WHY ARE SHELTERS AT INCREASED RISK FOR DISEASE OUTBREAKS?

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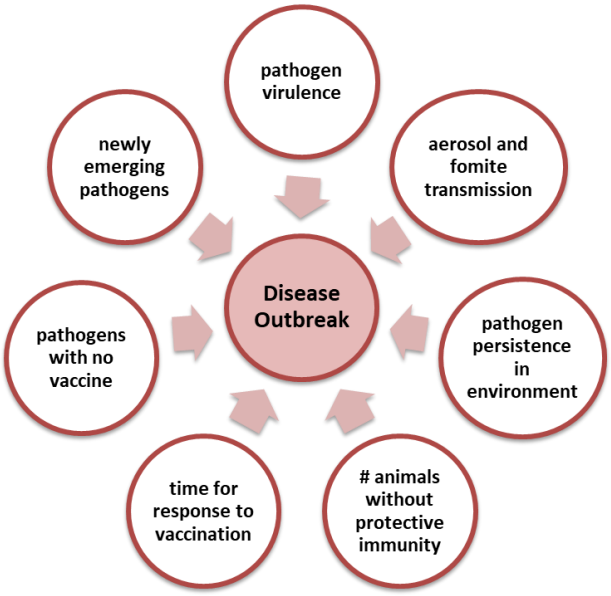
Management of contagious infectious diseases in dogs and cats continues to be one of the biggest challenges facing shelters. Every shelter is at inherent risk for introduction of contagious diseases into their facility with intake of animals from the community, many of which have acquired infections prior to entry. Infected animals may be in the pre-symptomatic incubation period on admission and thus not recognized as an infectious risk. If the shelter population contains large numbers of susceptible animals, particularly puppies and kittens, then widespread transmission of disease will ensue from exposure to the infected animal. Disease outbreaks not only impact the life-saving capacity of shelters, but also damage the shelter's reputation with adoption partners, local veterinarians, and the entire community, especially when such outbreaks are publicized by local and national media sources. This contributes to paralyzed adoptions, low staff morale, and perpetuation of the vicious cycle of crowding. In addition to the tangible losses associated with the financial costs of a disease outbreak, there are the intangible but far more costly losses of life and community support. The overall impact is decreased life-saving capacity.

This presentation identifies risk factors for disease outbreaks in shelters and provides the framework of strategic steps for successfully managing these outbreaks while maximizing the saving of lives.

Every shelter has inherent risk for a disease outbreak and this risk cannot be eliminated, even by the best management practices. Risk factors for disease outbreaks include crowding, which increases animal contact and stress and decreases care capacity; random co-mingling of animals in a run or cage; ineffective population management; ineffective sanitation; suboptimal vaccination policies, especially for puppies and kittens; lack of daily medical rounds; and failure to promptly recognize and remove sick animals from the general population. Many shelters do not have adequate isolation areas to house animals with contagious infections, so they are frequently kept in the general population, assuring the perpetual transmission of the pathogen so that it becomes an accepted "endemic" problem. Of all these risk factors, crowding is the most important and common since it directly impacts all other facets of animal care and exponentially increases the stress level for both the animals and the staff.

Other important risk factors include pathogen virulence, pathogen transmission by aerosols and fomites, persistence of the pathogen in the environment, number of animals without protective immunity, time required to respond to vaccination, pathogens for which there is no protective vaccine, and newly emerging pathogens that may not be recognized and for which the population has no immunity.



Studies have shown that large numbers of dogs and cats enter shelters without protective immunity to contagious pathogens that commonly cause disease outbreaks. Most puppies and kittens <6 months old have no or little pre-existing immunity to canine distemper virus, canine parvovirus, feline panleukopenia virus, feline herpesvirus, or feline calicivirus. Only about 50% of adults have protective immunity to canine distemper and feline herpesvirus at the time of entry into shelters, whereas a larger proportion have immunity to parvovirus and panleukopenia virus. This creates a substantial pool of animals in the shelter that are susceptible to infection if the pathogen is introduced.

Compounding the risk of disease due to a large pool of naïve animals is the time required for them to respond to vaccination. Studies have demonstrated that an effective immune response can take 10 to 14 days for most adults, and even longer for juveniles. While this response time is less troublesome for animals living in environments with low exposure risk, it is not fast enough for animals in the high-risk shelter environment. Most of the core vaccines for shelters, including for *Bordetella bronchiseptica*, canine adenovirus and parainfluenza virus, and feline herpesvirus and calicivirus, induce a partial response that ameliorates disease but do not prevent infection and pathogen shedding. There are no vaccines for some contagious diseases that frequently cause outbreaks in shelters, including canine pneumovirus, feline ringworm, and *Streptococcus zooepidemicus.* While vaccination is vital to increasing population immunity in a shelter, additional strategies for minimizing transmission of contagious infections are needed to protect at-risk dogs and cats.

The risk for introduction and spread of disease in shelters cannot be fully eliminated. Every shelter has managed or will need to manage a disease outbreak. Successful outbreak management strategies maximize life-saving, minimize disruption of shelter operations, achieve the quickest resolution possible, and are financially responsible. The following steps form the basic response:

1. Diagnosis of the disease
2. Isolation of sick animals
3. Quarantine of exposed asymptomatic animals

4. Assessment of infection risk in exposed animals
5. Create a clean break to prevent exposure of more animals
6. Biosecurity and environmental decontamination
7. Documentation
8. Communication

Please note that while these are listed as steps, the responses occur simultaneously. ***The overarching goal of the management strategy is to create an effective break between the infected/exposed population and the unexposed population without resorting to mass depopulation via euthanasia.***

Diagnosis directs the management strategy and is essential for successful control and resolution of disease outbreaks. ***Timely diagnosis substantially impacts how many dogs and cats remain healthy and adoptable.*** No diagnosis or late diagnosis increases the number of sick and exposed animals due to improper management and ultimately the number of animals euthanized. Even shelters with tight budgets should invest in diagnostic testing since this is the key to management and prevention strategies. It is far costlier to base the core steps on guesswork and trial by error, both in terms of the financial burden as well as the suffering of the animals and the shelter's reputation. Diagnostic test accuracy is dependent upon the timing of sample collection with the periods when the suspected pathogens are shed in highest amount and selecting the best test for the pathogen.

Prompt isolation of sick animals from the general population is the single most important step in controlling a communicable disease outbreak. This significantly decreases opportunities for transmission to other animals and reduces the infectious dose in the environment. Leaving sick animals in the general population guarantees the spread of infection to others and perpetuation of the outbreak. ***Infected animals should be isolated for the duration of pathogen shedding***. If the shelter cannot provide adequate isolation for the entire contagious period or do not have enough staff and medical resources to provide proper care, then the sick animals should not be kept in the shelter. In some cases, the sick animals can be transferred off-site to veterinary clinics, foster homes, or adoption groups with greater resources.

The benefit of isolating sick animals for disease containment is undermined if asymptomatic exposed animals remain in the general population. Exposed animals may not yet be ill because they are in the preclinical incubation period, they have a subclinical infection, they were not exposed to a high enough dose to become infected, or they are immune to infection. ***All exposed animals should be considered an infectious risk regardless of vaccine status and quarantined to protect other animals from exposure***. Ideally, the exposed animals should be consolidated to a housing area that is physically separated from other areas where unexposed animals are housed. ***The minimum quarantine time is equal to the pathogen's maximum incubation period.*** There should be no animals in and no animals out until the quarantine period expires or infection status is determined by diagnostic testing. Sick animals should be promptly removed to isolation and the quarantine clock re-started for the remaining animals since there was a new exposure. One of the foremost challenges of quarantining exposed animals in the shelter is the enormous strain it places on housing capacity and staff, especially when the quarantine periods

are extended for weeks. However, effective quarantine of exposed animals can save lives and increase staff morale.

Quarantined animals can be assessed for their risk of infection. This provides a humane and cost-effective strategy for quickly moving animals out of quarantine, thereby relieving the strain created by utilizing housing for quarantine. The risk assessment is based on 3 approaches:

1. Tests for pre-existing protective antibody titers to the pathogen
2. Tests for the pathogen itself
3. Age and vaccine status at time of exposure

Although no risk assessment is 100% accurate, when used and interpreted appropriately these approaches can predict in most cases which animals are safe to release and which animals are at risk and must stay in quarantine.

The cornerstone for stopping further spread of infection is creation of a clean break. This is defined as protection of unexposed animals and new arrivals from exposed or infected animals by housing them in a segregated area. As housing choices for "clean" animals are likely limited due to need for isolation and quarantine, the key for creating a clean break is implementation of intake diversion strategies to stop or reduce the admission of new animals. In conjunction with intake diversion, population management strategies should focus on moving the clean animals out of the shelter as quickly as possible to keep the shelter from getting crowded. Litters of puppies and kittens should be placed for adoption or transferred to rescue groups and foster homes immediately at intake to reduce the number of vulnerable animals on-site.

Biosecurity and effective sanitation should be practiced at all times, but is paramount during a disease outbreak. Signage should be placed on entrances to the isolation room, quarantine room, and clean rooms indicating what animals are in the room, no movement of animals in or out, and what staff can enter. Ideally, dedicated staff should be assigned to each room. If there is not enough staff for assignment to specific rooms, then staff should care for animals in the clean rooms first, followed by quarantine, then isolation last. When caring for animals in quarantine and isolation, staff must wear PPE consisting of full-length gowns or scrubs that completely cover arms and legs, hair cover for long hair, rubber boots, and gloves. Effective sanitation reduces infectious doses of pathogens in the environment. Disinfectants that kill the parvoviruses, feline calicivirus, and ringworm should be used in all housing areas with adherence to proper contact times.

Several disease outbreak parameters should be documented to aid in diagnosis, to determine whether infection was contracted outside of the shelter or acquired in the shelter, to assess the efficacy of the containment strategy, and identification of the weakness in the system that enabled the outbreak. Protocols for intake processing, vaccination, sanitation, daily monitoring of animal health, and isolation of sick animals should be evaluated and updated to include best practices. Responsible staff should be trained, supervised, and held accountable for the practices. To mitigate risk for recurrent outbreaks, a daily disease surveillance and monitoring protocol should be implemented.

Proactive transparent communication about a disease outbreak in the shelter and the control strategy being used provides an opportunity to disseminate accurate information to shelter staff as well as community stakeholders such as adopters, rescue groups, and veterinarians. Proactive communication averts spread of rumors and false information, improves the shelter's image, and enlists public support and trust. Consulting with infectious disease experts is another important component of communication, especially when dealing with an outbreak that cannot be diagnosed with routine testing, outbreaks with high morbidity/mortality, and outbreaks with unusual clinical signs.

When is the disease outbreak over? By convention, a disease outbreak is declared over when a period of 2X the pathogen's max incubation period has elapsed without identification of any new cases.

Key Takeaways

1. Crowding caused by ineffective population management is the most important and common risk factor for a disease outbreak.
2. Leaving sick animals in the general population is another important and common cause of disease outbreaks.
3. The overarching goal of a successful disease outbreak management strategy is creation of an effective break between the infected/exposed population and the unexposed population without resorting to mass depopulation via euthanasia.
4. Diagnosis is essential for successful control and resolution of disease outbreaks. All the steps for management and resolution depend on knowing the pathogen and its properties.
5. Prompt relocation of sick animals from the general population to isolation housing is the single most important step in containing a communicable disease outbreak. Infected animals should be isolated for the duration of pathogen shedding.
6. All exposed animals should be considered an infectious risk and quarantined to protect other animals from exposure. The quarantine time is equal to the pathogen's maximum incubation period. Quarantined animals can be assessed for risk of infection.
7. The cornerstone for prevention of further spread of infection is creation of a clean break. This is defined as protection of unexposed animals and new arrivals from exposed or infected animals.
8. When caring for animals in quarantine and isolation, staff must wear PPE and use disinfectants that kill the parvoviruses, feline calicivirus, and ringworm in all housing areas.
9. Several disease outbreak parameters should be documented to aid in diagnosis, to determine whether the infection was contracted outside of the shelter or acquired in the shelter, to assess the effectiveness of the management strategy, and identification of the weakness in the system that enabled the outbreak.
10. Proactive transparent communication about a disease outbreak within the shelter and the control strategy being used provides an opportunity to disseminate accurate information to shelter staff as well as community stakeholders such as adopters, rescue groups, and veterinarians