phenols

Phenols, like Lysol and Pine-Sol, are bacteriocidal, fungicidal and virucidal to most viruses with the exception of the unenveloped viruses (such as parvo and panleukopenia). The presence of organic material reduces their effectiveness, but less so than other disinfectants. Phenols can be recognized by their tendency to turn milky white when added to water. Phenols have a residual disinfecting effect that can be beneficial.

Phenols Toxicity

Phenols are highly toxic to cats, and in strong concentrations (2 percent or higher), phenols are toxic to all animals, including humans. For these reasons, phenols should never be used in animal-holding areas (kennels and cages) and should be used with caution elsewhere.

Some shelters use phenols on the floors of common areas with a high level of human foot traffic. Other shelters do not want the risk of having phenols on the shelf anywhere in the shelter where they could be accidentally used by a well-meaning volunteer or new staff member.

Disinfectant Use and Safety

Disinfectants must be left in contact with the surface for the period specified by the manufacturer (usually 10 minutes) and in ample volume to avoid drying before the contact time is completed. Some disinfectant residues must be rinsed away, but most will be safe if completely air dried before returning the animal to the environment. Air drying may be hastened by the use of a squeegee or paper towels.

Fans may be used with some caution. Avoid fans where they will blow respiratory irritant fumes around the shelter or where they force air from one area of the shelter to another.

Telltale signs of animals being exposed to wet disinfectants or concentrated residues are sores around the mouth, on or in between the foot pads, or on the scrotum.

Disinfectants should be carefully stored and capped tightly to reduce evaporation and absorption of moisture from the air. Depending on the use rate of disinfectants in a particular facility, it may be more effective to buy slightly more expensive smaller containers rather than a 50-gallon drum, which sits around long enough to deteriorate and lose effectiveness.

Protective eyeglasses or goggles, chemical-resistant gloves, respirators, boots and protective clothing must be readily available, particularly when mixing

and handling undiluted disinfectants. Set up and regularly maintain emergency eyewash stations in each area. Do not store chemicals in the same area as food or bedding.

OSHA requires that a library of Material Safety Data Sheets (MSDSs) for every chemical used in the shelter be available in a central location. All chemical disinfectants must have a MSDS listing the stability, hazards and personal protection needed, as well as first aid information. Train staff in the use of MSDSs in case of accidental exposure. MSDSs are available from your chemical supplier or may be available through your distributor's website.

Disease Recognition

Viral Diseases

Canine Parvovirus

Parvovirus is a non-enveloped virus that is very durable in the environment and resistant to many disinfectants. Bleach diluted to 1:32 in an environment free of organic matter will kill parvovirus.

The young are the most vulnerable, but older dogs may develop a transient infection without clinical signs. Parvovirus attacks and kills rapidly dividing cells. As it destroys the intestinal lining, parvo causes vomiting and diarrhea. It also attacks bone marrow, lowering the immune system to almost nothing. Animals die from dehydration, protein loss and secondary infection. **In a young dog without treatment, parvo is 100 percent fatal.**

The incubation period runs three days to two weeks, although the usual period is five to seven days. After recovery, parvo-infected dogs may continue to shed virus in their feces for up to one month. It is possible but not common for cats to be infected with canine parvovirus.

There is a fecal viral antigen test (Idexx SNAP) that is very accurate at detecting antigen. Beware of the false positive in the recently vaccinated dog. The false positive will be a faint blue spot. A deep blue positive spot is always indicative of parvovirus infection. A negative test is not always truly negative. A blood smear to look for the presence of white blood cells may also be done.

The treatment of parvo requires stringent isolation techniques, intravenous fluids, powerful antibiotics and intravenous protein supplementation. This level of nursing care must be done in a veterinary clinic. Most dogs require between three days and three weeks of intensive care.

Because a recovered dog is a contamination risk and the treatment is costly, most shelters euthanize parvo dogs.

Canine Coronavirus

Canine coronavirus is a self-limiting viral enteric disease of dogs that causes vomiting and diarrhea. The incubation period is one to five days. It is spread through contact with infected feces. Dehydration is more serious and can be life threatening in puppies. Dogs will do well with supportive care, fluids and antibiotics. Dogs will shed corona virus for one to two weeks post infection. It is susceptible to most disinfectants.

Canine Distemper

Canine distemper is caused by an enveloped, and more easily disinfected, virus. Ferrets and raccoons are also susceptible to canine distemper.

The virus is most often spread by aerosol droplets produced through a cough or sneeze. The incubation period is one to two weeks, and onset of the disease is marked by lethargy, fever, anorexia and nasal discharge, followed by pneumonia or gastrointestinal signs.

Neurological signs, such as muscle twitches, seizures and behavior changes, may develop one to three weeks later. The dog with distemper may have ocular involvement. Watch for hardening of the footpads and nose pad, which are associated with a poor outcome. These dogs are more likely to suffer lifelong neurological effects.

Preventive vaccination is very effective, but shelter staff must suspect distemper in any dog with a nasal discharge and fever.

Canine Parainfluenza

This virus is one of the components of the Kennel Cough Complex. Parainfluenza invades the lining of the upper respiratory tract. On its own, Parainfluenza causes a mild disease. This virus incubates for five to 10 days. Not hardy in the environment, parainfluenza is easily disinfected.

This disease becomes complicated when a secondary bacterial component joins in, the most common of which is bordatella bronchiseptica (see below).

Canine Adenovirus Type 2 (CAV2)

Another viral component of kennel cough, CAV2 is transmitted by aerosol, but it is also not hardy in the environment. CAV2 incubates for five to 10 days and causes mild disease on its own.

Infectious Canine Hepatitis (Canine Adenovirus Type 1)

This infection is marked by a fever over 104 F, watery eye discharge, lethargy, abdominal pain and swelling. This infection can be serious and require hospitalization. Some dogs require blood transfusions for low white blood-cell counts and low platelet counts. The virus is somewhat hardy in the environment, and recovered dogs can shed virus for up to six months. Vaccination is an effective preventive.

This virus often causes loss of litters of puppies, even puppies of apparently healthy bitches. She may have had CAV2, recovered and is shedding virus when her pups are delivered. The puppies will die one by one in what is referred to as "fading puppy syndrome."

Rabies

This fatal virus is transmitted by the saliva of an infected animal through a bite wound. The most often-implicated carriers are bats, skunks, foxes and other wildlife. This virus travels from the site of the bite wound to the brain via the nervous system. By the time the virus is detectable in brain tissue, it is also being shed by the salivary glands. All bite wounds of unknown origin must be treated as rabies suspects.

State laws are very detailed and specific regarding vaccination use and the management of rabies-suspected animals. Consider the possibility of rabies in any mammal with neurological signs. Rabies can incubate for as long as five months before reaching the brain.

Feline Upper Respiratory Disease Complex (URI)

Feline URI can be caused by the feline herpes virus, calici virus, Chlamydophila felis (formerly known as Chlamydia psittici), mycoplasma and occasionally bordatella bronchiseptica, or any combination of the above viral and bacterial organisms. Often, the exact causative agents are not clear, but appropriate therapy is supportive with oral and ophthalmic antibiotics that will be effective against C. felis, mycoplasma and bordatella when secondary bacterial infection is suspected. The viral component has to run its course, and like the human common cold, can take up to three weeks to do so.

Feline Herpes Virus (Feline Viral Rhinotracheitis – FVR)

Most cats have been exposed to FVR at some point in their lives. Like all herpes viruses, it never completely clears and can re-emerge at times of stress. When it is being shed in oral, ocular and nasal

secretions, the virus is highly contagious. This virus is often transmitted by fomite and can live up to four hours on inanimate objects.

Cats with herpes viral infections will have sneezing, ocular and nasal discharge, fever and lethargy. The use of lysine oral supplementation has been shown to shorten the duration of the disease. Kittens should receive 250 mg and cats 500 mg once a day. This nutritional supplement may be obtained in powdered form and sprinkled on food. More severe cases may require fluids and force feeding.

Feline Calici Virus

Like herpes virus, calici can be shed chronically by carrier cats in times of stress. Calici virus is considerably hardier in the environment than herpes virus and requires bleach disinfection. Calici virus is also fomite transmitted and can live up to 28 days on inanimate objects.

Calici virus produces symptoms similar to herpes virus, but also can cause significant drooling due to large, painful oral ulcers. In kittens, calici virus can cause arthritis and sudden death from acute pneumonia.

There have been outbreaks of Virulent Systemic Feline Calici virus (VS-FCV), formerly known as hemorrhagic calici virus, throughout the United States. This form of the virus, although rare, is resistant to vaccination, can be shed by unaffected carriers and has a high mortality rate. VS-FCV should be suspected if cats are dying of upper respiratory infection in the shelter.

Feline Panleukopenia

This non-enveloped virus is closely related to the canine parvovirus and causes the same disease course. This disease has been called “feline distemper” in the past, which is confusing. Feline parvo would be more accurate. This disease causes vomiting, diarrhea, lethargy, anorexia and bone marrow suppression. Sometimes the only symptom in the early course of disease is profuse hypersalivation.

The Idexx SNAP parvo antigen test cross reacts with panleukopenia. This test should be conducted on any panleuk-suspect cat, particularly in times of increased disease outbreaks (the spring and fall). Panleuk incubates for three to seven days and causes varying degrees of illness, depending on the virulence or strength of the virus, and the immune status of the cat or kitten affected. As with canine parvovirus, some cats can be shedding the virus without showing any symptoms. It is also persistent in the environment and resistant to most chemical disinfection.

Vaccination is effective prevention. Modified live, single-agent vaccines are available and are recommended on admission to provide the most rapid immunity among shelter cats. **Do not give modified live vaccinations to pregnant cats.**

Feline Leukemia Virus (FeLV)

This retrovirus is moderately contagious and requires cat-to-cat contact. FeLV may be transmitted vertically from queen to kittens. This virus may be transmitted through friendly behavior, such as allogrooming or sharing common food bowls. This virus can survive up to two days in a moist environment.

Feline leukemia is a biphasic disease. It can become symptomatic early in a kitten’s life, causing bone marrow suppression, susceptibility to other

diseases and death. If an infected cat survives this period, it may go on to have a long, healthy life marked by bone marrow suppression or the development of cancer in its teen years.

Feline Infectious Peritonitis (FIP)

FIP is caused by a corona virus in cats similar to the corona virus in dogs described above. Most cats exposed to corona virus will have a mild, self-limiting case of vomiting and diarrhea, which resolves with no residual effect.

In certain situations with susceptible populations, usually purebred cats, corona virus can mutate to a form that causes fatal disease. These cases are marked by fluid accumulation in the belly or by granulomatous disease causing inflammation of the eyes or brain (seizures). Kittens may show symptoms of failure to thrive or grow, with intermittent fevers.

Corona vaccination is not effective. Good husbandry is the best preventive as the virus is not hardy in the environment.

Bacterial Diseases

Leptospirosis

This bacterial infection is spread most commonly by urine contamination of the environment by rodents or wildlife. The bacteria can survive well in a wet environment. Dogs should not be allowed to drink standing water outdoors, particularly in areas where rodents, deer or foxes are known to live. This bacteria is virtually everywhere.

In severe cases, dogs will break with a high fever and weakness. Later on, there may be signs of kidney failure or jaundice, indicating liver involvement. Affected dogs shed large amounts of leptospirosis organisms in their urine. If the disease is diagnosed early, before organ damage has occurred, it is treatable with antibiotics. Untreated, lepto causes death by organ failure.

Vaccination is ineffective as there are many more strains of lepto than are included in the vaccines. It is also thought that this limited protection lasts less than six months post vaccination.

Infectious Tracheobronchitis, Bordatella bronchiseptica (Kennel Cough)

Bordatella is an opportunistic bacterium, causing infection where viral infection has already opened the door, usually parainfluenza or CAV2. Infection is marked by a harsh hacking or honking dry cough. Gentle palpation of the dog's throat will trigger a cough response. The young, elderly or poorly conditioned may progress to a serious case of pneumonia, as will cases complicated by other bacteria, such as streptococcus.

Transmission is by aerosol droplets at fairly close contact (nose-to-nose contact) or by fomite. Treatment is with rest and antibiotics, if a productive cough or nasal discharge are noted. Exposure to cold air or exercise can exacerbate the course of the disease, so dogs with kennel cough require strict rest and isolation from other dogs. Some dogs will benefit from cough suppressants. Kennel cough typically runs its course in 10 days.

Rickettsial Disease

Ehrlichia canis, rickettsia rickettsii and Lyme Disease are all tick-borne diseases that can cause joint pain, fever, muscle pain and effects on blood-cell counts.

Fortunately, if caught early, these diseases are responsive to doxycycline therapy.

Fungal Diseases

Ringworm

Dermatophytosis, aka "ringworm" (microsporum canis, m. gypseum, trichophyton mentagrophytes), is a fungal skin infection that causes hair loss, itching and redness. Ringworm is spread by fomite or direct contact. Ringworm organisms cannot live without organic matter, such as hair or shed skin cells. The spore form is very durable in the environment and can be infective for years.

The young, the elderly and the immune compromised are at greatest risk, as are Persian cats and Yorkshire terrier dogs. Incubation can be anywhere from four days to four weeks, and as many as 10 percent of cats can be asymptomatic carriers.

The vaccine is ineffective, and lufeneron (Program), which had been heralded as a wonder cure, has also proven ineffective. Wood's lamp examination, if positive, is diagnostic for ringworm. Unfortunately, only 40 percent of ringworm infections fluoresce, so negative examination does not rule out ringworm. Suspect hairs may be inspected under the microscope for a telltale appearance, but the most accurate diagnostic test is dermatophyte culture.

When dealing with an outbreak of ringworm, use bleach at a 1:10 dilution and allow 30 minutes of contact time. Make sure to rinse and dry the cage thoroughly before returning the cat to it.

Because ringworm infection in a cat population can be stubborn, and because it can be zoonotic with terrible public relations outcomes, many shelters choose to euthanize ringworm-positive cats in order to limit disease spread within the shelter.

Treatment can be difficult and expensive. Most cases require a long course of shampoos and lime sulfur pet dip, with clipping of long-haired cats. Some cases require oral medication as well, which can be toxic and require blood monitoring during treatment.

Do not take the diagnosis of ringworm in the shelter cat lightly. It is a disease that can easily spread to staff and customers, and can be extremely difficult to remove from the shelter environment.

External Parasites

Fleas, ticks, sarcoptic mange, demodectic mange and ear mites are of concern because they cause discomfort (sometimes extreme) and because these parasites can be vectors of serious disease. Skin and hair coats should be examined closely on admission to the shelter so that the conditions may be treated in a timely fashion.

Internal Parasites

Coccidia

Coccidia are a single-celled protozoan organism that causes diarrhea in puppies and kittens. Adult animals are only transiently infected and do not usually develop diarrhea. Stressed kittens and puppies can develop severely dehydrating diarrhea. Coccidia are very resistant to disinfection, but vigilant removal of feces prevents their transformation to the infective form. It takes between four and 24 hours for this to occur. Any infected

litter should have feces removed every couple of hours to reduce the risk of reinfection. Coccidia are species specific, so cross-contamination between puppies and kittens is not a concern.

Previously treatment was lengthy and laborious, with a 21-day course of sulfadimethoxine. Some strains proved to be resistant. Recently, treatment with ponazuril (Marquis paste – Bayer, an equine product) has shown that a single treatment can be curative. Some shelter veterinarians are dosing ponazuril at 15 mg/kg once a day for three consecutive days and are seeing excellent results. The drawback to ponazuril is that it is very expensive, and four tubes must be purchased at one time. Interested shelters may wish to enter into a purchasing agreement with three other organizations in their area.

Giardia

Giardia is one of the most common protozoan parasites of humans. Many animals are capable of being infected and passing the cysts in their stool, including dogs, cats, birds, horses and cattle. It is most commonly contracted by ingesting water or food contaminated with the giardia cysts.

Giardia can cause diarrhea, especially in puppies and kittens, which may be severe enough to cause weight loss and dehydration.

Metronidazole (Flagyl) or fenbendazole (Panacur) are commonly used to treat giardia, but no treatment is universally successful in preventing the shedding of cysts in the stool. Treatment is only effective in minimizing diarrhea and symptoms in infected animals.

Good hygiene is very important in the prevention and control of giardia. Promptly pick up feces in runs and cages. Bathe animals infected with giardia to prevent re-infection from their hair coat.

Quats are very effective in killing the cysts in the environment, but these compounds rapidly lose their effectiveness in the presence of large amounts of organic matter. So it is essential to physically pick up all fecal matter prior to disinfection.

Roundworms (toxicara)

Shed in very high numbers in the feces of infected dogs and cats, roundworms are easy to treat, but they have serious zoonotic risks. Ingested roundworm eggs will result in larval migrans disease in children. Larval migrans can cause lung inflammation, liver damage, brain damage and blindness.

Untreated cases in kittens and puppies cause unthriftiness and even life-threatening intestinal blockage. The typical roundworm-infected puppy or kitten will have a potbellied appearance and a rough haircoat. The infected adult may appear perfectly healthy.

Hookworms

Hookworms (ancyclostoma) are picked up by migration through the skin or from mother's milk. Hookworms attach to the intestinal wall and feed on blood. Heavy infections can cause anemia, weakness and wasting. Pyrantal pamoate cures hookworm infection. Hookworm eggs can migrate through human skin causing an itchy but self-limiting eruption. Bleach will kill hookworm larvae on cement, but not in moist soil.

Whipworms (tricuris)

Eggs become infective within two weeks after production, and they can remain viable for years. Whipworms cause signs of large bowel diarrhea (loose stools with mucous or blood). Fenbendazole (Panacur) is the most often-used treatment.

Tapeworms (dipylidium, echinococcus, taenia)

Tapeworms are transmitted by fleas, so any flea-infested animal must also be assumed to be tapeworm infected. Tapeworms pass segments that creep around on their own and dry to appear like grains of rice on the anus. Common tapeworm infection is not terribly detrimental to the animal. However, they are a potential zoonotic infection, which should be treated seriously.

Echinococcus tapeworm, however rare, has been reported in the southwestern United States. These worms cause the formation of cysts, a very serious health concern that requires very careful surgical removal. If they rupture, the cysts can seed thousands of other cysts throughout the internal organs. A single cyst in the brain can be fatal.

Tapeworm infections can be treated with Praziquantel (Droncit – Bayer).

Heartworms

Heartworms are transmitted between dogs by mosquitoes. Left untreated, heartworm disease is debilitating and ultimately fatal. Treatment of heartworm infection is costly and hard on the dog, as a highly toxic medication must be used. Dogs require strict rest in the month following heartworm treatment, as the worms break up and circulate through the body. Worm fragments can interrupt blood supply to the lungs, brain or intestines, with fatal complications.

Fortunately, heartworm disease is far easier to prevent than it is to treat. Shelter dogs should be given monthly heartworm preventive, such as ivermectin/pyrantel (Heartgard Plus – Merial), milbemycin oxime (Interceptor – Novartis) or selamectin (Revolution – Pfizer). Cats are also vulnerable to heartworm infection, and if they are potentially exposed to mosquitoes in an endemic area, give cats selamectin on a monthly basis.

Whenever possible, heartworm testing and heartworm disease staging should occur prior to administration of the preventive. Then, give dogs preventive medications on a monthly basis regardless of test status in order to reduce the available microfilaria (baby worm) population for mosquitoes to pick up. The use of a heartworm preventive in a heartworm-positive dog runs the risk of anaphylaxis as the microfilaria die off, but the benefit to the remainder of the dog population outweighs this risk. The use of preventive in the heartworm-positive dog creates a situation known as “occult heartworm disease,” detectable by antigen testing only.

Preventive Recommendations

Vaccinations

Vaccination recommendations for the shelter environment differ from those recommended for animals in a home. Most often, previous vaccination status of shelter animals is unknown. The most prudent approach, therefore, is to consider each animal entering the facility as unvaccinated.

Vaccination in the shelter setting will not prevent outbreaks of disease. Early vaccination, meaning the moment the animal arrives, or as close to arrival as possible, gives the animal an advantage in the race between immunity and disease. If the animal was exposed to the disease before coming into the shelter for vaccination, he may still break with disease. In some cases, however, vaccination may lessen the intensity or duration of disease. Also, some animals will not respond to vaccination in a protective manner. For those individuals, no degree of vaccination will prevent disease.

Vaccines not to use:

Using too many vaccines can have a detrimental effect. Too many antigens administered at once can overwhelm the immune system and lessen the strength of the immune response. The more vaccines used increases the likelihood of an adverse vaccine reaction.

Rule out vaccinations for diseases that are self-limiting or treatable. In the shelter setting, the Lyme vaccine, giardia vaccine, corona, leptospirosis, Chlamydophila (C. felis), ringworm (m. canis), FeLV and FIP vaccinations may be wasted money. Many of these vaccinations are of so little added benefit that they are not worth the cost of administration.

Lyme – Effective tick preventive is the best Lyme disease preventive. This vaccine has a high rate of vaccine-associated illness. It is not fully protective and will cause false positive when screening for Lyme disease.

Giardia – This vaccine is expensive and may be considered for limited times during disease outbreak. Most shelter animals are not at great risk for exposure.

Corona – This infection is considered to be protective against parvovirus and is certainly the lesser of two evils. Also, the vaccine is not terribly protective.

Leptospirosis – Vaccinations for leptospirosis are of limited efficacy and are available for only a small number of the strains that exist. Rodent control and not allowing shelter animals to drink standing water outdoors will provide greater protection against Lepto than the vaccine.

Chlamydophila – Because signs of disease associated with C. felis infection are comparatively mild and respond favorably to treatment, and because adverse events associated with use of C. felis vaccines are of greater concern than adverse events associated with use of many other products, routine vaccination against C. psittaci infection is not recommended.

Ringworm – The m. canis vaccine is no longer being produced because it had a tendency to cause the disease symptoms to disappear, but not eliminate the carrier status of the cat. There may be some vaccines still available through

distributors, but they are not recommended.

FeLV – Because cats in a shelter are in a closed community with no contact with FeLV-positive cats, this vaccine is also not recommended.

FIV – As above, cats in a shelter are in a closed community with no contact with FIV-positive cats. One major drawback to this vaccine is that it will cause cats to test positive on routine FIV testing.

Feline infectious peritonitis – Considerable controversy surrounds the ability of this vaccine to prevent disease. Some studies demonstrate protection from disease, while others show little benefit from vaccination. At this time, there is no evidence that the vaccine induces clinically relevant protection, and its use is not recommended.

Feline bordatella – This vaccine may be of use if the pathogen is identified in a disease outbreak, but otherwise, bordatella is rarely implicated in feline upper respiratory infection.

Vaccines to use:

Modified live vaccines (MLV) are recommended for their properties that provide quicker immune protection. It is important that staff learn to differentiate between mild vaccination symptoms that mimic actual disease and real disease outbreak. The biggest differentiating factor is the presence or absence of fever.

Local or topical vaccines are recommended for diseases that enter via the topical route. This means an intranasal vaccine is recommended for feline herpes and calici viruses. For canine bordatella, the intranasal vaccine is recommended.

Parenteral (injected) vaccines are recommended for all other infectious diseases. The intranasal administration of the panleukopenia vaccine is not thought to be protective. If the trivalent upper respiratory and panleukopenia vaccine is used, it should be backed up by the use of the injectable panleukopenia vaccine.

Core Vaccinations

Core vaccines are those that should be administered to every animal as it enters the shelter.

For cats, the core vaccines are:

- Panleukopenia MLV (modified live) parenteral
- Herpes (also known as rhinotracheitis)
- Calici virus MLV topical
- Rabies, non-adjuvented

For shelters that are having difficulty lowering feline upper respiratory rates, the parenteral FVRCP (Feline Viral Rhinotracheitis, Calici virus, Panleukopenia) may be given in addition to the intranasal vaccine, thereby further reducing outbreaks.

For dogs, the core vaccines are:

- Distemper MLV
- Adenovirus 2
- Parvovirus MLV
- Parainfluenza (this combination is known as DAPP)
- Rabies (killed)
- Bordatella intranasal

Bordatella intranasal can have a combined parainfluenza and adenovirus 2 component, but should not substitute for the parenteral DAPP.

Individual risk-assessment and vaccine protocols can be developed as needed by

the adopters' veterinarian. The individual animal's lifestyle will be evaluated, and the veterinarian may recommend further vaccines at that time. Also, an individual shelter profile may require modifications to the core vaccines outlined above in conjunction with an advising veterinarian. These guidelines are intended as a suggested starting point.

Puppies should be vaccinated with bordatella and DAPP at 6 weeks of age and boosted every two weeks until out of the shelter. Kittens may be vaccinated with the intranasal upper respiratory components at 2 weeks of age. This can be boosted at 6 weeks of age along with panleukopenia, also administered at 6 weeks old.

The best protocol places litters of puppies and kittens into foster homes outside of the shelter. Litters visit at 6 weeks for vaccination and return at 8 weeks for adoption. The recombinant PurVax rabies vaccine by Merial has the advantage of being approved for use in 8-week-old kittens. Puppies must wait until 12 weeks of age for rabies vaccination.

Pregnant animals should not be vaccinated with any modified live vaccines, as this may cause abortion or problems with fetal development.

Deworming

All animals should be prophylactically dewormed with a broad-spectrum dewormer, such as pyrantal pamoate (Strongid, Nemex). Further tailored deworming may be done as needed and indicated by fecal floatation tests. The best preventive medicine programs obtain fecal floatations on all animals in the shelter. The minimum monitoring to be done is to conduct fecal floatation on all animals with either diarrhea or vomiting.
The Centers for Disease Control (CDC) recommends an aggressive routine deworming to prevent human exposure to toxicara eggs, including these guidelines for dogs and cats:

Dogs:

Puppies should be dewormed at 2 weeks of age and every two weeks until 3 months old. From 3 to 6 months, puppies should be dewormed once a month, and then four times a year for life. Lactating bitches should be treated at parturition and then every two weeks with the puppies. Newly admitted dogs to the shelter should be dewormed at admission, with the dose repeated in two weeks. Heartworm preventive administered monthly year-round can serve as the strategic deworming medication.

Cats:

Kittens should be dewormed at 3, 5, 7 and 9 weeks, then monthly until 6 months of age. Adults should be dewormed four times a year. Lactating queens should be treated concurrently with kittens. A good choice for strategic deworming in cats is Drontal because it treats roundworms and tapeworms, the zoonotic species that cats most often carry.

Screening

All cats over 6 months should be screened for both FeLV and FIV. Kittens under 6 months may be tested for FeLV only. There are concerns with both false positives and false negatives when testing for FIV in kittens less than 6 months of age.

Counsel adopters to have their cats retested in six months. If an adopter is looking to add a new cat to a household of

existing cats, the safest bet would be an owner-surrendered, indoor-only cat with a negative FeLV/FIV test. Cats with positive FeLV or FIV tests must be strictly isolated from other cat populations.

Flea Control

Cases inundated with fleas should immediately use nitenpyram (Capstar – Novartis), an oral product that causes rapid death of the resident fleas, usually within 30 minutes. This should help prevent the establishment of fleas within the facility.

Ongoing flea prevention should be implemented with a topical spot-on product, such as fipronil (Frontline – Merial), imidacloprid (Advantage – Bayer) or selamectin (Revolution – Pfizer). In tick-endemic areas, Frontline, Advantix (Bayer) or Revolution are appropriate choices for dogs. For cats, Revolution is the best choice because it eradicates fleas, ticks and ear mites. Revolution is also helpful in areas afflicted with sarcoptic mange, as this product also kills sarcoptic mange mites.

Grooming

All animals in the shelter environment should be free of external parasites, burrs, hair mats or other uncomfortable foreign materials in the fur.

Monitoring

Every animal should be observed for behavior and attitude each day. If any changes are noted, closer examination is indicated.

Zoonoses

A zoonotic disease is one that may be transmitted from animals to people. Zoonotic agents can be viruses, bacteria, fungus, or internal and external parasites. Those most vulnerable to zoonotic disease include the very young, the very old, pregnant women, chemotherapy patients, transplant patients, those with immunosuppressive diseases or those on immunosuppressive medications. These folks are particularly at risk of having serious or even fatal outcomes from diseases such as bartonellosis (cat scratch fever), salmonella, bordatella, toxoplasmosis and lymphocytic choriomeningitis virus (LCMV, carried by rodents).

Other zoonotic diseases include giardia, hookworm, roundworm, tapeworms, tick paralysis, campylobacter, shigella, clostridium, helicobacter, tritrichomonas, echinococcocus, ringworm, scabies, rabies, pasturella, leptospirosis, yersinia pestis, monkey pox, ehrlichia, Rocky Mountain Spotted Fever (RMSF), Lyme disease and hanta virus. This list is far from complete, as new disease organisms or modes of transmission are discovered regularly.

Some of these diseases are transmitted directly from animal to human by bite exposure, such as rabies or bartonella. Other diseases require a vector, such as a tick, to transmit the disease, like RMSF. Others, such as salmonella, are transmitted passively from handling and then oral ingestion. A fatal disease may be transmitted as quickly as a child holding a reptile and then chewing her fingernails or sucking her thumb.

The principal routes of zoonosis transmission are dermal or mucocutaneous contact, bites and scratches, inhalation of droplet aerosols, ingestion and vectors. Provide hand-washing facilities to employees and visitors alike, and encourage their frequent use through signage and verbal reminders. Where hand-washing facilities are not available, provide waterless alcohol-based hand sanitizers. Advise parents to be vigilant of their children's activities.

Shelters are more likely to see zoonotic diseases than other animal facilities. This is because animals come from random sources, even out of state or out of the country. Some shelters are direct importers of animals from other geographic areas, while others are recipients of the fallout from well-meaning but under-resourced rescue groups. Shelter animals are likely to have not had any previous preventive health care, such as protective vaccines or routine dewormings. Animals may have been roaming before arriving in the shelter system and may have picked up a variety of diseases. Once in the shelter, animals experience environmental factors that promote zoonotic disease, including stress and high animal density.

The public should never be allowed to interact with animals showing any disease symptoms. Because immunocompromised or immunosupressed individuals may be reluctant to reveal their health status and may wish to maintain privacy, there should be some signage and literature regarding zoonotic disease available. This way, visitors may peruse them at their own volition and in private.

Animal Stress

Stressors play a significant role in the health status of shelter animals. Stressed animals are more likely to shed infectious disease organisms through diarrhea or other symptoms. Stress can be brought on by a variety of conditions and can be expressed through obvious or obscure clues. A stressed animal may be either withdrawn or hyperactive. Animals should be observed for signs of stress.

Stress reduction measures within the kennel enclosure include soft classical music, toys, a comfy bed, hiding and perching spots for cats, an outdoor view (if possible), fresh air and behavioral enrichment devices, such as stuffed Kongs for dogs and Kitty Kongs for cats. Use volunteers as much as possible to provide behavioral enrichment: brushing, petting, soothing talk, play, walking and manners instruction.

Pain exacerbates stress, and stress exacerbates pain. Train staff to recognize painful conditions and to alleviate suffering for humane and disease-control reasons. If an animal must be held for stray time after having been injured or while suffering with painful conditions, such as arthritis, the pain must be addressed. Measures taken may be as simple as providing deep bedding or may require veterinary intervention and the use of pain medications. If animals are frequently chewing at their surgical sites post-spaying or neutering, it may be time to have a discussion with your veterinarian regarding post-operative pain control measures. We have it in our power to alleviate or eliminate animal suffering, and we should take our responsibility to do so with profound seriousness.

Hunger is an easily avoided stressor in the kennel environment. A minimum of twice-daily feeding is recommended to lessen the chance of hunger. Puppies and kittens should be fed an age-appropriate food at least three times daily. In addition, the stress of the kennel environment increases the requirement for energy. The stressed animal exerts more calories by not sleeping and by pacing, shivering, jumping and barking. All animals should be weighed weekly to monitor for weight loss. Ensure provision of appropriate foods, particularly for exotic species, to be sure that what has been set in front of them is truly a good food. Consistently feeding the same brand of high-quality food is highly recommended. Although shelters often get donated food, changes in diet can result in inappetance, vomiting and diarrhea. Donated food is best utilized as a resource for fosters or a food bank for needy pet owners in the community, rather than for feeding shelter residents. Great care must be taken when re-feeding the starved animal and should be undertaken with veterinary guidance. Animals who have been starved for long periods of time may be unable to absorb nutrition, leading to explosive diarrhea, dehydration and protein loss that the starved animal cannot afford.

Boredom can lead to behaviors that endanger health. Some animals will engage in repetitive behaviors that can cause painful stress on joints or infected skin eruptions from licking. Again, these conditions can make an animal more vulnerable to infectious disease.

Separation anxiety is a difficult suffering to address in the shelter situation. Most often what (or who) animals pine for is no longer available to them. Sometimes these animals can be comforted by animal

companionship or special attention from volunteers. Others will only do well out of the shelter in a foster situation, and some never do well without serious pharmacologic and behavioral intervention.

Overstimulation from noise and activity may be rough for some animals, until they become habituated to the kennel environment. Measures such as hanging a blanket over a cage, providing a crate within the enclosure or moving an animal to a quiet location may ease the discomfort and associated stress.

Temperature extremes — particularly cold for the very young, the very old, the very small and the sparsely hair-coated — can create serious discomfort. On the other hand, heat and high humidity can be unbearable for the obese, giant breeds and heavy-coated animals. Special provisions must be made for these animals, including coats, blankets, moving to a different area, providing a child's wading pool or other measure to alleviate this suffering.

Conclusion

In summary, preventing disease outbreaks from occurring in a shelter setting requires a consistent effort to reduce the numbers of animals at risk through prompt and appropriate vaccination, by maintaining a healthy facility through disinfection, by keeping a watchful eye on the population and by immediately isolating suspect cases from the general population. Maintaining clear records of all of the above preventive measures allows for review and revision in times of failure. Those records should include:

- **Vaccination:** All incoming animals should be properly vaccinated.
- **Disinfection:** Maintain unrelenting dedication to disinfection.
- **Surveillance:** Keep constant surveillance of incoming and currently housed animals.
- **Health records:** Keep timely records of the health of the shelter population, and even more timely records for quarantined sick and exposed animals.
- **Population management:** Manage the movement of all animals within the shelter.

Good shelter disinfection and disease-control measures are cost saving and humane. They can also help stabilize the workforce by preserving morale through the avoidance of mass euthanasia in times of disease outbreak. These measures improve public relations and responsible social interaction. A clean and healthy shelter is a happy place to be.

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Glossary

Abscess A pus-filled cavity within tissue

Alkalinity Opposite of acidity, having a high pH level

Asymptomatic Infection without symptoms

Bacteriocidal Kills bacteria

Biodegradable Metabolized to non-toxic matter in environment

Carrier state Harboring disease agents without showing symptoms

Contagious Can be transmitted

Disinfect To free from infection, especially by destroying harmful microorganisms

Enteroviruses Viruses that infect the digestive tract

Enveloped viruses Have an extra coat supplied by the host cell; easily inactivated

Euthanasia Humane deliberate death

Fungicidal Kills fungi

Gram-negative A more complex bacterial cell wall defined by staining

Hard water Contains salts of calcium, magnesium or other chemicals

Hemorrhage Bleeding

Incubation period Time span from infection to start of symptoms

Intermediate host Host where parasite passes non-reproductive stage

Killed virus vaccine Virus is unable to reproduce

Maternal antibodies Those passed to offspring (in milk) to grant immunity

Modified Live Virus (MLV) Virus can reproduce but is unable to cause disease

Mucous membranes Lining of mouth, vagina, eyelids, etc.

Non-enveloped virus No extra coating; difficult to inactivate

Pathogen A disease-producing organism

Pneumonia Inflammation of the lungs

Prophylactically Given to prevent disease rather than to treat disease

Secondary bacterial infection Bacterial infection following previous infection by another pathogen

Sporicidal Kills bacterial spores

Sterilization To free from living microorganisms

Virucidal Kills viruses

Zoonotic Disease transmissible from animals to man

DISEASE CONTROL IN ANIMAL SHELTERS

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WHY WORRY ABOUT DISINFECTION?

- Protects animals from infectious disease
- Protects staff and visitors
- Keeps the facility clean & tidy
- Keeps animals healthy so they can be adopted!

SPECIAL CONSIDERATIONS FOR DISEASE IN THE SHELTER SETTING

- Unknown history of animals entering the shelter
  - May have been exposed to a disease prior to entering the shelter
  - May be harboring a disease
  - Unknown vaccination status
- Stress of the shelter
  - Leads to shedding of pathogen that had been latent

SPECIAL CONSIDERATIONS FOR DISEASE IN THE SHELTER SETTING

- Disease can spread **quickly** in this environment
  - Stress
  - Large number of animals in a confined space (think, day care!)

- Turnover of animals
  - Increased exposure of individual animals

IMPACT OF DISEASE IN THE SHELTER

- Disease leads to longer shelter stays
  - Increased cost: treatment and daily care
  - Delay in movement to adoptions
- Potential for spread within the population
- Decreased morale
- Public perception
- Worst case scenario – Euthanasia

DISEASE TRANSMISSION

Understanding is half the battle!

Disease Pathogen Routes of Transmission

the Center for Food Security & Public Health
Iowa State University

Disease causing agents can be spread from animal-to-animal or animal-to-human through a variety of transmission routes.

- **Aerosol** — Droplets containing pathogenic agents travel through the air and are inhaled by another animal or human.

- **Oral** — Ingestion of disease causing agents from contaminated food, water or by licking or chewing contaminated objects in the environment.

- **Direct contact** — Spread of disease agents through contact with open wounds, mucous membranes, or abraded skin contacting an infected animal or its tissues or fluids (e.g., blood, saliva, urine). Inoculation of pathogens can occur from bites or scratches.
  - **Reproductive** — A subtype of direct contact that involves diseases spread through contact with reproductive fluids or tissues. In animals, pathogens may be spread during breeding or between mother and offspring.

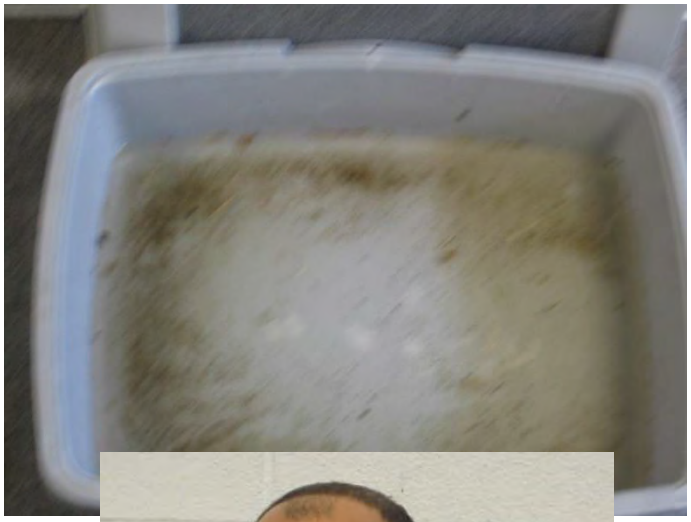
- **Fomite** — Spread of pathogens through contact with inanimate objects, contaminated by an infected animal.

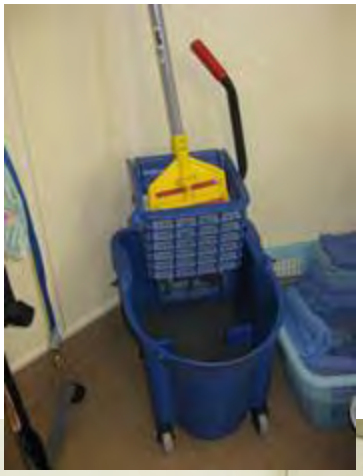
- **Vector-borne** — Transfer by an insect that acquires a disease agent from one animal and transmits it to another animal or a human.

- **Zoonoses** — Diseases transmitted from animals to humans.

Environmental contamination must always be taken into consideration.

THE BIGGEST CULPRIT: FOMITES!





Now that we know how it happens……

HOW DO WE PREVENT DISEASE SPREAD?

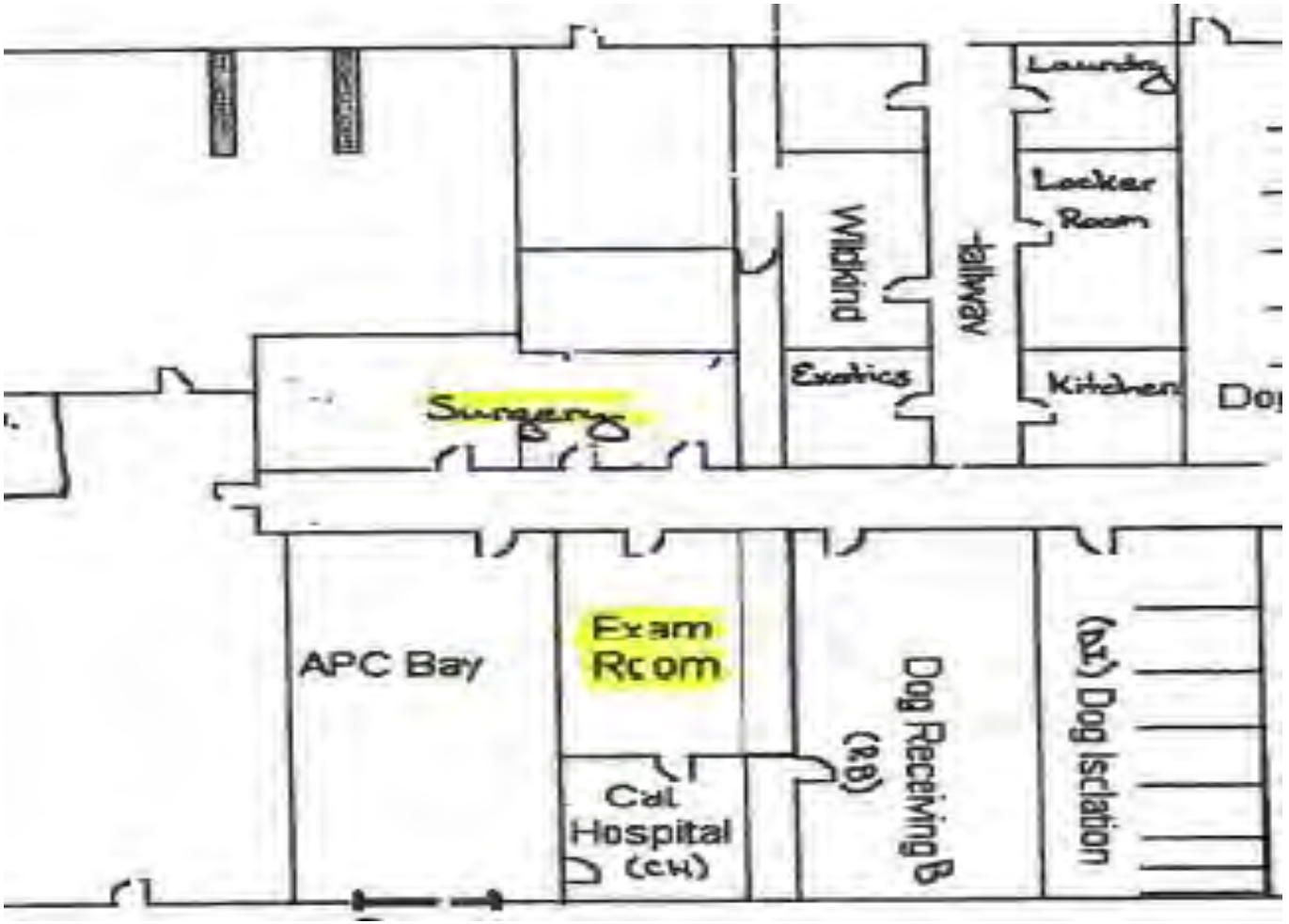
DEVELOP AN INFECTION CONTROL PLAN

- Assess shelter-specific risk factors
- Develop infection control policies specific to your shelter
- Educate and train both staff and volunteers
- Ensure that policies are consistently implemented!
- Monitor the efficacy of the control plan – is it working?

SHELTER-SPECIFIC RISKS FACTORS

- What diseases are most concerning for your shelter?
- Examine the basic design of the shelter
  - Strengths and weaknesses for entry of pathogens
- Review the traffic pattern of both animals AND humans
  - Take a walk through your shelter!
- What is the knowledge/training of staff/volunteers
  - Who do you rely on for cleaning?

CRITICAL EVALUATION - TRAFFIC PATTERNS



DEVELOPMENT OF POLICIES

- Develop policies for general cleaning and disinfection
- Develop policies for specific diseases
  - Develop before an outbreak occurs!
  - What signs do staff need to look for?
  - How will disease be recognized?
  - How will affected animal be housed?
    - What about exposed animals?
- Policies should be written and maintained!!

TRAINING

- A well-written policy is useless if staff is not trained to use the policy
- Improves compliance
- Repeat frequently if there is high turnover
- Determine the best way to implement in your shelter
  - One-on-one
  - Group training
  - Recorded video
- Ongoing training as policies change

SPECIAL CONSIDERATIONS FOR TRAINING

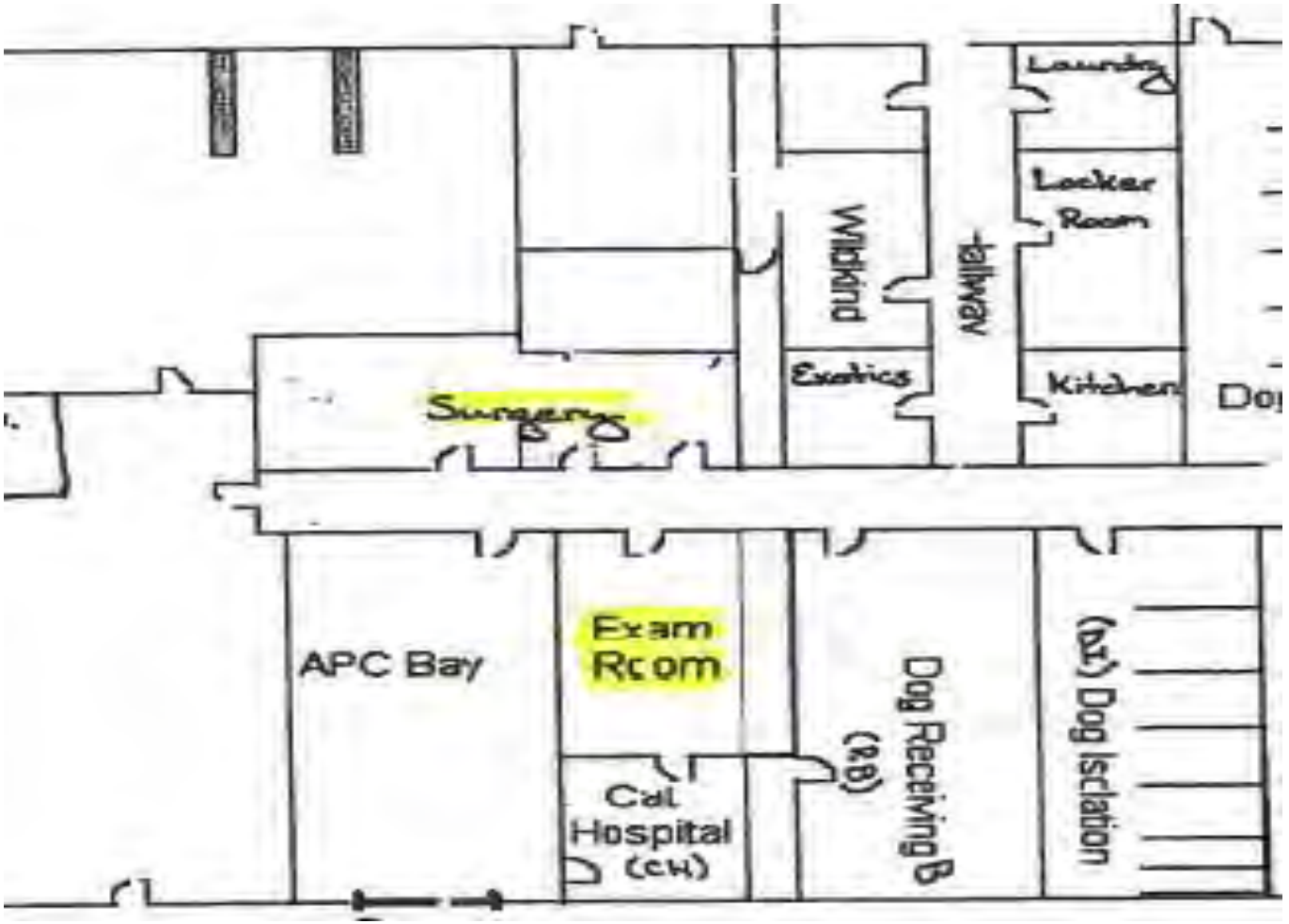
- Make it relevant to your shelter
  - Use examples of past diseases with an undesirable outcome
- Education about specific diseases
  - Remember staff will have varied backgrounds
- Provide written materials and resources for further information
  - Make sure staff know where these are located!
- Try to make facilities as user-friendly as possible
  - Easy access to sinks or hand sanitizers


Purell
INSTANT HAND SANITIZER

IMPLEMENT THE PLAN

- Use signage to remind staff/volunteers (and the public!)
  - Encourages compliance
- Make sure proper equipment is available, accessible, and in working order!
- Rewards or recognition for employees
  - Encourages compliance

BACK TO THE FLOOR PLAN



THE SOLUTION

MONITOR

- Continually monitor to make sure policies are implemented and effective
- Set goals of the program to determine if the program is effective
  - Ex. Compare disease rates before and after implementation

DEVELOPING THE PLAN IS EASIER SAID THAN DONE!

CHECKLIST

- Make sure you have the right products
  - Consider: Pathogens, environment, time, staff
- Determine what needs to be disinfected
- Provide personal protective equipment
  - Gloves, gowns, masks, boots/shoe covers

DISINFECTANTS

- Things to consider:
  - Ease of application
  - Cost
  - Contact time needed
  - Spectrum of effectiveness
  - Potential for toxicity
- Use the right disinfectants for shelter pathogens!
  - Special consideration for non-enveloped viruses
    - Parvo, Panleukopenia, calicivirus

DISINFECTANTS

- Not all disinfectants are created equal!

WHAT TO DISINFECT?

- Focus is often animal cages
- Don't forget about other surfaces animals may contact
- Special focus – high risk areas
  - Surfaces that juvenile animals (or those not protected by vaccination) will contact
    - Ex: Carriers, intake counters, vehicles, clothing of intake staff
  - Surfaces that ill animals will contact
    - Clothing or tools that have been used in isolation areas
  - High-contact surfaces (those that many animals will touch)
    - clothing, hands, exam tables

WHAT TO DISINFECT

- Other items to consider:
  - Main lobbies and hallways
  - Employee and volunteer clothing
  - Common walkways, walls, doorknobs, etc.
  - Hands
  - Toys
  - Tools, such as poop scoopers and mops
- Walk through your shelter and make a list
  - Add the list to your written protocol!

FOMITE CONTROL!

- Laundry
- Dishes
- Litter pans
- Cleaning tools
  - Mops
  - Pooper scoopers
- Staff and Volunteers!!
  - Clothing, shoes

ELIMINATING FOMITES REDUCES DISEASE!

PAY ATTENTION TO THOSE PROCESSES THAT COULD LEAD TO FOMITE TRANSMISSION:

- Intake
- Transport
  - Animal Control Vehicles
  - Carriers
- CLEANING!!

CLEANING IS ONE OF THE DIRTIEST JOBS!

- Review your cleaning procedure
  - Does staff wear a different pair of scrubs or PPE/smocks for each ward?
  - Do staff change gloves between every animal?
  - How is dirty laundry contained or transported?
  - How is trash transported?

- Is there dedicated cleaning equipment for each ward?
- Does staff move from healthiest → sickest and most susceptible → least susceptible?

THOUGHTS TO CONSIDER…

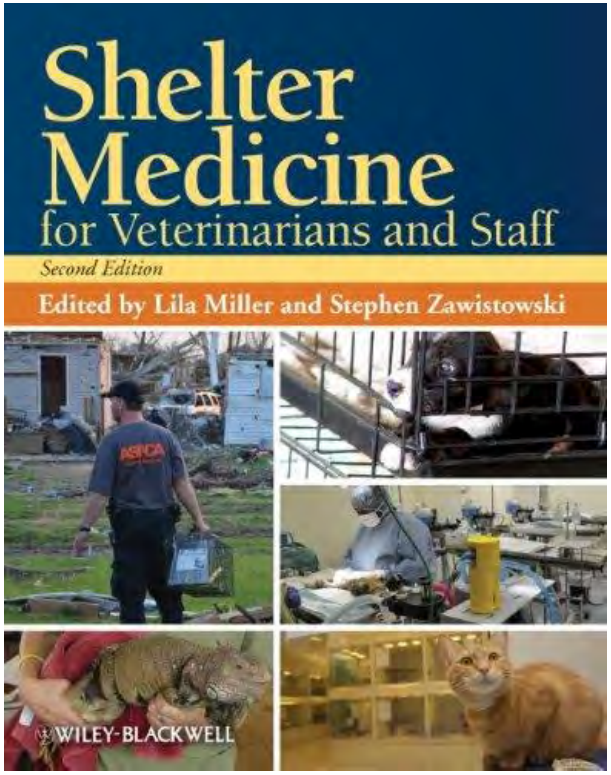
- How susceptible is this animal?
  - Younger or ill animals more susceptible to disease
- Should I handle this animal?
- Did I wash my hands?
- Can I contract a disease from this animal?
- How will my actions affect the health of the shelter population?

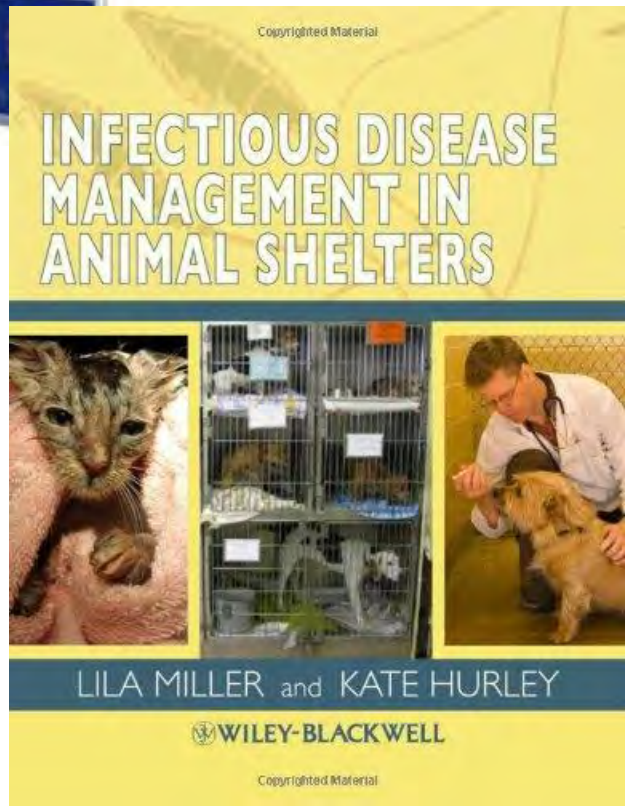
SUMMARY

- Determine the risks in your shelter
- Develop written protocols
  - Start with the most critical needs in your shelter
- Start small
- Education is key!
  - Train staff AND volunteers
- Be an example to your staff

RESOURCES


FOR ANIMAL SHELTERS


Shelter Medicine
for Veterinarians and Staff
Second Edition
Edited by Lila Miller and Stephen Zawistowski
WILEY-BLACKWELL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INFECTIOUS DISEASE MANAGEMENT IN ANIMAL SHELTERS
LILA MILLER and KATE HURLEY
WILEY-BLACKWELL
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RESOURCES

- Websites:
  - www.sheltermedicine.com
  - www.sheltermedicine.vetmed.ufl.edu
  - www.sheltermedicine.vet.cornell.edu
- Virtual Consultant – Koret Shelter Medicine Program
- Maddie's Animal Shelter Infection Control Tool
- Archived webinars:
  - Petfinder
  - ASPCA Pro
  - Maddie's Fund
  - Petsmart Charities

QUESTIONS?

Preventing the Spread of Disease

How Diseases Spread

- Through feces:
  - Parvo
  - Feline panleukopenia
  - Salmonella
  - Toxoplasma
  - Worm eggs (rounds, whips, hooks)
  - Giardia and coccidia
- Fecal-oral – infectious organism ingested after being passed in feces

How Diseases Spread

- Fecal-oral
  - Fecal contamination is not always obvious
  - Many pathogens may survive for long periods of time in the environment.
  - Parvovirus, ringworm and some worm eggs can survive for years

How Diseases Spread

- By air (aerosol)
  - Upper respiratory infection (URI-cats)
  - Kennel cough (dogs)

How Diseases Spread

- Aerosol
  - Aerosols travel only 3-4 feet, so dividers between cages help
  - 12-15 fresh “air exchanges” per hour minimum is recommended
  - “Air change” is also good
    - » Open windows or fan brings outside air in
    - » After moving through the room, another fan blows air back outside
  - Fans blowing directly on animals can spread disease by creating aerosols

How Diseases Spread

- Animal bites or saliva
  - Feline leukemia
  - FIV
  - Rabies
  - Bacteria that can cause bite wound abscesses

How Diseases Spread

- Animal bites or saliva
  - Saliva spread (FeLV):
    - » Grooming each other
    - » Sharing food and water bowls
  - FIV and Rabies require bites, not just friendly casual contact
  - Rabies can also infect by entry through broken skin or contact with mucous membranes (eyes, mouth, etc.)

How Diseases Spread

- Through direct contact
  - Ringworm
  - Scabies
  - Ear mites
  - Hookworm larvae

How Diseases Spread

- By insect “vectors”
  - Mosquitoes spread heartworms
  - Fleas spread tapeworms
  - Ticks spread Lyme disease, Rocky Mountain Spotted Fever, and more
  - Vectors must be controlled in the shelter
    - » Eliminate standing water (mosquitos)
    - » Treat fleas on animals and in environment
    - » Keep grass cut to limit ticks

How Diseases Spread

- By infected objects (fomites)
  - Ringworm spread by spores on pet hair
  - Cage walls, toys, and bedding
  - Peoples' hands – including staff!

12 Tips to Help You Avoid Zoonotic Diseases

- Stay current on appropriate vaccinations (tetanus, rabies)
- Wash hands frequently with antibacterial soap
  - before eating or smoking
  - After handling each animal or cage
- Wear long pants and sturdy shoes or boots
- Use gloves
- Wear safety glasses and mask when spray cleaning
- Disinfect scratches and bite wounds thoroughly

12 Tips to Help You Avoid Zoonotic Diseases

- Don’t allow animals to lick your face or any open wounds
- Learn safe & humane animal-handling techniques, and user proper equipment
- Seek assistance when handling questionable animals
- Report any bites or injuries to supervisor
- Tell your physician where you work
- Consider other work if you are immunosuppressed.

How to Prevent Disease Spread

- Examine each animal upon arrival
  - Eyes, ears, nose, mouth, skin/coat, limbs, anal/genital
  - Hydration
  - Rectal temperature
  - Respiration
  - Attitude
  - RECORD RESULTS!!

How to Prevent Disease Spread

- Vaccinate and deworm immediately
- Quarantine for two days or longer (preferably with solid divider between animals)
- 2 week quarantine is ideal
- Avoid indirect contact between animals (bowls, toys, play areas, etc.)
- Move into healthy animal housing area if no signs of disease

How to Prevent Disease Spread

- Observe animals every day, record changes and act when you need to
- Smart staff know what to look for
- Some sick animals don’t look sick
  - Exposed before arrival (incubating)
  - Healthy-appearing animals can be disease “carriers”

How to Prevent Disease Spread

- Write down how cleaning and disease treatment are to be done
- Make sure that everyone understands WHY, so they will be more likely to do it properly

Animal Housing

What are your cages made of and what is in them?

Problems for cleaning:

- Wood
- Cracked floors
- Gravel runs
- Chain link
- Toys
- Blankets & towels
- Bowls – plastic

What are your cages made of and what is in them?

- Dirt floors, grass lawns and wood are impossible to clean
- Gravel and can not be cleaned well
  - Replace once a year
- Sealed concrete runs work well
- Drainage of water and waste are critical
- Scrub chain link fences and bars
- Toys should be non-porous and disinfected
- Bedding changed daily

What About Cats?

- Most older shelters not designed for cats
- Cats are often housed with dogs, which is stressful for many of the cats
- Smaller rooms can hold groups of cats
- Special cages needed for cats
  - Smaller size, stainless steel
  - Designed to protect the staff and the cat

Cat Housing

- Ventilation critical to reduce URI
- Air exchange can be as simple as a fan in a window pulling air to the outside
- Minimize moisture

•Ideally, there should be at least three cat holding areas
  - •Adoption (healthy cats)
  - •Isolation
  - •Quarantine (± healthy hold)

•Ideally, litters should not be mixed

Cat Colonies

- Allow furniture, exercise, and company of other cats
- Reduces stress
- Risk of URI increased
- No strays until hold period completed

- Screen colony candidates for health, test for FeLV & FIV, vaccinate, deworm
- Monitor for health and behavior problems; remove if necessary

Cat Colonies

- House by life stage groups
- Don’t add new cats as animals leave the group
- Allow group to dwindle down until 1-2 left that can be moved to cages
- Disinfect and start over with a new group

Isolation and Quarantine

- They are not the same!
- Both are important
- Combining these areas will create health problems in the shelter
- Not having these areas at all will create even more problems!

Quarantine

- Housing for incubation suspects, to watch for disease
  - Exposed to disease
  - new animals
  - Rabies observation
  - Pregnant & newborn animals
  - Recuperating animals

- Quiet, safe, away from public view/traffic
- Ideally, separate air flow coming from healthy parts of building and vented outside
- Quarantine is for healthy animals!

Isolation

- Housing for sick animals
- Prevent disease transmission & enable treatment
- Quiet, safe, away from public view/traffic

Preventing Disease Transmission During Euthanasia

- Euthanize unhealthy animals first
- Avoid handling other animals directly after euthanasia

Things that Affect Overall Disease Control in the Shelter

- Ventilation—12-15 air exchanges per hour
- Air flow and human traffic
  - from younger to older life stages
  - from healthy to sick areas
- Temperature control—minimum of 65-75 degrees, maximum of 85 degrees
  - Warmer for puppies and kittens
  - Heaters, A/C, vents and filters cleaned regularly
- Drafts—avoid

Things that Affect Overall Disease Control in the Shelter

- Humidity—should be below 50 percent
- Light—diffused is best
- Noise reduction reduces animal stress
  - Insulate between metal cages
- Proper nutrition is critical for healthy immune system
  - The best food you can afford
  - Make sure animals are being fed enough
- Human companionship for those animals who want it

Shelter Sanitation

Two Steps to Sanitation

Cleaning

(To rid of dirt or other impurities)

Disinfecting

(To destroy or eliminate infection by reducing the number of pathogens present)

Disinfectant

- Definition:

  Chemical agent that is applied to inanimate objects or surfaces to kill pathogenic microorganisms, including bacteria, but not usually bacterial spores. Fungi and some viruses are often killed by disinfectants also.

Properties of Disinfectants

- **Bacteriostatic** (capable of inhibiting or preventing growth of bacteria)
- **Bactericidal** (capable of killing bacteria)
- **Fungicidal** (capable of killing fungi and yeast)
- **Virucidal** (capable of killing viruses)
- **Sporocidal** (capable of killing spores)
- **Oocidal** (capable of killing oocysts)

Types of Disinfectants

- Most common types are phenols, quaternary ammoniums, halogens, biguanides and peroxygens.
- Want one that acts fast, kills many types of germs, and penetrates
- Must also be nonirritating, nontoxic, nonstaining, noncorrosive, inexpensive, etc.
- No one product meets all criteria, but peroxygens are a current favorite.

Safety of Chemicals

- Safe for animals and humans
- Use according to directions
- Comply with OSHA and EPA regulations
- Store separately from food and bedding
- Improper use can be dangerous

Phenols

- Example - Lysol
- Most organisms are killed by phenols
- Fast-acting, work well in hard water, most effective in acidic environments
- May be corrosive, toxic, smelly
- Toxic to cats
- Newer types (substitued phenols) are better, but still not for cats

Phenols

- Effective against:
  - Canine parainfluenza
  - Rabies
  - Corona
  - Canine distemper
  - Bacteria
  - Fungi
- Not so good for:
  - Parvovirus
  - Hepatitis virus
  - Adenoviruses
  - Bacterial spores

Halogens

- Include bleach and iodine
- Bleach is quickly inactivated by organic matter
- Only clean surfaces should be bleached
- Inexpensive, act rapidly, best in weakly acidic environments
- Corrosive to many metal surfaces including drain pipes

Sodium Hypochlorite (Bleach) - a halogen -

- Dilute from 1 to 4 ounces per gallon of water for best effect
  - 5% bleach is the stock solution
  - Diluted 1:32 with water
- Fumes may irritate skin and respiratory tracts of staff and animals
- Contact time = 10 minutes
- “Chlorox Ultra” formulation (lye added) difficult to rinse off and not recommended for use around pets or children
  - Especially dangerous to cats

Halogens

- Effective against:
  - Canine parainfluenza
  - Rabies
  - Corona
  - Canine distemper
  - Bacteria
  - Fungi
  - Parvo
  - Hepatitis
  - Adenoviruses
  - URI viruses
  - Feline leukemia
- Not so good for:
  - Bacterial spores, unless prolonged contact
  - Worm eggs
  - Coccidia oocysts
  - Need stronger dilution for ringworm (1:10)

Quaternary Ammoniums

- Most effective in alkaline environments (don’t work well in hard water)
- Act fast, low tissue toxicity, not very corrosive
- Soap and organic matter quickly inactivate quats
- More expensive

Quaternary Ammoniums

- “New” quats not effective against canine parvovirus or feline calicivirus, despite manufacturer’s claims
- Contact with full-strength solutions will burn skin and mucous membranes
- Cats may develop ulcers of mouth and esophagus if they ingest even diluted amounts
- Most popular versions: Parvosol and Roccal-D Plus
- Most require one-ounce-per-gallon dilution, but read label

Quaternary Ammoniums

- Effective against:
  - Canine parainfluenza
  - Rabies
  - Corona
  - Canine distemper
  - Feline leukemia
  - Bacteria
  - Fungi
- Not so good for:
  - Parvo
  - URI viruses
  - Hepatitis
  - Adenoviruses
  - Bacterial spores
  - Worm eggs
  - Coccidia oocysts
  - Ringworm

Biguanides

- Nolvasan (chlorhexidine) is most common
- Work best in alkaline environments
- Not very toxic to tissue, organic matter limits effectiveness
- Expensive

Biguanides

- Effective against:
  - Canine parainfluenza
  - Rabies
  - Corona
  - Canine distemper
  - Some types of bacteria
  - Fungi
- Not so good for:
  - Parvo
  - Hepatitis
  - Adenoviruses
  - URI viruses
  - Bacterial spores

Peroxygens & Accelerated Peroxides

- peroxygens Aka – potassium peroxymonosulfate disinfectants
  - Have come about in the past 10 years
  - Examples – Virkon and Trifectant
  - 1% dilution recommended
  - Have to mix fresh solution weekly from the stock powder
  - Less irritating and corrosive than bleach
  - Works better with small amounts of organic debris than quats or bleach

Peroxygens & Accelerated Peroxides

- accelerated peroxides
  - Have come about in the past 5 years
  - Examples – Accel
  - Less irritating and corrosive than bleach
  - Works better with small amounts of organic debris than quats or bleach
  - Has detergent properties for cleaning like quats
  - The first disinfectant to be effective with short contact time (1 minute)
  - Liquid can be used in sprayers and other apportioning units

Peroxygens & Accelerated Peroxides

- Effective against:
  - URI viruses
  - Rabies
  - Corona
  - Canine distemper
  - Bacteria
  - Fungi
  - Parvovirus
  - Calicivirus
  - adenoviruses
- Not so good for:
  - Worm eggs
  - oocysts

Using Disinfectants

- Things to consider:
  - Exposure time
  - Temperature
  - Concentration
- Use hot water (except when diluting bleach)
- Read label for recommendations and follow them carefully

Cleaning

- Written protocols are crucial
- Rotate disinfectants
- Clean from healthy to sick
  - Degreaser
  - Quat (let sit 10 minutes)
  - Bleach (let sit 10-20 minutes)
  - ALWAYS RINSE!!
- Clean younger to older
- Never mix bleach other disinfectants (ammonia gas)

Cleaning

- Supplies
  - Right tools
    - » Scrub brushes
    - » Glasses
    - » Gloves
    - » Aprons
    - » squeegees
  - Make sure they are clean (180F)
  - Enough for everyone
  - Each area has its own tools
  - In good repair

Cleaning

- Oversight
- Training
- Understand WHY
- Accountability
- Pride in work
- Say “thank you” for a job well done
- Have a “scrub fest”

Cleaning Dog Cages

- Remove dog from run
- Remove food and water bowls – clean or change them
- Scoop poop and other materials in cage
- If necessary, use detergent to scrub before disinfecting
- RINSE

Cleaning Dog Cages

- Spray disinfectant and scrub again
- Rinse cage
- squeegee dry

Cleaning Dog Cages

- Replace toys and bedding
- Bedding for litters of puppies may need to be changed more than once daily
- Return dog to run

Cleaning Cat Cages without moving Cats

- Leave cat in cage, or place in carrier or twin cage
- Wipe down with disinfectant and paper towels
- Change bedding if needed
- Food/water/litter
- Less moisture = lower humidity = reduced URI risk

Cleaning Cat Cages by Moving Cats

- Remove cat from cage – place in holding cage
- Scrub thoroughly
  - Cage walls
  - Cage doors
  - Cage CEILING & floor
- Rinse and dry cage
- Bedding
- Food/water/litter
- Reset cage, return cat and disinfect holding cage

Hand Washing

- Volunteers to remind public
- Post signs (nice ones) to remind visitors to wash hands between touching animals
- Hand sanitizer in each room

Controlling Parvo: Real-Life Scenarios

In the November-December 2006 issue of *Animal Sheltering*, Dr. Hurley detailed the basics of parvo: how it's caused, how it's transmitted, and what to do about it. In this issue, she shares real cases sent to her by shelters and rescue groups—and provides potential solutions for controlling the spread of this often deadly disease.

BY KATE F. HURLEY, D.V.M., M.P.V.M.

LYNN PAUKOVITCH/DREAMSTIME.COM

Kate Hurley, the director of the **UC Davis Koret Shelter Medicine Program**, has worked in the sheltering field since 1989. Her previous roles included jobs as a kennel attendant, adoption counselor, animal control officer, and shelter veterinarian.

Parvo Puppies: The Road to Recovery

The Scenario: I have several parvo cases in the shelter that I am treating. All the puppies are doing very well and have no more symptoms. They have solid stools and are eating well. I would like to send them home. Can you tell me how long they are going to be shedding the virus and when I can consider them healthy?

The Recommendation: Luckily, prolonged shedding of parvovirus does not tend to be a problem. The majority of affected puppies will no longer be contagious by two weeks after recovery. To be on the extra-safe side, you could repeat the parvo "snap" test—if that is negative, it is very unlikely these puppies are a significant risk to others. By two weeks after recovery, their immune systems should also have recovered and be ready to face the world again. Remember to bathe them to remove any virus lingering on their fur. Beyond that, no special precautions are necessary—they can be spayed or neutered, vaccinated, and placed up for adoption as usual.

In the meantime, puppies should be kept in an easily disinfected environment and away from other puppies or unvaccinated adult dogs for a full two weeks after complete recovery. If they are placed in foster care or adopted out before this, be sure to let the caretakers know that these puppies should not go out and about, to the pet supply store, puppy class, or even to the veterinarian (unless they are sick). The last thing we want to do is contaminate our communities with this very durable virus.

Parvo in Adult Dogs: What Does it Mean?

The Scenario: We recently got in a neutered male fox terrier, about 4 years old. This afternoon he vomited multiple times. When I went to examine him, he just had that "parvo look," very lethargic and sad. No fever, but bloody diarrhea. So even though I was sure it would be negative (because of his age), I ran a fecal snap test. It came up positive! I was shocked. I have never seen a dog over a year old with parvo, and the fact that he was neu-

Because you can't blast them with bleach, outdoor areas like these present a dilemma for shelters, rescues, and foster homes. Ideally, puppies should be confined to disinfectable areas for at least a two-week quarantine period. INDIA LAWSON

tered makes me think he had probably been vaccinated at least once in his life. Does this indicate some sort of immune deficiency? Is there a new vaccine-resistant strain of parvo out there?

The Recommendation: Surprisingly, plenty of dogs make it to adulthood without ever encountering the virus through vaccination or exposure. In one survey, 95 percent of dogs coming into veterinary clinics in the U.S. and Canada tested positive for antibodies to parvo, indicating they were protected by prior vaccination or exposure. However, in two other surveys conducted at shelters, only 68 percent of dogs entering a Wisconsin animal shelter were similarly protected, and over 40 percent of dogs entering a Chicago shelter showed no evidence of ever having received a parvo vaccine. For a dog who's been kept in solitary confinement in a backyard all his life, the shelter may be his first exposure to a myriad of infectious organisms. That's why immediate vaccination is so important in the race to protect our animals.

Even an adult dog with a history of vaccination could come down with parvo. Probably the most common cause is maternal antibody interference with the final vaccine, usually administered before the puppy reaches 16 to 20 weeks. A bad batch of vaccine or failure to keep it refrigerated might also be to blame. And of course, a few dogs just don't have a good immune response to the vaccine. The good news is that, despite plenty of reports of parvo in adult dogs with variable vaccine histories, so far there is no evidence of a truly vaccine-resistant strain in the United States. If you think you have such a strain in your shelter—that is, if you see more than one case of parvo in a dog over 4 months old who has been vaccinated more than two weeks ago—follow these guidelines:

Double-check your cleaning program. What looks like vaccine failure is often a case of an animal being exposed before we've had a chance to vaccinate him. Make sure that animal transport vehicles are carefully disinfected, that dogs are being admitted to a clean intake area, and that intake staff are wearing clean clothes and handling animals with clean hands or gloves.

Double-check your vaccination program. Make sure all staff are handling and administering the vaccine correctly. If you think there may be a problem with a batch of vaccine, contact the vaccine manufacturer and report the possible problem.

Double-check your diagnosis. One shelter I know of euthanized more than a dozen dogs for parvo before realizing it was the test itself that was giving false positive results. Always double-check a suspicious diagnosis. Use a different

brand of test, use additional tests such as a white blood cell count, and/or get a definitive diagnosis by sending tissue specimens out to a diagnostic laboratory.

Contact an expert. If you're seeing unexpected levels of parvo infection in adult or vaccinated dogs in spite of a good cleaning and vaccination program, it's time to get help. You can always contact the UC Davis Koret Shelter Medicine Program at www.sheltermedicine.com. You can also try contacting infectious disease experts at your local veterinary school, state veterinarian's office, or state diagnostic laboratory.

Littermates: Bathe, Disinfect, Isolate

The Scenario: Our shelter has been struggling with a parvo outbreak for the last few weeks. One puppy from a litter of seven came down with parvo six days ago. She tested positive and we euthanized her. A bigger, stronger puppy got sick and tested positive yesterday, but that one is receiving treatment and doing well so far. Are the other puppies all going to get sick eventually? If they don't, should we go ahead and vaccinate them as usual?

The Recommendation: Not all parvo-exposed puppies suffer the same fate. Because of varying levels of maternal antibodies that are either low enough to allow the vaccine to take effect or high enough to block the vaccine but not infection, some puppies might get severely ill, some can be mildly affected, and some may never get sick at all. Once puppies are protected by vaccination, they have no further worries. But remember that maternal antibodies dwindle over time, so pups who were naturally protected on Monday might not be protected by the following Friday. That may be why you saw a second puppy get sick five days after the first. Her maternal antibody levels may have finally dropped down low enough to permit infection, and parvo still hanging around the environment—even on the puppy's fur from exposure to the first affected littermate—was right there waiting to attack.

If you are going to quarantine littermates of a parvo puppy, all members of the litter should be bathed, placed in a freshly disinfected environment, and carefully isolated for 14 days. Each time a new member of the litter breaks with parvo, you will need to repeat the bathing and disinfection and start the 14-day quarantine period over again. To further decrease the risk of spread, you can split the litter into pairs; the mental health benefits of companionship likely outweigh the risk of being housed with a littermate. During and after quarantine, puppies should continue to be vaccinated according to your usual schedule. Even puppies who have recovered from parvo should continue their vaccine series on schedule. Although they are no longer at risk for parvo, they still need protection from the other diseases we vaccinate against.

Pre-Adoption Dogs: To Screen or Not to Screen?

The Scenario: I'm a vet who works with my local animal shelter. The shelter is interested in attempting early detection of parvo cases. The shelter would like to be able to catch some of the cases that become clinical one to three days after they move them out to the adoption ward. I have in my mind that affected dogs can shed the virus for a brief time prior to the onset of clinical signs. Based on this premise, would it be "crazy" to consider simply running a fecal parvo test on every puppy before it is placed for adoption? Vaccination would be performed either at the same time as the test or seven days prior, and we are aware some might have interference with false positives from vaccination.

The Recommendation: Because of the likelihood of false positives in low-risk populations, blanket testing of asymptomatic puppies is not an effective use of resources for most shelters. The benefits of detecting a few cases a day or two earlier are offset by the time and money it takes to run all those tests—and by the needless worry (and even euthanasia) caused by false positives. However, some circumstances warrant testing certain puppies, even if they aren't overtly ill. It's a good idea to test them when they've been transferred from a shelter that has frequent parvo problems, when they just "don't look right," or when they've been brought in from an area of town known for incubating a high number of parvo cases. One shelter I visited had a map of the area they served in their intake room and marked the location of all cases. In this way, they were able to identify high-risk neighborhoods and focus their testing on the puppies most likely to come in already infected.

If you do decide to test high-risk pups, do it at intake rather than just prior to placement. This has a double benefit: you don't have to worry about vaccine interference, and you catch the disease before it has a chance to spread. If your shelter has the resources for additional testing and the ability to isolate healthy pups who test positive, clearly this would be preferable to euthanasia based on a single test result in an apparently healthy pup.

Decontamination: Cleaning Foster Homes and Outdoor Areas

The Scenario: Three weeks ago, our small rescue group picked up three dogs and a couple of four-month-old puppies from a local shelter. Two days later, the puppies developed parvo, and we treated them with subcutaneous fluids and antibiotics. The adults never got sick. All five dogs have been healthy and active for about a week now. As soon as the parvo was diagnosed, we isolated all five dogs in the garage and changed shoes and clothing between handling them and our resident dogs. However, before this, they were in the house and yard with our resident dogs (all vaccinated, luckily). Also, while they were in isolation, they used a small outdoor potty area. We've heard different things about how soon it will be safe to rescue puppies again—anywhere from a month to a year or more! There aren't many groups in our area able to rescue puppies, so we'd like to reopen as soon as possible. Is there anything we can do to get rid of the parvo faster?

Not all parvo-exposed puppies suffer the same fate. Because of varying levels of maternal antibodies that are either low enough to allow the vaccine to take effect or high enough to block the vaccine but not infection, some puppies might get severely ill, some can be mildly affected, and some may never get sick at all. Once puppies are protected by vaccination, they have no further worries.

The Recommendation: This is a common dilemma for rescue groups, and one that shelters face as well when dealing with contaminated play yards, staff offices, foster homes, or any place that's not particularly amenable to being blasted with bleach. While we hate to put puppies at risk, eliminating foster homes for months at a time is quite a hardship, and even closing exercise areas for prolonged periods can be a real problem when dogs have no other place to go. Obviously it's best to prevent contamination of hard-to-clean areas in the first place. That means whether in a shelter or foster home, puppies should be confined to disinfectable areas for at least a two-week quarantine period. (Assuming you do not transmit parvo to them once they are in your care, this period should be sufficient to screen out those puppies that come to you already infected.) Potty breaks should take place in an area with a disinfectable or replaceable surface.

But what do you do if quarantine precautions fail and a home or outdoor area becomes contaminated with this durable and deadly virus? Unfortunately, there's no foolproof method to guarantee safety of some of these areas once they've been contaminated. Just waiting for the virus to die off on its own accord is not an option; when not chemically inactivated, parvo can last for a year or more. Scientists working to reintroduce wolves in northern Wisconsin found infectious doses of parvo surviving in a wolf den two years after a sick litter of cubs resided there. This represents a worst-case scenario; contamination levels in the den were probably high, and the virus was protected from light, heat, and drying. Parvo, like most pathogens, survives better in cool, moist conditions. Lower levels of contamination would be expected in a home that housed a sick puppy only briefly. That said, you will still need to take some steps to maximize your chances of safely caring for puppies again:

Take an inventory. Think of everything the parvo puppies may have contacted starting three days before they got sick. Were they in a personal car or animal transport vehicle? Did they touch clothes, towels, or blankets? Play with toys and lie in crates and on beds? In a shelter, think about every kennel and area the puppies may have passed through—intake kennels, get-acquainted areas, offices, play yards, exam rooms, etc.

Clean, rinse, and repeat. If you can't kill the virus, in some cases you might just be able to wash it away. Even in areas such as kennel runs that are pretty easy to disinfect, wash and scrub first to make sure there's no organic matter to inactivate your disinfectant. In outdoor areas (weather permitting), flush with plenty of water, allowing the areas to dry thoroughly between bouts of irrigation. In carpeted areas, thoroughly clean and vacuum, making sure to get under furniture and into nooks and crannies popular with curious puppies. Although steam-cleaning is unlikely to attain sufficient temperatures to kill parvo, it can help mechanically remove yet more contamination. Soiled laundry should be washed in hot water and bleach and dried in a hot dryer. If machines are functioning correctly and are not overloaded, this should be sufficient to get rid of the virus. Stainless steel dishes and cages can be disinfected and kept, but other items such as toys, plastic food dishes, and crates should be discarded.

Kill what you can. For mop-friendly surfaces, disinfection of parvo is actually a fairly simple matter. Just clean the surface completely, then apply a parvocidal disinfectant such as bleach or potassium peroxymonosulfate (marketed as Trifectant in the United States for small animal use) for a sufficient contact period (generally at least ten minutes). Areas where organic matter contamination is inevitable—such as yards, wooden surfaces, or old, cracked concrete—present a bit more of a problem. While bleach is a fine disinfectant, it doesn't do well in the face of dirt and debris. Potassium peroxymonosulfate has much better activity under these circumstances, and is a good product to have on hand for just such an occasion. It can be mixed at normal strength (1 percent) and applied via a pesticide-type sprayer, or mixed at 10 percent concentration and applied through an applicator system set at a 1:10 dilution. There is no guarantee you will eliminate every last particle of parvo by this method, as it is unlikely you will be able to fully coat every surface of a grassy yard. However, reducing the amount of contamination will likely help. Because prolonged contact time may be helpful, allow at least a couple of hours after application before irrigating an outdoor area. Potassium peroxymonosulfate can even be used to disinfect carpets; test in an inconspicuous area first to make sure it doesn't stain.

Assess the risk. Animal sheltering and rescue is all about balancing risks and benefits—it's rare that we get to choose a "no-risk" scenario. Risk of reopening an

area to puppies is lower if contamination was relatively light to start with—from, say, a pre-clinical pup visiting the area briefly instead of a sick litter spewing diarrhea or vomit into every corner. Risk is also likely to be lower if the area is uncluttered and relatively easy to clean, even if it cannot be completely disinfected. Risk is lower in areas exposed to sunlight and drying, and conversely higher in moist, damp, or cold areas. Also consider the risk of not reopening the area. If puppies will be euthanized for lack of foster care, that's obviously a bigger deal than just closing off a play yard for a month or two.

Apply tincture of time? I have heard from fosterers who cleaned carefully, disinfected where they could, and brought puppies in again after only a one-month waiting period—and did just fine. I have also heard about places having problems even after several months of cleaning and waiting. Once you've done your best to clean and disinfect, and considered the risks from every angle, you may decide to leave an area or foster home closed to puppies for a time (usually one to six months is sufficient, unless the area you're working with is a wolf den or other dark, moist environment impervious to disinfection). There is no absolute guarantee that the virus will die off even if you close off an area for a year or more. However, repeated cleaning and exposure to sunlight and the elements will gradually reduce contamination. Vaccinated adult dogs are at very low risk of contracting parvo, so foster homes closed to puppies could concentrate on helping older dogs for a time. Because of the possibility that canine parvo can infect cats, any place closed to puppies should also be off limits to kittens.

Read Our Online Extras!

Do you **experience frequent cases of parvo** among puppies but **lack adequate facilities** for quarantine? Are you unsure about whether you can reopen disinfected kennels following a parvo outbreak? Visit www.AnimalSheltering.org/diseasecontrol for answers to these and more questions about parvo, vaccination, and disinfection.

To read a **parvo information sheet** prepared by UC Davis, visit www.sheltermedicine.com/portal/is_parvovirus_canine.shtml#top3.

Quarantining Puppies: Consider the Risks

The Scenario: We vaccinate all puppies at intake, then hold them for two weeks to allow the vaccine to take effect. We then revaccinate them and put them up for adoption. Recently we had a puppy break with parvo three weeks after intake. Should we extend our quarantine period?

The Recommendation: Intake quarantine of puppies for parvo (or any disease, for that matter) is not as simple a matter as it may seem. As I said before, we have few "zero risk" options in the world of sheltering, and this is a good example. The risk of not quarantining puppies on intake is pretty clear: some puppies may come in already infected and spread parvo within the shelter or even get adopted before they break with disease, leading to expensive vet bills, contaminated homes, and understandably upset adopters. Quarantining puppies, however, also presents risks:

Puppies cannot be reliably protected by vaccination, so they will be at risk of infection the entire time they are in the shelter. Several studies have shown that increasing time in a shelter is the single biggest risk factor for a variety of infections. Although the idea that puppies will be better protected once they have received two or more vaccines is common, this is actually not true. The very first vaccine that slips past maternal antibodies will work within five to seven days; in the meantime, no amount of vaccinating will provide protection. The longer puppies stay in the shelter, the greater the chances their maternal antibodies will drop below the protective level, leaving them vulnerable to parvo and other diseases. This may account for the puppy who got sick after three weeks in your shelter. (Remember that there is a time period—up to two or three weeks—when maternal antibodies can block the vaccine without protecting against infection).

Puppies need socialization. As a behaviorist friend often reminds me, behavioral problems can lead to death just as surely as any infection. A puppy who misses out on socialization during this key developmental period could end up with behavior issues later in life that lead to relinquishment or worse. It's awfully hard to provide adequate socialization while maintaining good isolation/quarantine precautions. If quarantine must be done, provide for socialization as best you can. House puppies with littermates when possible. Create or designate an easily disinfected area to allow play and interaction, and permit contact with well-vaccinated adult dogs. Encourage staff or trained volunteers to put on protective gear and spend time with the puppies.

Quarantine costs time and money that might be better spent elsewhere. Let's face it—puppies are messy, and doing quarantine right takes a lot of effort in the best of circumstances. Careful isolation precautions need to be followed to prevent the spread of disease between quarantined puppies and to keep disease contained within the quarantine area. Unless the shelter was designed for quarantine to start with, precious isolation space may be taken out of circulation, leaving no place to house ill animals.

All this is not to say that quarantine is never indicated, just that the risk/benefit ratio should be carefully considered on a case-by-case basis. When puppies or unprotected dogs have suffered a known exposure to parvo, a 14-day quarantine is certainly in order (if sufficient facilities exist). Quarantine, like testing of healthy-appearing pups, may also be a good idea for puppies transferred from shelters with known parvo problems, or from high-risk neighborhoods. AS

Canine Distemper Virus: Anatomy of an Outbreak

One shelter's experience getting rid of a microscopic enemy

BY MIRANDA SPINDEL, D.V.M., M.S., ASPCA AND BOBBI ALLEN, ANIMAL WELFARE SOCIETY

JOCELYN LAYMAN/ANIMAL WELFARE SOCIETY

After a distemper outbreak caused some sheltered dogs to get sick, titer-testing helped the Animal Welfare Society of West Kennebunk, Maine, figure out which dogs could be safely kept in the adoption area.

The Veterinary Perspective: Miranda Spindel

As the director of veterinary outreach at the ASPCA, much of my work involves answering questions and consulting with humane organizations across the country about infectious disease control. Recently, I've been receiving an increasing number of questions about canine distemper virus (CDV), particularly from groups involved in transporting animals from regions where adoption may be unlikely to areas where resources and homes are more abundant.

Organizations involved in transporting do risk bringing infectious diseases like CDV into the receiving shelter along with friendly and adoptable dogs. But in most cases, the risks associated with transport can be mitigated with some commonsense measures, and are far outweighed by the potential to save lives.

Although many veterinarians and animal care workers think CDV is rare, it's actually still present in many communities, often persisting in wildlife populations. Raccoons, foxes, skunks, and coyotes can circulate and transmit distemper to dogs. CDV can easily enter a shelter, is difficult to distinguish from other canine respiratory diseases, can be tricky to diagnose, and may slowly wreak havoc in a shelter's dog population. Shelters


BOBBI ALLEN/ANIMAL WELFARE SOCIETY

In the wake of the outbreak, all asymptomatic dogs with positive titers (indicating a low risk for canine distemper virus) remained in the adoption section. The one dog with a low titer result (and therefore a higher risk of infection) was kept isolated.

MIRANDA SPINDEL/ASPCA

In a pinch, a well-signed curtain can help direct employees away from isolation areas. But the Animal Welfare Society took its containment procedures even further, creating a separate area where it could isolate sick dogs and where only two specific employees were allowed to enter.


MIRANDA SPINDEL/ASPCA

Nasal swabs on dogs with varying symptoms helped the shelter rule out the possibility of canine influenza as the culprit behind the outbreak.

need to be aware of the clinical signs of CDV and know steps to take to confirm cases and stop transmission.

My first contact with the Animal Welfare Society in West Kennebunk, Maine, came in October 2009. After learning that this shelter was experiencing some unusual canine respiratory disease, a colleague from the ASPCA introduced me to the shelter's co-manager, Bobbi Allen. In her first e-mail to me, Bobbi wrote, "Hopefully you have some insight or suggestions for us. We have an outbreak of disease affecting a large number of dogs here at our shelter."

Escalating Illness

The Animal Welfare Society was a well-run shelter with first-rate shelter medical health care protocols. Following shelter medicine standard recommendations (available at *aahanet.org/PublicDocuments/VaccineGuidelines06Revised.pdf*), the shelter was administering modified live Da2PP vaccinations and intranasal trivalent kennel cough vaccines to all dogs on arrival. Like many well-resourced Northeast shelters, the Animal Welfare Society was bringing in dogs and puppies from partnering shelters on a monthly basis. New arrivals were isolated from the general population for a week after arriving at the shelter.

Bobbi explained that canine respiratory disease seemed to be escalating. Some months earlier, a puppy had been transported, spent a short period of time at the shelter, and then was euthanized with severe respiratory disease. The puppy's clinical signs of nasal discharge, cough, and subsequent pneumonia were consistent with distemper—though unfortunately, a confirming necropsy was not performed.

At the time, shelter staff felt that other dogs hadn't been significantly exposed. However, cases of respiratory disease recently seemed to be increasing and not responding well to the typical therapies the shelter customarily used with success. The shelter had been keeping good records of affected animals and did not detect any particular pattern. Young and geriatric dogs were affected. Some dogs became ill soon after entry; some recovered, and then became ill a second time. Some became only mildly ill, while others developed severe pneumonia.

Bobbi reported that out of 55 dogs housed at the shelter, 20 were showing clinical signs of significant respiratory disease: coughing, thick nasal discharge, vomiting, lethargy, loss of appetite, and some pneumonia. These dogs were on broad spectrum antimicrobial coverage, but Bobbi was quite concerned, as they had recently had two dogs with signs of respiratory disease die at the shelter.

Although the shelter did not have a staff veterinarian, veterinary guidance and support from the community was strong. Recently, a community veterinarian had performed a polymerase chain reaction (PCR) panel test on one of the very ill dogs. Results were negative for canine influenza virus, *Bordetella bronchiseptica*, adenovirus, and corona virus, but positive for distemper and parainfluenza. However, this particular dog had received a modified live Da2PP vaccine within the preceding two weeks, and Bobbi had been correctly informed that the sensitive PCR test could be detecting the vaccine rather

than actual infection. These tests must be interpreted carefully, as positive results are not always indicative of the cause of an illness. Confirming a diagnosis at this point was critical, not only for treating the affected dogs, but also for strategizing to prevent further disease spread.

Diagnosis Dilemmas

Everyone, including myself, was worried. While a definitive diagnosis was pursued, the shelter put steps in place to ensure that the disease was contained and further transmission stopped. Although this sounds simple, enacting any type of effective quarantine requires tremendous staff effort.

Bobbi and I talked over the two most likely rule-outs for the clinical signs she was observing in her shelter, with the understanding that many agents of canine infectious respiratory disease can cause similar clinical signs—and sometimes there can be more than one infectious agent present at a time. With a recent case of possible canine distemper virus, transport occurring from many areas of the country, and a high percentage of dogs showing clinical signs and some showing pneumonia, CDV was high on the list of possibilities. However, pre-death diagnosis of distemper is, unfortunately, not a simple undertaking. Although there are many tests for distemper available, they all require interpretation. Recent vaccination (within approximately one to three weeks) can interfere with most test results, including serology, immunofluorescent antibody testing, and PCR, creating confusion in shelters where vaccination on intake is standard practice.

We also discussed canine influenza virus (CIV) as another rule-out. Several of the dogs seemed to have had repeated bouts of illness, which is typically not the case with CIV. Because testing for CIV is a little more straightforward, the decision was made to run serum antibody titers and nasal swab PCR tests on 12 dogs with varying clinical signs and shelter intake dates in order to attempt to rule CIV in or out. (For more information on testing methods, read the Mar-Apr 2010 *Animal Sheltering* article, "Canine Influenza Virus: Fact or Fiction?" and the chapter on canine influenza in the new textbook *Infectious Disease Management in Animal Shelters*.) All dogs tested negative for canine influenza virus both via PCR and serology, making this disease a very low likelihood as the cause of the outbreak.

At this time, two dogs started to show neurological signs—a classic symptom associated with CDV. Euthanasia was elected due to poor prognosis, and distemper was quickly confirmed through a necropsy at the state laboratory. Had these dogs not developed obvious distemper signs, further testing would have been required to properly determine management steps, as there are many other infectious agents that can cause canine infectious upper respiratory disease. In many shelter outbreak situations, animals euthanized due to illness provide ample opportunity for necropsies to be performed. It's an opportunity that's frequently overlooked and is generally one of the fastest and most economical means to

Bobbi Allen

Miranda Spindel

direct treatment and management steps that can save other lives.

With the diagnosis of distemper now certain, Bobbi and I were able to discuss options for how the shelter should manage the outbreak.

The Shelter Perspective: Bobbi Allen

When Dr. Spindel and I first spoke, she explained to me the importance of isolation to mitigate the spread of disease. We were operating as usual and did not realize that some common practices—in conjunction with the layout of the building—were contributing to transmission of respiratory disease among the dogs.

Despite being a well-used, aging building, our shelter has many great features, and our experienced management team and staff have developed some good protocols and standard operating procedures. However, when faced with this disease outbreak, we took a step back to evaluate the flow of both human and animal traffic in the building. We realized that our situation and some of our practices were less than ideal.

Given our current facility, true isolation or quarantine is virtually impossible for us in our daily operations as a busy open-admission shelter. Because most canine respiratory agents transmit through direct contact, through fomites (surfaces that can carry disease agents), and through the air with relative ease, Dr. Spindel recommended that we separate all of the dogs in the building (both exposed and sick) from any new dogs coming in. She also suggested to further separate symptomatic dogs. Some shelters, she explained, can do this by simply halting admissions. In other shelters, that's not an option, and creative use of space can allow a break between incoming and existing populations. Some facilities even use an off-site building for intake.

We decided the best plan for our shelter was to stop accepting owner-relinquishments and halt dog adoptions while diagnostics took place. Our shelter has contractual arrangements, and a clean area was set up for new stray animals to be received and handled separately from the exposed population.

After two weeks, the diagnosis of canine distemper virus was confirmed, and the shelter management pulled together to discuss the options. We talked about how long the exposed and sick dogs would need to stay separated based on incubation and shedding periods. The unfortunate aspect of distemper is that it has a lengthy incubation time (weeks to months) and a lengthy shedding period (two to three months), and some animals can be infectious without obvious clinical signs. We were basically faced with two choices: strict isolation of the sick and exposed dogs for the 90-day period required to ensure dogs are no longer incubating or shedding virus, or total de-population. Euthanasia of our entire dog population was not something we were willing to consider.

Splendid Isolation

We made a plan to seal off a kennel room that houses 23 kennels to give us the space needed to isolate nearly 30 dogs. An existing exterior door was modified to accommodate staff entrance only from the outside. The area was stocked with all the supplies needed for daily enrichment, sanitation, feeding, medical treatments, first aid, etc. We prepped the room to exist as a stand-alone operation that would be staffed by two employees all day for 90 days; these employees were not permitted access to the rest of the shelter after beginning their shifts. All dogs who exhibited symptoms of illness were moved to this area. We literally locked the door that connected the area to the rest of the shelter building and put up a plywood wall to prevent any possibility of accidental exposure.

The remaining dogs underwent bedside distemper antibody testing to establish whether individual dogs were at a high or low risk for infection. Titer testing is a somewhat experimental method of management in a shelter outbreak situation. In our shelter, all asymptomatic dogs with positive titers (indicating a low risk for CDV because they were likely to have strong immunity) remained in the adoption section. The one dog with a low titer result (and therefore a high risk for infection) was relocated to isolation.

After the move was complete, we spent two whole days rigorously cleaning and disinfecting the building. While the virus cannot survive long-term outside a host, we had to be vigilant to eradicate any possibility for new animals to be exposed. On the third day, we reopened to the public for dog adoptions and relinquishments.

For the first six weeks after reopening, we drew blood on each incoming dog the moment she came through our doors to measure distemper antibody levels, then vaccinated against DA2PP and *Bordetella bronchiseptica* as part of an established routine protocol. We titer-tested these dogs because we wanted information about their immunity to distemper on intake. We hoped that this information might allow us to diagnose disease and decide on a plan of action should any sickness appear in the new population.

One discovery that was particularly alarming was the evidence of unprotected and under-vaccinated dogs. About half of the local dog population that came in during this time did not have sufficient antibodies on the titer test to be considered protected. We were fortunate that not one dog fell ill after the initiation of quarantine.

Clear Communications

We decided right from the beginning to let the public know about what was happening via press releases and the Internet and to provide frequent, factual, non-alarming updates. Our honesty and openness were key in maintaining the public's trust, gaining support, and generating adoption interest. Our careful approach enforced the fact that we are a competent group of animal care professionals who are caring for homeless animals. We are extremely fortunate to have the resources and support that we have. Our donors, volunteers, colleagues, local veterinarians, and the public all stood behind our efforts to successfully care for these dogs.

Our dedicated and enthusiastic staff were determined to create an environment where the isolated dogs would thrive, with a goal of releasing for adoption those dogs who were behaviorally better than when they went in. Daily obedience training, scheduled rest time, play groups, indoor agility, treat puzzles, and quiet one-on-one time in the kennels for 90 consecutive days produced a mish-mash group of highly desirable adoption candidates.

The final release of quarantine was a day of celebration and lots of wonderful adoptions. Fifteen dogs went home on that first day! One dog went to Massachusetts, to a new owner who had been following the story on our website and was excited to adopt a dog who had undergone the training we had invested in the dogs to keep them healthy and sound. All of the quarantined dogs found new homes within a short period.

While operations at the Animal Welfare Society are back to normal now, managing this outbreak highlighted some important lessons, both from a management and a veterinary perspective. No shelter is immune to viral disease outbreaks, and an outbreak of a disease like distemper is a lot of work to manage! Not every shelter would be able to successfully complete a distemper quarantine, not just because of physical building limitations, but because maintaining animals' behavioral well-being during this time requires creativity and dedication.

The Animal Welfare Society is now operating with a heightened awareness of the general health of residents, tighter transfer dog protocols, and is quick to perform diagnostic testing (up to a necropsy) in the event of illness. Shelters need to know that there are resources available and should feel comfortable asking for help if animals are not responding to typical treatments, are dying, or if a large percentage of the population is ill. The earlier that diagnosis and management steps can be implemented, the better off a shelter and an entire community will be.

The outbreak at the Animal Welfare Society serves as an important reminder of the vital role that shelters play as sentinels and educators for the community—and not just in cases of disease. While canine distemper virus is almost entirely preventable through good vaccination programs, it is a disease that is still circulating in the dog population. Ultimately, learning to reduce any infectious disease in an animal shelter will result in more healthy animals finding lifelong homes.