Upper respiratory signs are a common presenting complaint for cats visiting small animal veterinary practices. Typical signs include sneezing, nasal and ocular discharge, congestion, and altered appetite, with some cats having additional coughing, conjunctivitis, keratitis, and oral ulceration. There is a lot of overlap in clinical signs and presentation among the various differential diagnoses, and determining the true underlying cause can be challenging. With certain diagnoses, successful management can be frustrating for both owners and veterinarians and requires client education and establishment of realistic expectations.

Diagnostic evaluation
A thorough physical examination is critical for each cat presenting with upper respiratory signs. This exam should include assessment of airflow, symmetry, and pain during palpation of nasal cavities, retropalpebral eyes, otoscopic exam, dental exam, and lymph node evaluation. Together with signalment and history, exam findings allow the clinician to rank differential diagnoses and create a logical diagnostic and treatment plan. For example, young cats with decreased airflow will have an inflammatory polyp higher on their differential list, whereas an old cat may have cancer highest. Similarly, a cat with mild serosanguinous nasal discharge and sneezing 1 week after July 4th is likely to be having a herpes flare-up, whereas a cat with an ulcerated nasal lesion is more likely to be ill from Cryptococcus. If the cat’s clinical presentation fits with a simple viral infection, further diagnostic testing may not be warranted, and the clinician may be best to educate the owner about feline viruses, supportive care options, and reinforce vaccination importance. In other cases where bacterial or fungal infection are suspected, diagnostic testing is warranted to determine exact etiology and optimal therapy. Although there are many infectious causes of upper respiratory disease in cats, part of the thorough workup is to investigate the possibility of non-infectious causes as well, such as foreign body, lymphoplasmacytic rhinitis, dental disease, polyps, and neoplasia. These diagnostic tests may include CBC, FeLV/FIV testing, cytology, Cryptococcus antigen testing, sedated dental exam and polyp check, skull radiographs or CT scan, rhinoscopy, bacterial culture, PCR, and virus identification.

Feline herpevirus-1
The most common viral cause of upper respiratory disease in cats is feline Herpesvirus-1. Clinical signs can be severe, including nasal and ocular discharge (typically serous), sneezing, stertorous breathing, depression, anorexia, gingivostomatitis, fever, conjunctivitis, and keratitis, and these signs are the most severe in young, unvaccinated, or immunosuppressed cats. Both virus isolation and PCR can be used to confirm presence of herpes in cats, but their diagnostic utility is limited because viral detection does not prove illness from the virus; thus rarely do we confirm the presence of herpes in clinical cases. Feline herpesvirus-1 is a self-limiting infection, and clinical signs resolve in most cats in about a week. Supportive care to keep their nares clean and nutritional support can be very helpful. All cats remain latent carriers with intermittent shedding; flare-ups can occur a week after a stressful event and last for 1-2 weeks. Flare-ups are self-limiting but frustrating and may be confused with secondary bacterial infections. Antimicrobial therapy will not help the primary herpes infection and should be prescribed judiciously to minimize development of resistance. L-lysine can be used in attempt to suppress viral replication during outbreaks or as maintenance therapy long-term and may help some cats. Good hygiene and isolation protocols decrease exposure to kittens, and routine vaccination will help minimize severity of clinical signs. Client education is beneficial regarding the recurrent nature of the disease, importance of minimizing stressful events, and providing supportive care during recurring episodes.

Feline calicivirus
Calicivirus is seen much less commonly in cats than herpesvirus, but can show similar clinical signs, including nasal and ocular discharge (typically serous), sneezing, fever, depression, oral ulceration, gingivostomatitis, conjunctivitis, and lameness. Calicivirus is a single-stranded non-enveloped RNA virus with a high mutation rate. Calicivirus is shed in upper respiratory secretions and transmitted by fomites, surviving several weeks in the environment. Diagnosis can be made with virus isolation and PCR. Like herpes, calicivirus is self-limiting and thus treatment is supportive only. Infected cats should be isolated, and the environment should be cleaned with bleach (diluted ½ cup 5% bleach in a gallon of water) or potassium peroxymonosulfate to minimize spread of this virus.

Bordetella bronchiseptica
*Bordetella bronchiseptica,* one causative agent of canine kennel cough, is a Gram-negative aerobic bacterium that can be either a primary or secondary pathogen in feline upper respiratory tract infections. Cats at increased risk are those from rescue organizations or multi-cat households, cats with exposure to dogs with kennel cough, and cats with concurrent respiratory infections. *Bordetella*
colonizes respiratory mucosa, adheres to cilia and causes ciliostasis and destruction of cilia, ultimately leading to mucociliary clearance failure. Clinical signs include sneezing, nasal and ocular discharge (often mucopurulent), dyspnea, and sometimes cough that can progress to bronchopneumonia. Diagnosis is made by bacterial culture and susceptibility (notify the lab if you suspect *Bordetella* so that proper media can be used) or PCR. Most cases are susceptible to doxycycline 5mg/kg PO BID for 3+ weeks (use liquid formulation or follow with water bolus to minimize risk of esophageal damage). *Bordetella bronchiseptica* is potentially zoonotic, especially to immunosuppressed children.

**Mycoplasma spp.**

*Mycoplasma spp.* are bacterial organisms lacking a cell wall that are part of the normal flora in the cat's upper respiratory tract. Although their role is still not fully understood, it is believed they can also be either a primary or secondary pathogen causing or contributing to respiratory disease including conjunctivitis, chronic rhinitis, and pneumonia. Transmission occurs via direct contact, although aerosol droplets and fomites likely play a minor role. Diagnosis is by culture or more commonly PCR. Without a cell wall, they are not susceptible to Beta-Lactams, but instead most often respond to doxycycline, azithromycin, or fluoroquinolones.

**Secondary bacterial infections**

Upper respiratory infections in cats can be frustrating because of the influence of underlying viral disease as well as secondary bacterial infections, and it can be challenging to differentiate between these etiologies and other concerning conditions. Factors that contribute to secondary bacterial infections include immunosuppression from viral infection and stress, permanent turbinate damage from viral infection, and alteration of normal protective flora from antimicrobial therapy. Although empirical antimicrobial therapy such as doxycycline or amoxicillin-clavulanic acid can be helpful in some circumstances, empirical antimicrobial agents should be used sparingly to minimize resistance and adverse effects. Culture and susceptibility are recommended to identify inciting bacteria and most appropriate therapy, but optimal method of sample collection is still debated, including submitting biopsies for culture, nasal flushes, or nasal swabs.

**Cryptococcus neoformans**

*Cryptococcus neoformans* is the most common fungal organism causing upper respiratory disease in cats. It is a dimorphic fungus whose mycelia are found in the soil, thus outdoor cats are at increased risk of infection, but we also see infections in indoor-only cats. Infection occurs via inhalation of spores that can remain in their nose (approximately 80%) or infect their lungs and spread hematogenously. Nasal cryptococcosis is typically very invasive, destroying turbinates and causing skin erosions, ulcerations, and facial asymmetry. Infection can involve the CNS by direct extension through the cribriform plate causing various neurologic signs. Ocular involvement can include chorioretinitis, retinal hemorrhages or detachment, and blindness. Diagnosis is with either cytologic identification of organisms from a nasal lesion or latex agglutination test for capsular antigen (on serum or CSF). This antigen test is a highly sensitive and specific test. CT can be used to evaluate the extent of disease if needed. Fluconazole is considered the first choice for antifungal therapy because of good penetration into the CSF and ocular tissue.

**Selected references**


