

Feline URI - Diagnosis and Treatment

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INTRODUCTION

Feline upper respiratory infection (URI) is perhaps the most frustrating illness facing shelter veterinarians, managers and staff, and has been identified as the number one disease concern for cats in shelters and after adoption.^{1,2} Many cats enter shelters already silently carrying the viruses that lead to illness; vaccines are partially effective at best; and specific treatments are limited. Factors such as overcrowding, poor air quality, poor sanitation, stress, concurrent illness, parasitism, poor nutrition, and other causes of immunosuppression predispose to disease.

In spite of these challenges, recent research has shown that some shelters have dramatically greater success than others in controlling this seemingly ubiquitous disease.^{3,4} We now know that having fewer than 5% of cats develop URI in shelter care is an achievable goal. Because of its close association with herpesviral activation and stress, URI is also a bellwether for overall shelter cat health and wellbeing. We cannot provide a humane, safe sheltering experience for cats if a substantial fraction develop illness in our care. Conversely, the measures necessary to control URI can have a widespread impact on overall cat comfort, wellbeing and even likelihood for adoption.

ETIOLOGIC AGENTS

Any of the following agents can be a primary cause of URI: Feline Herpesvirus-1 (FHV-1), Feline Calicivirus (FCV), *Chlamydomphila felis* (*C. felis*), *Mycoplasma* spp., or *Bordetella bronchiseptica*. In general, approximately 80–90% of cases are thought to be caused by one of the two viruses listed. In shelter cats, herpesvirus appears to be more closely linked to endemic shelter URI.⁵ Calicivirus, while undoubtedly the cause of periodic outbreaks, has not been consistently associated with an increased risk of URI in shelter populations nor does it appear to spread as readily as herpesvirus.^{6,7} Recently, *Streptococcus equi* subspecies *zooepidemicus* was identified as a common URI pathogen in sanctuaries where cat hoarding has taken place.⁸ Contrary to popular belief, aerosol transmission is **not** a significant means of spreading URI.^{9,10} Feline URI is much more readily spread via fomites and droplet transmission (over distances of 5 feet or less), or, importantly, via reactivation of latent herpesvirus due to stress.

SECONDARY BACTERIAL INFECTION

Primary respiratory pathogens increase cats' susceptibility to secondary bacterial infection, both by causing respiratory irritation and in some cases directly damaging respiratory immune function. A wide range of bacteria can be isolated from the respiratory tract of cats sick with URI, including *Pasteurella*, *E. coli*, *Streptococcus*, *Enterobacter* and *Staphylococcus* species.^{11,12} Because gram-negative bacteria are frequently isolated, antibiotic treatment targeted at secondary infection should include a gram-negative spectrum. Note, though, that not all cats develop bacterial infections requiring antibiotic treatment. If this seems to be a common occurrence at a given facility (classically based on clinical signs of colored ocular or nasal discharge and response to antibiotic treatment), consider whether poor air quality or other hygiene factors in the URI treatment area may be contributing to a high bacterial load in the environment.

DIAGNOSIS

Most often, a causative agent is not identified in individual cases of URI. Sometimes a best guess can be made based on clinical signs: FCV is relatively likely to be associated with oral ulceration or limping, FHV-1 is more likely to cause keratitis or corneal ulceration, *Chlamydomphila* and *Mycoplasma* are more commonly associated with conjunctivitis without other signs. However, all can cause overlapping clinical signs and it is rarely possible to make a diagnosis based on clinical signs in an individual cat. In some cases additional testing to identify specific pathogen(s) is indicated, e.g.:

Unusual signs, severity or frequency of disease in a population of cats
Planned husbandry changes (e.g., before investing in vaccination for a particular pathogen)
Legal issues (e.g., hoarding investigation, liability concerns)

Diagnostic testing has become more widely available in recent years with the advent of RT-PCR testing and panels specific for feline URI. A negative test result in a correctly handled specimen is a reasonably sure way of ruling out acute infection, though intermittent shedding can occur with several of the URI pathogens. Interpretation of positive test results in an individual cat, however, is complicated by the fact that any of these pathogens can be isolated from clinically normal cats. Remember, too, that PCR detects both live (field or vaccine strain) and inactivated virus. Given these limitations, a positive PCR test result on an oro-nasal sample from an individual cat has little meaning. Ideally, at least 5–10 typically-affected cats should be sampled. Samples should be obtained from the most prominently affected location (e.g., eyes, oral cavity, nasal swabs), or as per laboratory guidelines.

Results must be interpreted in light of the expected prevalence in shelter populations. Unfortunately, because RT-PCR testing used by diagnostic laboratories has only relatively recently become widely available, data regarding prevalence via this testing method are limited and likely vary with region and population sampled. In a survey of 573 cats at 8 California shelters, prevalence in cats with and without URI, respectively was: FHV 29% / 16%; FCV 28% / 27%; *C felis* 4% / 0.4%; *B bronchiseptica* 8% / 12%, and *Mycoplasma* 21% / 6%. However, in this survey viral isolation rather than PCR was used to detect FCV and FHV, and bacterial culture used to detect *Bordetella*. These methods may have resulted in decreased frequency of detection compared to PCR.^{13,14} A recent study, using RT-PCR, has demonstrated differences in prevalence of URI pathogens based on the shelter housing model (short-term animal shelters, long-term sanctuaries, home based foster care programs, and trap-neuter-return programs for community cats). FHV (59%, 41%) and *Bordetella* (33%, 24%) were more prevalent in both symptomatic and asymptomatic cats in short-term animal shelters. FCV (67%, 51%) and *Mycoplasma felis* (84%, 86%) were more prevalent in long-term sanctuaries. The majority of cats in each housing model carried at least one pathogen, regardless of whether they displayed clinical signs.¹⁵

In a serious outbreak in which cats are dying or being euthanized as a result of severe URI, necropsy and histopathology should be performed. This can often rapidly identify a cause and permit effective intervention. Histopathology has the significant advantage of documenting interaction between the supposed pathogen and the tissue, allowing a much more accurate assessment of the true role of the pathogen in causing the observed disease signs. Necropsy can also permit detection of unexpected pathogens not include in routine URI PCR panels.

MANAGEMENT, LENGTH OF STAY, AND URI

Crowding, with its associated problems, is undoubtedly the single greatest underlying risk factor for respiratory (and other) disease in shelters. Increased population density leads to a greater risk of disease introduction, higher contact rate between animals, reduced air quality, and often, compromises in housing and husbandry. Unfortunately, crowding of shelter cats is not uncommon. In some cases this is due to insufficient facilities to humanely house stray cats for a required holding period or make a reasonable number available for adoption. Even when facilities are adequate to house stray and an optimal number of adoptable cats, some shelters have not identified an optimal capacity beyond which they are not able to keep cats healthy or maximize live release. Given the abundance of cats in need of homes in most communities, crowding will inevitably occur unless capacity is established and some policy is in place to balance the number of cats admitted with the number released alive on an ongoing basis (e.g., managing intake, fast-tracking cats to appropriate live release pathways, utilizing adoption driven capacity, and implementing progressive life-saving programs such as Shelter-Neuter-Return (SNR) for community cats).

The fear is often raised that housing fewer cats at any one time will result in an increase in euthanasia, but this is not the case. The number of feline lives saved in a community depends on the number of adoptions and/or reduction of intake by preventing unwanted births, keeping cats in homes, and implementing community cat programs. None of these numbers will be positively affected by an

overcrowded shelter. On the contrary, URI has been linked to higher stress, increased risk for euthanasia and lower save rates on both an individual cat and population level.^{16,17} A shelter full of healthy cats will expend less on medical care, very probably see an increase in adopter interest, and have more resources for prevention that otherwise might have gone into medical care of animals with shelter-acquired illness. Implementing population management tools can prevent shelter URI, improve animal welfare, and increase the chances of cats leaving the shelter alive. For example, shelters that have implemented SNR programs are reporting 90% reduction in euthanasia for URI. Strategic adoption promotions can also be used as a population management tool. Planning adoption promotions should be planned around predictable surges in intake (such as kitten season) or around special events, rather than implemented only in response to crowding.

REDUCING LENGTH OF STAY

An underappreciated strategy for reduction of crowding and respiratory disease prevention is to simply reduce the amount of time each cat spends in the shelter environment. Length of stay in a shelter is a significant risk factor for development of feline URI.^{3,18} Illness further increases the length of stay. Conversely, reducing the length of stay on average for each cat will result in fewer cats housed in the shelter each day. This in turn results in less crowding and better care for each cat, further reducing the risk of illness. Reducing length of stay is not achieved by euthanizing more cats or placing time restrictions on individual cats. Rather, each cat should be provided the necessary care and attention to move it seamlessly through the shelter to its outcome without delay. Staffing must be adequate at all critical control points. Management practices that increase length of stay for shelter cats should be carefully assessed to ensure the benefit of these practices outweighs the cost. This could include routine quarantine of apparently healthy animals, delays created by backlogs in pre-adoption exams or surgery, or failure to move cats to public-viewing areas of the shelter as soon as they are available for adoption.

A sufficient number of cats and kittens should be available for adoption to ensure that potential adopters always have a variety to choose from. Beyond this, however, the number awaiting adoption should be based on the **optimum** rather than the maximum that can possibly fit in the available space. Fewer cats in the shelter awaiting adoption will mean a shorter wait for each one - if 30 cats are available for adoption and on average one cat is adopted each day, the wait will be 30 days for each cat. If only 15 at a time await adoption, the average time to adoption will be 15 days. Adopters may also have an easier time choosing if they are confronted with fewer choices; an increasing body of research shows that people are more likely to make choices, and to feel good about their choice, when they have relatively fewer options from which to select. A good general rule is to have no more than 7-14 times more cats moving actively through the shelter towards adoption than the average daily number of adoptions for that month. (Don't include cats in active rehabilitation that are not ready for adoption in this calculation.) **This does not equate to time limits:** the average length of stay will naturally fall if fewer cats are made available at any one time. Some cats may still stay considerably longer than 7-14 days, while others may be adopted within a few days of shelter entry. Initially reducing the number of cats available for adoption does not entail additional euthanasia. Rather it can be achieved simply by decreasing the time to adoption for each one by eliminating delays; through special adoption promotion events; or by controlling intake until adoptions have caught up with ongoing admissions. For more information on "adoption driven capacity", see www.sheltermedicine.com/documents/calculating-shelter-capacity.

STRESS REDUCTION

Because clinical signs and shedding of FHV-1 are specifically activated by stress, reduction is crucial to feline URI control. Efforts to reduce stress must be continuous from the moment a cat enters the shelter's care. Even moving cats from cage to cage is enough to induce reactivation in some cats.^{19,20} "Spot cleaning" where possible and providing housing that does not require extensive movement or handling for care is key to control of URI. Regrouping of cats in group housing has also been associated with reactivation of URI.²¹ If group housing is utilized, smaller groups of 2-4 cats are preferable to a few large ones to minimize the need for frequent addition and removal of cats. Even partitioning separate areas within a large room can be helpful. Providing hiding places, decreasing noise exposure (especially

exposure to dogs barking), maintaining light/dark cycles and comfortable temperatures, and providing toys and scratching surfaces are also important to relieve feline stress. Unnecessary handling for treatment should be minimized - the theoretical benefit of interventions that involve aversive handling or forceful medication must be weighed against the certain stress these procedures cause.

Feline socialization programs can be helpful in relieving stress but must be implemented and monitored with care. Being removed from a cage, cuddled by a stranger and carried to an unfamiliar room to play may provide welcome relief from boredom for some cats, but may be highly stressful for others (as well as serving to efficiently spread disease). Train volunteers to assess the cat's response to interaction and offer options such as grooming or petting the cat within its cage, or letting the cat exercise or sit in their lap in a clean, quiet area out of the cage (for healthy, vaccinated cats). If possible, provide each cat a carrier within its housing unit, or if space within the unit is insufficient assign each cat a carrier stored elsewhere that is used throughout its shelter stay. Use the carrier to transport cats to socialization areas and allow the cat to choose when to exit, explore and interact. If this is not possible, at least bring the cat's own towel or bed from its cage. Ensure that all volunteers and staff assess both the cat and the kennel for signs of URI or other illness prior to interaction. Healthy cats should not be handled after handling a sick cat without a change of top and thorough hand sanitation.

DISINFECTION

Most URI pathogens survive in the environment no more than a few hours (FHV-1) to a few weeks (*Bordetella*) and are inactivated by routinely used disinfectants. While a tidy and sanitary shelter is always a desirable goal, feline URI is not likely to be vanquished simply by ramping up disinfection practices without attending to stress reduction and feline comfort. Feline calicivirus is an exception - although not as durable as the notorious parvoviruses, it can survive for up to a month or even longer in dried discharge. Rigorous attention to disinfection is required when an FCV outbreak is suspected. Calicivirus is inactivated by household bleach (5% sodium hypochlorite) diluted at 1:32 (1/2 cup per gallon), applied to a clean surface. Products in the same family as bleach that have also been found effective against un-enveloped viruses include calcium hypochlorite (e.g., Wysiwash®) and sodium dichloroisocyanurate (e.g., Bruclean®). Like bleach, these have no detergent properties and must be applied to a pre-cleaned surface. Other proven products include potassium peroxymonosulfate (e.g., Virkon®, Trifectant®) and accelerated hydrogen peroxide (e.g., Virox®, Accel®), which both reportedly have greater detergent properties and better activity in the face of organic matter compared to bleach and related products. Independent studies have repeatedly shown that quaternary ammonium disinfectants (e.g., Triple Two®, Rocal®) do not reliably kill un-enveloped viruses, in spite of repeated reformulation and label claims of efficacy. In addition, exposure to high concentrations of quaternary ammonium products can lead to toxicity and symptoms that mimic severe upper respiratory infections, including fever, oral ulcers, and anorexia, thereby negatively affecting animal welfare and confounding disease recognition. Calicivirus is not reliably inactivated by alcohols, and hand sanitizers commonly used in shelters may not be completely effective (though they should still be available in all animal housing areas to protect public health). Sanitizers containing 60-90% ethanol and propanol are more effective than other alcohols. As noted above, the stress and fomite transmission associated with cleaning may outweigh the benefit of thorough disinfection. Accordingly, spot cleaning is recommended to mitigate these concerns. When spot cleaning, bedding, bowls, litter boxes, and hiding containers are left in the cage if the cage is relatively clean. Cages are still thoroughly cleaned, disinfected and dried between residents.²² Double-compartment housing facilitates use of a spot cleaning protocol.

AIR QUALITY

Although aerosol transmission per se is of minimal significance, air **quality** is undoubtedly important to respiratory health and URI control. The relevant air quality is at the level of the cat's nose, not the room at large. Cages or condos that are open on at least two sides provide better passive ventilation than those that are open on only one side. Housing cats in fully enclosed cages (all four sides, top and bottom) results in poor air quality and should be avoided unless each cage is individually actively ventilated. Although fresh air exchange is often emphasized, reduction of airborne contaminants is equally or more

effective (e.g., through reducing population density, frequent litter box cleaning, low dust litter, use of disinfectants at correct dilution). Air filtration (i.e., HEPA filter) may be tried, although it is less effective than fresh air exchange or contaminant reduction. Filters need to be replaced frequently to prevent them from becoming a source of infection. Ozone based air filters should be avoided, as ozone itself may be a respiratory irritant.

HOUSING

Housing, stress reduction and safe, effective cleaning go hand in hand when it comes to feline care in a shelter. Good quality housing directly impacts feline wellbeing, greatly facilitates both cleaning and stress relief, and is likely the most important single factor in determining URI frequency in shelters. For instance, in one recent study, only 60 out of 1,434 cats admitted to shelters in the United Kingdom developed URI during their shelter stay.² Cats in the study shelters were typically held in large, comfortable indoor/outdoor runs separated by guillotine doors. This housing provided for ample hiding spaces, separation of litter and food, complete isolation from dog noise, care of the cats without disruption, and the ability to make postural adjustments.

Additionally, separation between food, resting, and elimination areas should be maximized (minimal triangulated distance of 2 feet). Housing that generally meets these recommendations has floor space of 9 ft² or greater. If group housing is utilized in shelters, cats should be matched with compatible mates and monitored closely for normal behavior displays. Smaller groups of 2–4 cats are much preferred to larger groups in order to decrease risk of disease transmission and allow adequate monitoring for behavioral and medical wellness. Kittens under five months of age should not be group housed except with littermates in order to lessen risk of infectious disease transmission in this vulnerable population.

Housing modifications can be done in the shelter to improve housing quality. Adjacent cages can be retrofitted at affordable costs by cutting portholes into the walls to make the cages double-compartmentalized. Cage covers can be added in order to give cats privacy. Elevated beds can be purchased or constructed from PVC pipe to add vertical space within cages. Provision of a hiding space is crucial to lower feline stress; cardboard boxes, plastic bins, feral cat boxes, and paper bags can all serve this purpose, as can a simple towel partially draped over the cage front. For more details on recommended cat housing, see www.sheltermedicine.com/shelter-health-portal/information-sheets/facility-design-and-animal-housing.

VACCINATION

Vaccination does not prevent infection or development of a carrier state for any URI pathogen, and many strains of feline calicivirus are vaccine resistant.²³ At best, vaccination reduces severity and duration of disease. Modified live (MLV) parenteral vaccines are available containing feline herpesvirus, feline calicivirus and feline panleukopenia (FVRCP). Even with an MLV product, two vaccinations 2–3 weeks apart are required for full protection against the respiratory viruses. If owners or finders are amenable to keeping cats for a short period prior to surrender, administer the two-vaccine series prior to shelter entry. At minimum, vaccinate all cats 4 weeks of age and older at the time of admission. Revaccinate kittens every two weeks throughout their stay in a high risk environment (e.g., shelter, high volume foster home) until 18–20 weeks of age. If possible, revaccinate adult cats two weeks after the first vaccine.

Modified live vaccines are generally preferred over inactivated products for the more rapid protection induced (at least 5–7 days parenteral, 3–5 days intranasal). Because URI and panleukopenia vaccines are generally delivered in combination, this is a consideration in vaccine selection. Panleukopenia is recognized with increasing frequency in many regions, and the superior protection provided by the MLV subcutaneous vaccine against this disease makes it the best choice in most situations.

Intranasal (IN) MLV two-way (FVRC) or three-way (FVRCP) vaccines are also available in the United States and some other parts of the world. Two studies have been conducted in the shelter setting to investigate the efficacy of an IN vaccine when given in addition to a parenteral vaccine. In one study the 2-way intranasal FVRC vaccine given in addition to an inactivated parenteral FVRCP vaccine provided modestly improved protection against URI.¹⁸ On the other hand, another study showed no

difference between shelter cats that received an intranasal MLV FVRC vaccine in addition to a parenteral MLV FVRCP vaccine, versus only the parental MLV vaccine.²⁴ Anecdotal reports from shelters are extremely varied regarding the efficacy of this strategy, from those that report a significant apparent decrease to those that report no change or even increased URI. If a modified live intranasal vaccine is used in addition to a subcutaneous 3-way FVRCP vaccine, an effort should be made to track the impact on URI within an individual shelter. **Under no circumstances should use of a modified live subcutaneous vaccine against panleukopenia be discontinued, as this vaccine is necessary for rapid protection of shelter cats against this common and deadly infection.**

Two-way (bivalent) inactivated calicivirus vaccines are now available in some areas (Europe, United States). One of these vaccines contains a strain of calicivirus isolated from a single outbreak of virulent systemic FCV in addition to the strain used in most calici vaccines. No cross protection between virulent systemic strains has been documented²⁵, so one would not expect that this vaccine is especially likely to protect against virulent systemic disease. However, the bivalent vaccine did generate antibodies that were more broadly cross neutralizing than the traditional single strain vaccines²⁶, which may correspond with broader protection against calicivirus in general. The other bivalent vaccine, currently available in Europe, also generated broader cross protection than traditional vaccines²⁷. Both bivalent are inactivated, and, like all calicivirus vaccines, require a two vaccine series to provide optimal protection. However, because calicivirus tends to be episodic rather than endemic in shelters, there may be a benefit for cats likely to be housed long term, e.g., in a sanctuary, for cats being held as part of an ongoing legal case, or simply in shelters where cats tend to stay for a month or more.

A MLV *Bordetella* vaccine for cats is available, but is not generally recommended for shelters except when repeated problems are demonstrated by laboratory diagnostics. Killed and modified live vaccines are available for *C. felis* (often given in combination with FVRCP). This vaccine is not generally recommended, as it has a short duration of effect, is only partially effective, and may have a relatively high frequency of adverse reactions. Frequent recognition of clinical *Bordetella* or *Chlamydomphila* in cats is often an indicator of overall husbandry problems, and prevention should focus on improvement of environmental management, rather than control of these agents specifically. The need for this vaccine, if used, should be periodically revisited. No *Mycoplasma* vaccine is available for cats. For more information on vaccination for feline URI, see the American Association of Feline Practitioners Vaccine Guidelines, available online. This document includes specific recommendations for shelter cats.

ISOLATION

Many cats shed URI pathogens without showing clinical signs, hence the need for careful hygienic precautions even when handling apparently healthy cats. Cats with active signs of infection are likely to be shedding much greater amounts of virus. Isolation of these cats from the general population is a requirement for even a minimal disease control program. In-cage isolation is acceptable if housing is such that the cat can be genuinely separated from other cats and cared for in such a way that fomite transmission is fully avoided. Most shelter housing requires that cats be moved to a separate room to achieve meaningful isolation. This is also beneficial to provide more efficient treatment and avoids the perception that the shelter is just “full of sick cats”. Many cats are still shedding increased amounts for a few weeks following recovery. Ideally these cats would not be mixed directly back into the general population, or at least not with vulnerable populations such as kittens or recent arrivals. However the risk of transmission is greatly reduced once clinical signs have fully resolved, and re-introduction of these cats into the general healthy population usually poses no great problems. If a chronic cycle of URI occurs following reintroduction of recovered cats, re-evaluate stress management and crowding. Consider additional diagnostics if the problem persists even in the face of good husbandry and stress control.

TREATMENT

Prevention must be the cornerstone of URI management in shelters. Once cats become ill, more than half the battle is lost. Even at shelters able to provide treatment, sick cats will suffer through a spell in isolation, crowding and costs will increase as cats are held for treatment, public trust may decrease, and

staff time is diverted from preventive efforts and adoptions. Some cats suffer chronic and even fatal complications from URI.

That said, treatment is an important component of URI management, for the population as well as the individual cat. Staff morale and community support often improves when sick cats can be treated. A discussion of treatment based on clinical signs can be found at:

www.sheltermedicine.com/documents/a-discussion-of-feline-upper-respiratory-infection-treatment and a sample standardized treatment protocol can be found at www.sheltermedicine.com/documents/sample-uri-treatment-protocol.

While we want to do all we can to speed recovery, it is important to recognize that treatment itself is associated with risks and costs, especially in a shelter. Over-use of antibiotics compromises normal gastrointestinal and respiratory flora and can increase susceptibility to other bacterial and viral infections.²⁸ Antibiotics also cause undesirable side effects, and the risk of selecting for antibiotic resistant organisms is a constant concern. Never use blanket antibiotic treatment as a substitute for good husbandry: not only is it not safe, it just doesn't work to manage this largely viral disease. Antibiotic treatment should ideally be reserved for cats with signs suggestive of bacterial infection. However, in some shelters almost all cats progress to these signs within a few days. If (and ONLY if!) this is the case, revisit air quality, stress control and crowding in the treatment area, but in the meantime consider starting antibiotics immediately for cats placed in the treatment area. There is no benefit in treating acute cases of URI for a specific time period; antibiotics can be discontinued once clinical signs resolve (if monitoring is spotty, it may be best to continue 2-3 days past the last observed sign of URI, in case a few last sneezes were missed). Chronic URI or suspected Chlamydia infection is a different matter. In these cases, treatment for 6-8 weeks may be required to fully resolve infection.

In most cases, antibiotics are chosen on an empirical basis for shelter feline URI. Several studies have been performed comparing the efficacy of various antibiotics for this use. In a trial in 103 cats with URI comparing marbofloxacin to clavamox for 5 days, no difference was found (cure or improvement in 87.8 versus 77.8 respectively).²⁹ A study comparing a 9 day course of amoxicillin versus azithromycin in 31 shelter cats likewise found no significant difference between treatment groups.³⁰ Cure rates at 9 days were 38% and 40% respectively. Another 50% of cats in each treatment group were cured after 9 days on the other antibiotic, while 8/31 were not cured by either drug. A study that evaluated the *in vitro* efficacy of various drugs to secondary bacterial infections in feline respiratory disease found that enrofloxacin had the highest overall efficacy (95%), with cefalexin and clavamox also reasonably effective at 90% and 84% respectively.¹¹ Tetracycline was only 71% effective. Importantly, however, this study did not report on susceptibility of three potentially important primary pathogens, *Bordetella*, *Mycoplasma*, and *Chlamydia*. These three bacteria are consistently **not** susceptible to cefalexin, and tend to have good susceptibility to doxycycline.^{31,32} Doxycycline has outperformed a number of other antibiotics specifically for treatment of *Chlamydia*.³²⁻³⁵ A good treatment combination, therefore, may be doxycycline as one treatment option and an antibiotic with better activity against secondary pathogens as the other choice. This would provide coverage for both primary and common secondary bacterial pathogens. (Remember that most shelter URI is caused by feline herpesvirus, with secondary pathogens and mycoplasma likely playing a more frequent role than *Bordetella* or *Chlamydia*.) Cats failing to respond to the first line empirical treatment should be given the other. Cats that fail to respond to either treatment should be further evaluated as described below.

With any treatment that involves handling and manipulation of cats, the risk of spreading disease is increased, and treatment itself can be quite stressful for cats and caretakers alike. Overtreatment should therefore be avoided. While it can be tempting to try a variety of anecdotal treatments or give antibiotics just to be doing **something** about this frustrating disease, treatment should ideally be limited to therapies for which there is a reasonably strong clinical justification.

Most cases of URI will resolve within 7-10 days. A few cats may take longer or may never recover in the shelter, but if a longer time to recovery is the rule rather than the exception, again re-evaluate stress control, crowding and care of cats in treatment. Evaluate shelter cats with chronic URI for contributing problems such as nasal polyps, foreign bodies, and immunosuppressive disease, just as you would approach any other individual patient. If these other causes are ruled out, long term antibiotics with good

tissue penetration may alleviate symptoms. These cats should not remain in the shelter long term just waiting for symptoms to resolve, as this may never occur. Keep in mind that because URI is strongly associated with stress, sometimes the “best medicine” for lingering cases is to get out of the shelter. For some cats, symptoms will resolve in the home setting of foster care. Even if symptoms don’t resolve in foster care, it is ideal for these cats to be placed via a foster home/internet-based adoption/off site adoption events where the condition can be explained to potential adopters versus lingering, sneezing, in the shelter. Supportive care helps to resolve clinical signs, but should be kept to a minimum and ideally performed by a consistent caretaker to reduce stress associated with handling. Supportive care includes minimizing patient stress and discomfort, promoting euhydration, providing nutritional support, and maintaining nares and eyes clear of dried discharge. Saline nasal drops may promote respiratory lining hydration, but its administration may induce additional stress. In-cage nebulization is therefore a reasonable alternative. Decongestants and antihistamines are of limited benefit.

The presence of ocular signs may warrant additional treatment. For mild conjunctivitis, oral doxycycline is a reasonable first choice as it has effective ocular tissue penetration against bacterial pathogens associated with ocular disease and its administration can be less stressful than topical treatments. If ocular signs are severe, then broad spectrum ointments that are also effective against *Chlamydophila* can be used (e.g., a tetracycline or erythromycin). Topical medications can be irritating in themselves, particularly triple antibiotic ointments in cats. If administering topical therapy, cats should be diligently monitored for worsening clinical signs and signs of irritation (i.e., pawing at the eyes) and medications should be discontinued.

Antiviral treatment for FHV should be reserved for refractory cases or cases manifesting signs of FHV (keratitis, severe conjunctivitis, or corneal ulcers). Oral famciclovir is becoming more commonly used in cats in private practice, and, although the optimal dosage remains uncertain, the most recent information based on experimental infection indicates that 40 mg/kg three times daily is likely to be effective.^{36,37} A recent field trial done in a shelter showed that a single dose of oral famciclovir at intake did not limit development of URI signs or reduce FHV shedding; however, further studies are needed to investigate its role in shelter-endemic URI.³⁸ For topical antiviral treatments, compounded cidofovir is effective, does not cause ocular irritation, has a long tissue half-life and, therefore, requires only twice daily administration.^{39,40} Idoxuridine, another topical antiviral, is also effective, but can cause ocular irritation and needs to be used 4–6 times daily.^{39,40}

L-lysine is an amino acid that inhibits the synthesis of herpesviral proteins, thereby theoretically reducing FHV replication. Unfortunately, lysine has not been shown to be effective for prevention of URI in published findings from field trials in shelters. Because of the lack of proven benefits, routine administration of lysine to cats as a URI preventative is not recommended, especially considering the added expense, time, and stress associated with its use.³⁶

To ensure prompt recognition, care, and control of feline URI, written policies and protocols, developed with veterinary oversight, should be in place. Staff should also use cage-side observation sheets to record daily clinical signs to promote prompt recognition of clinical resolution or deterioration, thereby ensuring animal welfare is upheld at all times.

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