Update on Feline Upper Respiratory Diseases: Condition-Specific Recommendations

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Abstract: Clinical signs of upper respiratory disease are common in cats. The differential diagnosis includes viral, bacterial, and fungal infections; chronic rhinosinusitis; foreign bodies; tooth root disease; neoplasia; inflammatory polyps; nasopharyngeal stenosis; and trauma. This article provides specific recommendations concerning the diagnosis, treatment, and prevention of the most common causes of upper respiratory diseases in cats.

When a cat presents with clinical signs of upper respiratory disease, a complete diagnostic workup is important to determine the etiology so that the treatment regimen can be appropriately directed and maximal response to therapy obtained. A companion article, published in December 2009, details a three-phase diagnostic workup for these patients.

Bacterial Agents
Diagnosis

Almost all cats with mucopurulent or purulent nasal discharge have a primary or secondary bacterial infection. Primary bacterial disease is rare but may be associated with *Bordetella bronchiseptica*, *Mycoplasma* spp, *Streptococcus canis*, and *Chlamydophila felis*.1–5 The normal flora of the nasal cavity commonly includes *Pasteurella*, *Staphylococcus*, and *Streptococcus* spp and a variety of anaerobic bacteria.6–12 Cultures of nasal flush fluid and tissue biopsy samples yield similar species results, but aerobic and anaerobic cultures of nasal flush fluid samples were positive for various species significantly more often in one study.13 Cultures of nasal biopsy samples may be more representative for deep mucosal infections,6 but this has not been definitively shown. In another study, different organisms were cultured from each sample type, so the most complete results may be obtained by collecting and culturing both nasal flush fluid and biopsy samples.6 However, culture results may not correlate with the cause of the disease due to the presence of normal flora and other superficial bacteria. *B. bronchiseptica*, a well-defined primary pathogen in dogs, can be isolated from many clinically healthy cats,1 making the positive predictive value (PPV) of serologic testing, culture, and polymerase chain reaction (PCR) assay for *B. bronchiseptica* low in this species. Many cats have antibodies against *B. bronchiseptica*, which is commonly cultured from cats in crowded environments, and there are sporadic reports of severe lower respiratory disease caused by bordetellosis in kittens and cats in crowded environments or other stressful situations.14,15 *B. bronchiseptica* was cultured from samples taken at necropsy from the lower airways of several cats from shelters in Colorado, and in one shelter, the organism was cultured from 19 of 40 cats (47.5%) with upper respiratory disease.
respiratory disease. However, the significance of infection in otherwise healthy pet cats appears to be minimal. For example, in client-owned cats in north central Colorado, the organism was rarely cultured from cats with rhinitis or lower respiratory disease (approximately 3%).

B. bronchiseptica is easily cultured, and culture is superior to PCR for diagnosis of infection because antimicrobial susceptibility testing can be performed on isolates. The organism is not usually eliminated by treatment; therefore, follow-up culture or PCR assay after treatment has minimal benefit.

C. felis infection is a common diagnostic differential for cats with clinical evidence of conjunctivitis and rhinitis; it is not a common cause of lower airway disease. The organism is difficult to culture, so PCR detection of microbial DNA from conjunctival swabs can be clinically useful. Because C. felis is an intracellular organism, adequate cellular material must be obtained from the conjunctival swab for analysis. PCR assay results can be used to prove that a cattery has been cleared of the infection after treatment. Most PCR-positive cats are clinically ill (3.3% of healthy cats were positive in one study), so the PPV of the PCR assay is likely to be low. Mycoplasma spp PCR assays have some clinical utility, and some allow speciation, which is helpful in assessing the pathogenic potential of an organism. However, because Mycoplasma spp are common flora, the PPV of these assays is likely to be low. Mycoplasma spp are not usually eliminated by treatment, so follow-up culture or PCR assay after treatment has minimal benefit.

**Treatment**

If a primary bacterial infection is suspected, doxycycline (10 mg/kg PO q24h) is usually effective for cats with rhinitis with or without conjunctivitis. Doxycycline is the treatment of choice for B. bronchiseptica, Mycoplasma spp, and C. felis infections and has been shown to be superior to topical administration of tetracycline in the treatment of C. felis. Doxycycline is associated with fewer adverse effects in young kittens than tetracycline. Amoxicillin–clavulanate is a good choice in young animals and is effective against most organisms other than Mycoplasma spp, which lack a cell wall. Pradofloxacin has been shown to have efficacy against Mycoplasma spp. Enrofloxacin has been shown to be effective against C. felis but should be used with caution in young cats because of possible adverse effects on cartilage. Clindamycin penetrates bone and tissue well and has an excellent anaerobic spectrum. The liquid form of this drug is generally well tolerated if it is administered cold. Azithromycin therapy can be tried for cats with suspected resistant bacterial infections.

Doxycycline and clindamycin have been associated with esophagitis and esophageal strictures in cats due to poor secondary esophageal contractions in this species. We recommend never administering dry pills or capsules to cats. If possible, drugs should be compounded into a liquid; if pills are administered, they should be coated with butter or Nutri-Cal (Evco), given in a pill delivery treat, or followed with a 3- to 6-mL liquid bolus or food. Cats with acute primary disease caused by a bacterial agent other than C. felis need only 7 to 10 days of treatment; for C. felis, 28 days of therapy is necessary. Chronic bacterial disease may require 6 to 8 weeks of treatment to adequately clear the infection if osteomyelitis exists. Pulse therapy may help some chronically affected cats but may induce antimicrobial resistance in some bacteria. Most cases of bacterial rhinitis are secondary to other conditions such as trauma,
neoplasia, inflammation induced by viral infection, foreign bodies, inflammatory polyps, chronic rhinosinusitis, and tooth root abscessation. Thus, if routine antibiotic therapy fails, a diagnostic workup should be performed.

Prevention
The available intranasal *B. bronchiseptica* vaccine can be administered to kittens as young as 4 weeks, has an onset of immunity as early as 72 hours, and has a minimum duration of immunity of 1 year.\(^2^8\) The American Association of Feline Practitioners (AAFP) Feline Vaccine Advisory Panel and the European Advisory Board on Cat Diseases recommend that *Bordetella* vaccination be considered primarily for cats at high risk for exposure and disease, such as those entering environments (e.g., boarding facilities, catteries) with a history of bordetellosis and those living in humane shelters with culture-proven outbreaks.\(^4,2^9\) However, because the vaccine is administered intranasally, mild sneezing and coughing can result, which may influence case management of kittens housed in shelters or humane societies. Because the disease is apparently not life threatening in adult cats, is uncommon in pet cats, responds to a variety of antibiotics, and is considered minimally zoonotic, routine use of the *B. bronchiseptica* vaccine in most client-owned cats seems unnecessary.

Killed and modified live *C. felis*–containing vaccines are available. In recent Colorado studies, *C. felis* was amplified from conjunctival swabs of 3.2% of cats with conjunctivitis\(^3^0\) but 0% of nasal discharge samples from cats housed in a humane society.\(^7\) The use of FVRCP vaccines that contained *C. felis* was associated with more vaccine reactions in cats than was the use of other products.\(^3^1\) Because *C. felis* infec-

**BOX 1**

## Doses of Drugs Used in Upper Respiratory Tract Diseases in Cats\(^6^6,6^8,6^9,a,b\)

### Antibiotics
- Amoxicillin: 10–22 mg/kg PO q12h
- Amoxicillin–clavulanate: 13.75 mg/kg PO q12h
- Azithromycin: 15 mg/kg PO q24h
- Cefadroxil: 22 mg/kg PO q12h
- Cephalexin: 22 mg/kg PO q8h
- Chloramphenicol: 10–15 mg/kg PO q12h
- Clindamycin: 10–12 mg/kg PO q24h
- Doxycycline: 10 mg/kg PO q24h
- Enrofloxacin: 2.5–5 mg/kg PO q24h
- Marbofloxacin: 2.5–5 mg/kg PO q24h
- Metronidazole: 10–15 mg/kg PO q12h
- Orbifloxacin: 2.5–5 mg/kg PO q24h
- Pradofloxacin: 5–10 mg/kg PO q24h
- Trimethoprim–sulfonamide: 15 mg/kg PO q12h

### Antifungal drugs
- Deoxycholate amphotericin B: 0.1–0.5 mg/kg IV, M, W, F to 16 mg/kg
- Deoxycholate amphotericin B (subcutaneous): 0.5–0.8 mg/kg in 400 mL of 0.45% saline/2.5% dextrose SC, M, W, F to 16 mg/kg
- Fluconazole: 50 mg/cat PO q12–24h
- Itraconazole: 10 mg/kg PO q24h
- Liposomal amphotericin B: 1 mg/kg IV, M, W, F to 12 mg/kg

### Antihistamines
- Cetirizine: 2.5–5 mg/cat PO q24h
- Chlorpheniramine: 2 mg/cat PO q12h
- Clemastine: 0.68 mg/cat PO q12h
- Fexofenadine: 5–10 mg/cat PO q12–24h
- Hydroxyzine: 5–10 mg/cat PO q8–12h
- Loratadine: 5 mg/cat PO q24h

### Antiviral drugs
- Cidofovir (0.5%): 1 drop OU, q12h
- Famciclovir: 62.5 mg/cat PO q12h for 14 days
- Interferon-α: 30 U PO daily (chronic); 10,000 U SC daily for 21 days (acute)
- Lysine: 500 mg/cat PO q12h

### Glucocorticoids
- Beclomethasone (inhaled): 1–2 puffs q12–24h
- Fluticasone (inhaled): 1–2 puffs q12–24h
- Methylprednisolone acetate: 5–15 mg IM q3–4wk as needed
- Prednisolone: 2.5–5 mg/cat PO q24–48h

### NSAIDs
- Meloxicam: 0.025–0.1 mg/kg PO q48–72h
- Piroxicam: 0.3 mg/kg PO q48h

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\(^c\) Treatment of choice for *Bordetella bronchiseptica*, *Chlamydia felis*, and *Mycoplasma* spp.
tion in cats generally results in only mild conjunctivitis, is easily treated with antibiotics, has variable prevalence rates, and is of minimal zoonotic risk, it has been questioned whether C. felis vaccination is ever necessary in the United States.\textsuperscript{32} The duration of immunity for *Chlamydocephila* vaccines may be short-lived, so high-risk cats, such as those in multicat environments or environments with a history of chlamydial infection, should be immunized before a potential exposure.

**Viral Agents**

**Diagnosis**

The viruses most commonly associated with feline respiratory disease are feline calicivirus (FCV) and feline herpesvirus-1 (FHV-1). Both viruses are extremely common in cats, particularly animals from crowded environments such as pet stores, catteries, and shelters.\textsuperscript{1,2}

Many strains of FCV exist, and mutations resulting in new strains are common. FCV is a common diagnostic differential for cats with clinical evidence of rhinitis, stomatitis, oral ulceration, and conjunctivitis. Less commonly, FCV is associated with polyarthritis, lower airway disease in kittens, and virulent systemic disease.\textsuperscript{33} Some variants of FCV are thought to induce systemic vasculitis in cats (virulent systemic calicivirus [VS-FCV]), and clinical signs can be severe even in cats previously vaccinated with FVRCP vaccines.\textsuperscript{34–38} VS-FCV strains arise spontaneously from endogenous FCV strains, and outbreaks have resolved quickly after the initial cases are recognized. It is not known how often these outbreaks occur and whether they are increasing. The VS-FCV strains evaluated to date have been genetically and antigenically diverse.\textsuperscript{39,40} Virus isolation can be used to document current infection but takes at least several days and is not performed by all laboratories.

Because of widespread exposure to and vaccination against FCV, the PPV of serologic tests is poor. Reverse transcriptase (RT) PCR assays can be used to amplify FCV RNA, and results can be returned quickly. However, these assays also have poor PPV because they amplify FCV RNA from samples collected from healthy carrier cats. False-negative results are possible, so the assays can also have poor negative predictive value (NPV). In addition, the assays cannot be used to prove VS-FCV infection.\textsuperscript{52} Treatment does not eliminate FCV infection, so there is no benefit to follow-up culture or RT-PCR testing.

FHV-1 is a common diagnostic differential for cats with clinical evidence of rhinitis, stomatitis, conjunctivitis, keratitis, and facial dermatitis. Because of widespread exposure and vaccination, the PPV of serologic tests is poor. FHV-1 infection can be documented by direct fluorescent staining of conjunctival scrapings, virus isolation, or PCR.\textsuperscript{41} FHV-1 DNA can be amplified from conjunctival cells of approximately 20% of healthy cats, making the PPV of PCR assay for this agent low.\textsuperscript{42} Current PCR assays also detect vaccine strains of FHV-1, further lessening the PPV.\textsuperscript{43} Quantitative PCR may ultimately prove to correlate with the presence or absence of disease but failed to correlate with the presence of conjunctivitis in one small study in our laboratory.\textsuperscript{50} The NPV of the FHV-1 PCR assays is also in question because many cats that are likely to have FHV-1–associated disease have negative results. This may relate to clearance of FHV-1 DNA from tissues by the immune reaction. Results from tissue biopsy samples have greater sensitivity than those from conjunctival swabs but do not necessarily have greater predictive value.\textsuperscript{44} FHV-1 DNA can be amplified from the aqueous humor of some cats, but whether this indicates FHV-1–associated uveitis is not known.\textsuperscript{45} Treatment does not eliminate FHV-1 infection, so there is no benefit to follow-up culture or PCR testing.

**Treatment**

Therapy for FCV consists mainly of supportive care, especially for cats with VS-FCV infections, and may include IV fluids, antibiotics for concurrent bacterial infections, and interferon. Interferon may augment immune responses to viral infections by upregulating key cytokines.\textsuperscript{46} Feline interferon-α inhibits FCV replication in vitro, but results of controlled studies evaluating its efficacy in clinically affected cats with respiratory disease are not available. If human interferon-α is to be used systemically for cats with life-threatening FCV or FHV-1 infections, it can be administered safely at a dosage of 10,000 U/kg SC daily, but controlled data concerning its efficacy are not available. Recently, interferon therapy has been used to improve the quality of life of cats with FeLV and FIV infections.\textsuperscript{7} In one study, low-dose oral interferon therapy (30 U/kg PO daily) improved the quality of life for cats with FIV infections.\textsuperscript{48} The effect of oral interferon is thought to be from mediation of inflammatory cytokines. Oral interferon may also have effects against chronic FHV-1 or FCV infections, but controlled data are not available. Anecdotally, topical administration of interferon-α in saline to the eyes or nose has been recommended by some veterinarians as an aid in the management of some cats with acute or chronic FHV-1 or FCV infection.

Antiviral drugs have recently become more popular in the management of cats with acute or chronic FHV-1 infection. Available antiviral medications are only efficacious against DNA viruses (e.g., FHV-1), not RNA viruses (e.g., FCV), because they interfere with viral DNA synthesis and thus viral replication. Acyclovir and valacyclovir have been
administered to some cats, but they can induce bone marrow suppression and are minimally effective against FHV-1; therefore, they should not be used to treat FHV-1 infection.\(^5^9,5^0\) Famcyclovir is safe and effective and is being used for acute and long-term therapy for cats with FHV-1 infection. Famcyclovir has been used with apparent clinical efficacy at \(\frac{1}{2}\) tablet (62.5 mg) q12h for 14 days.\(^5^3\) However, recent pharmacokinetic studies indicate that higher doses may be needed to have activity against FHV-1.\(^5^2\) Idoxuridine and trifluridine have been used topically in cats with conjunctivitis or keratitis from FHV-1 infection but must be administered multiple times per day and are irritating. Recently, cidofovir was shown to lessen clinical signs and FHV-1 shedding in a small, experimental FHV-1 conjunctivitis study.\(^5^3\) Lysine (250 to 500 mg PO bid) may be helpful in some cats with acute or chronic rhinosinusitis due to FHV-1 infection.\(^5^4\) However, in a controlled study of cats fed a lysine-fortified diet, a significant positive effect was not noted.\(^5^5\)

Administration of intranasal modified live FHV-1 and FCV vaccines may lessen disease in some chronically infected cats, but controlled data are lacking. If a cat with chronic disease responds positively to intranasal vaccination, this form of immunotherapy can be administered up to three times per year. The intranasal FVRCP vaccine has been shown to potentiate cell-mediated immunity to FHV-1 better than the parenteral vaccine.\(^5^6\) Long-term administration of one commercially available probiotic (FortiFlora, Nestlé Purina PetCare) was shown to enhance T-helper lymphocyte numbers in cats.\(^5^7\) When cats with chronic FHV-1 infections were given this probiotic and then subjected to mild stress, improved conjunctivitis scores were noted in some cats.\(^5^8\) The section on chronic rhinosinusitis presents other nonspecific therapies for FHV-1 infection.

### Prevention

Specific pathogen free (SPF) cats inoculated with one dose of the intranasal modified live FVRCP vaccine had significantly fewer clinical signs than control cats when challenged with virulent FHV-1 as soon as 4 days after vaccination.\(^5^9\) Administration of the intranasal FVRCP vaccine was also shown to induce FCV antibody responses in SPF kittens more quickly than a parenteral modified live FVRCP vaccine.\(^6^0\) Thus, the intranasal route of administration may be preferred for the primary or booster immunization of kittens housed in environments with high risk for exposure to FHV-1 or FCV (e.g., shelters, humane societies, catteries, boarding facilities, multiscat households). However, administration of intranasal vaccines that contain FHV-1 and FCV can induce transient, mild sneezing or coughing; therefore, owners should be informed of these potential effects. These effects may also influence the case management of kittens housed in shelters or humane societies. Subcutaneous vaccines are recommended if concerns about respiratory effects of intranasal vaccines exist. The currently recommended US and European FVRCP vaccination intervals are yearly for cats in high-risk environments (shelters, catteries, multiscat households) and every 3 years for cats in low-risk environments (indoors-only with no contact with other cats).\(^2^8,3^3,4^1\)

An inactivated, VS-FCV–containing vaccine line is available (Calcivax, Fort Dodge Animal Health). The product contains a routine FCV vaccine strain (strain 255) as well as a VS-FCV strain. To date, the only challenge data are from small numbers of cats that were challenged with the homologous strain shortly after the last booster. However, cross-neutralization studies show that cats inoculated with more than one FCV strain inactivate more FCV strains in vitro than cats inoculated with one FCV strain.\(^5^1,5^2\) Thus, even if this vaccine antigen does not protect against other VS-FCV strains, it may induce superior cross protection against other FCV strains. The AAFP recently posted an information brief that reviewed the current information about this vaccine on its Web site (catvets.com).

### Fungal Agents

*Cryptococcus neoformans* and *Aspergillus* spp are the most common causes of fungal respiratory infection in cats.\(^6^3,6^4\)

### Cryptococcus neoformans

Cryptococcosis is the most common systemic fungal infection of cats and should be considered a diagnostic differential for cats with respiratory tract disease, subcutaneous nodules, lymphadenopathy, intraocular inflammation, fever, and central nervous system disease.\(^6^5\) Infected cats range from 6 months to 16 years of age, and male cats are overrepresented in some studies.\(^6^4\) Infection of the nasal cavity is most frequently reported and commonly results in sneezing and nasal discharge. The nasal discharge can be unilateral or bilateral, ranges from serous to mucopurulent, and often contains blood. Granulomatous lesions extruding from the external nares, facial deformity over the bridge of the nose, and ulcerative lesions on the nasal planum are common. Submandibular lymphadenopathy is detected in most cats with rhinitis. Definitive diagnosis of cryptococcosis is based on antigen testing or cytologic, histopathologic, or culture results.

Cats with cryptococcosis have been treated with amphotericin B, ketoconazole, itraconazole, fluconazole, and 5-fluorocytosine alone and in varying combinations. Responses have varied between studies, but good to excellent treatment responses are often achieved in cats given fluconazole.
A conservative approach would be to increase the dose 1 to 2 months past resolution of clinical disease or until Wednesday–Friday schedule until a cumulative dose of 12 mg/kg has been reached.68

If the infection is life-threatening or does not respond to or itraconazole,65,66 Because of toxicity and the availability of more efficacious drugs, we no longer recommend ketoconazole. Fluconazole (50 mg/cat once to twice daily) is recommended because it has the fewest adverse effects, the best penetration (of the azoles) across the blood–brain and blood–ocular barriers, and good efficacy.66,67

If the infection is life-threatening or does not respond to an azole, amphotericin B should be used.65 A typical deoxycholate amphotericin B protocol involves IV infusions on a Monday–Wednesday–Friday schedule until a cumulative dose of 16 mg/kg has reached. Nephrotoxicity is the adverse effect of most concern. An initial infusion dose of 0.1 mg/kg is used as a test dose; the dose can then be slowly increased to 0.5 mg/kg if well tolerated clinically and if renal values remain stable.68,69 1 (J. Q.) recommend checking renal values before each infusion, at least initially. A conservative approach would be to increase the dose 0.1 mg/kg/week; however, if renal values are stable, an increase of 0.1 mg/kg every other infusion may be considered. Once the plateau has been reached, renal values should be checked at least weekly. A successful subcutaneous protocol has also been described in which 0.5 to 0.8 mg/kg of amphotericin B is added to 0.45% saline/2.5% dextrose to a total volume of 400 mL, which is given over two to three times weekly to a cumulative dose of 8 to 26 mg/kg.66,69 Amphotericin B is also available in a liposomal formulation. It is thought that less nephrotoxicity is seen with the liposomal product. The recommended dose regimen for liposomal amphotericin B is 1.0 mg/kg IV on a Monday–Wednesday–Friday schedule until a cumulative dose of 12 mg/kg has been reached.68

Focal nasal and cutaneous cryptococcosis generally resolves with treatment; central nervous system, ocular, and disseminated diseases are less likely to respond to treatment.66,67 Treatment should be continued for at least 1 to 2 months past resolution of clinical disease or until antigen titers are negative.66,70 People and animals can have the same environmental exposure to Cryptococcus spp, but zoonotic transfer from contact with infected animals is unlikely.

Aspergillus spp

Aspergillosis is less common than cryptococcosis but can be equally devastating.65,71,72 Clinical signs of mild disease are similar to those of nasal cryptococcosis. Sino-orbital aspergillosis was recently described in cats and appears to be more aggressive than canine aspergillosis, involving invasion into surrounding structures.65 Ocular involvement (e.g., exophthalmos, ocular discharge) can be seen in addition to nasal signs. The diagnosis of aspergillosis is based on visualization of fungal plaques on rhinoscopy or fungal hyphae on cytology or biopsy. Infection can be caused by either Aspergillus or Penicillium spp, which can be difficult to differentiate cytologically. Fungal culture seems less sensitive and specific than visual identification.72 Therapy with oral itraconazole and fluconazole has been documented as 50% to 60% efficacious;73,74 better efficacy with nasal clotrimazole therapy has been reported in a few cases.71

Chronic Rhinosinusitis

The histopathologic diagnoses of lymphocytic–plasmacytic, eosinophilic, and idiopathic rhinosinusitis are collectively referred to as chronic rhinosinusitis. In many cases, this is a diagnosis of exclusion. This syndrome is one of the most significant causes of sneezing and nasal discharge in cats.75 The nasal discharge is usually serous, but secondary bacterial infections can result in mucopurulent nasal discharge, and inflammation can be severe enough to cause intermittent hemorrhage.75 The clinical signs may exist for years. Cats with relatively stable disease that suddenly changes in severity should be reevaluated for the presence of a more severe secondary disease such as fungal rhinitis or neoplasia.

A subset of cats with chronic rhinosinusitis have a history of acute FHV-1 or FCV viral upper respiratory infection at a younger age, and it is postulated that an early, severe viral infection may trigger chronic disease.6 In addition, it is estimated that approximately 80% of all cats have a latent FHV-1 infection,76 and another possible etiology for chronic viral rhinosinusitis is recrudescence of a latent FHV-1 viral infection, triggered by a stressful event. Cats with chronic viral rhinosinusitis and a history of viral infection are often treated with therapies such as lysine, antiviral drugs, and immunomodulators, as described under Viral Agents above. Subjective improvement in clinical signs has been noted in response to immunomodulatory therapy with cationic
liposome DNA complexes in a small pilot study under way at Colorado State University as well as in a previously published study.33 Stress is thought to play a role in the clinical severity and recurrence of chronic viral rhinosinusitis, particularly if latent FHV-1 or chronic FCV infection is involved. Environmental measures to decrease stress, allocation of resources in multicat households, and antianxiety therapies such as feline facial pheromone (Feliway, Ceva Animal Health, Manchester, MO) may provide some benefit. Although controversial, immunosuppressive therapy in these patients may not be beneficial and runs the risk of exacerbating viral and bacterial components of the disease syndrome.

Many cats with chronic rhinosinusitis have no history of viral infection or any other predisposing cause. Generally, idiopathic chronic rhinosinusitis is somewhat refractory to treatment, and palliation of clinical signs, rather than cure, is the goal of medical management. Broad-spectrum antibiotics are often prescribed to manage secondary infections. Administration of antihistamines like chlorpheniramine (1 to 2 mg PO q12h) may lessen clinical signs of disease in some cats. Several other antihistamines are available (box 1), and because response to therapy varies from patient to patient, an alternative drug should be tried if no improvement is seen. Moistening therapies such as nebulization and saline drops can help loosen secretions and soothe mucosa, particularly in drier climates.

The role of immunosuppressive drugs as therapeutic agents in the treatment of chronic idiopathic rhinosinusitis is poorly understood, likely because the condition is multifactorial. Individual patients respond variably to this approach. Prednisolone should be used in cats rather than prednisone; 1 to 2 mg/kg PO q12h is the maximum dose. If a positive response is noted, the lowest dose and the longest interval that are effective should be determined by adjusting the dose over time. Inhaled glucocorticoids can be used as an alternative to decrease the adverse systemic effects of oral glucocorticoids and have the benefit of directly affecting the nasal mucosa. Beclomethasone or fluticasone can be administered via inhalation chamber (1 to 2 puffs once to twice daily). Resistant cases may respond to administration of cyclosporine (up to 7.5 mg/kg PO daily or every other day), but controlled data are lacking. Trough blood levels should be checked 2 weeks after starting cyclosporine to make sure that excessive blood levels are not reached, which may activate infectious diseases.

Nasopharyngeal Polyps
Nasopharyngeal polyps are nonneoplastic, inflammatory nodules that are most common in young cats. They originate in the middle ear or auditory canal and grow out through the nasopharynx (or, occasionally, the tympanum).74,75 The etiology is unknown, but because most affected cats are young, some authors have postulated that these polyps are congenital.74 The possible association of polyps with infectious agents, including FHV-1, FCV, C. felis, and Mycoplasma and Bartonella spp,79,80 has been explored, but to date, no organism has been definitively proven to be a cause. Large polyps can be detected by palpation through the soft palate, and otic examination may reveal discoloration or bulging of the tympanum. When polyps extend into the nasopharynx, they disrupt the normal flow of secretions, resulting in secondary bacterial infections, mucopurulent nasal discharge, stertorous breathing, and gagging. Signs of middle ear involvement (e.g., Horner’s syndrome, head tilt) can also be seen. The diagnosis can be confirmed with a dental mirror and spay hook or rhinoscope as described in the companion article. A bulla series or computed tomography (CT) should be conducted to determine if the bulla is involved. If there is no evidence of clinical disease associated with the middle ear and the polyp can be removed from the mouth, many clinicians remove the polyp via traction and wait for a recurrence before performing a bulla osteotomy because of the high incidence of morbidity associated with bulla osteotomy.76,79 Without bulla osteotomy, approximately 30% of polyps will recur.79 Combining removal by traction with a course of glucocorticoids (1 to 2 mg/kg/day for 14 days, then tapered over 2 weeks) may decrease recurrence.84 Bulla osteotomy is an effective surgical treatment, and when it is performed at initial presentation or recurrence, almost all cases experience complete resolution.70,79,82

Neoplasia
Nasal neoplasia is rare in cats compared with dogs. Lymphoma is the most common tumor type, followed by adenocarcinoma and squamous cell carcinoma.73,83,84 Lymphoma is treated with chemotherapy, often in conjunction with radiation therapy, and has the potential for a good long-term prognosis.85 Palliative radiation therapy is indicated for other nasal neoplasms; surgical debulking is generally not required.86 The prognosis depends on the aggressiveness and extent of the tumor, which are best determined by CT. Piroxicam (0.3 mg/kg PO q48–72h) can control inflammation and clinical signs of disease in some cats with nonlymphoproliferative nasal neoplasia. Meloxicam (0.1 mg/kg PO every other day) may also be efficacious. However, neither NSAID may have antitumor effects against squamous cell
carcinoma, as this cancer type expresses minimal amounts of COX-2 in cats.87 If NSAID therapy is used, the cat should be monitored for adverse renal and gastrointestinal effects, including packed cell volume measurements to assess for gastrointestinal hemorrhage.

**Foreign Body**
Nasal foreign bodies are more common in cats than many realize.75,88 In dogs, foreign material is usually inspired into the anterior nares and is found in the ventral meatus just caudal to the nares. In cats, most nasal foreign bodies are composed of plant material that lodges above the soft palate after coughing or vomiting. Clinical signs may include sneezing, reverse sneezing, gagging, and repeated attempts at swallowing. Retroflex rhinoscopic examination of the nasopharynx can sometimes confirm diagnosis and aid in removal. Nasal lavage is often more effective. The cuff of the endotracheal tube should be checked for full inflation before nasal lavage is performed with saline administered under pressure. In cats, we recommend lavaging from the anterior nares caudally. Gauze should be placed in the oropharyngeal area, and a 20-, 35-, or 60-mL syringe can be used to forcefully flush saline through the nose while the nares are pinched off to create pressure. Material flushed from the nose or oropharynx should be caught on the gauze and examined.

**Nasopharyngeal Stenosis**
Nasopharyngeal stenosis is a rare condition that involves narrowing of the choanae to the extent that little air is able to pass. Stenosis may be a result of chronic infection or aspiration rhinitis, or it may be present at birth.73,89 The typical clinical signs include stertorous, labored breathing; nasal discharge is less common. The diagnosis is determined by retroflex rhinoscopic assessment of the nasopharynx. Previously, manual dilation and/or advanced surgical procedures combined with steroid therapy were the only therapeutic options, and recurrence was common.75 More recently, stenting of the nasopharynx has been described as a successful palliative measure.20

**Conclusion**
Clinical signs of acute and chronic upper respiratory disease are common in cats. The diagnostic differentials include viral, bacterial, and fungal infections; chronic rhinosinusitis; foreign bodies; tooth root disease; neoplasia; inflammatory polyps; nasopharyngeal stenosis; and trauma. When a cat presents with clinical signs of upper respiratory disease, particularly chronic signs, a complete diagnostic workup is important to determine the etiology. Diagnosis is important so that an appropriate treatment regimen can be implemented and maximal response to therapy obtained.

**References**


88. Riley P. Nasopharyngeal grass foreign body in eight cats. JAVMA 1993;202:299-300.


1. Which statement regarding nasal bacterial infections in cats is true?
   a. Only nasal biopsy samples are suitable for culture.
   b. Positive culture results may represent normal flora.
   c. Primary infections are common.
   d. The associated nasal discharge is usually serosanguineous.

2. Which statement regarding B. bronchiseptica in cats is true?
   a. PCR is superior to culture for diagnosis.
   b. B. bronchiseptica can be isolated from many healthy cats.
   c. Elimination after treatment can be confirmed with PCR.
   d. B. bronchiseptica is a well-defined primary pathogen in cats.

3. Which statement regarding C. felis in cats is false?
   a. It is a common diagnostic differential for conjunctivitis and rhinitis.
   b. Culture is the ideal method of detection.
   c. It is important to gather adequate material by swab for analysis.
   d. Elimination after treatment can be confirmed with PCR.

4. Which statement regarding treatment of bacterial agents in cats is true?
   a. Seven to 10 days of treatment is effective for all organisms associated with acute illness.
   b. Topical tetracycline is superior to doxycycline for C. felis.
   c. Esophageal strictures have been associated with administration of enrofloxacacin tablets.
   d. If antibiotic therapy fails, a workup for an underlying condition should be performed.

5. Which statement regarding virulent systemic calicivirus is true?
   a. The associated illness can be effectively treated with famcyclovir.
   b. Clinical signs can be severe even in adults previously vaccinated against conventional FCV.
   c. It is thought to primarily induce multiple organ failure.
   d. It is a single mutated strain of FCV.

6. Which statement regarding viral therapy is true?
   a. Antiviral medications are efficacious against FHV-1 and FCV.
   b. Interferon strengthens the immune response to viral infections by upregulating key cytokines.
   c. Lysine is efficacious against FHV-1 and FCV.
   d. Aycinlovir is safe and effective and currently being used to treat FHV-1 infections.

7. Which statement regarding fungal disease is true?
   a. Aspergillosis is the most common systemic fungal infection in cats.
   b. Cryptococcosis is diagnosed by antibody assay or identification of organisms.
   c. Hepatotoxicity is the most important adverse effect associated with amphotericin B.
   d. Fluconazole has the best penetration of the blood–brain and blood–ocular barriers.

8. Nasopharyngeal polyps
   a. are most common in older cats.
   b. may involve the middle ear and cause Horner’s syndrome.
   c. are commonly associated with Bartonella spp infection.
   d. recur in 60% of cases after removal by traction alone.

9. Which statement regarding nasal neoplasia in cats is false?
   a. Nasal lymphoma is treated with chemotherapy, often in conjunction with radiation therapy.
   b. NSAIDs are safe and effective for palliation of all nasal tumors.
   c. CT is the best method of determining the invasiveness of a nasal tumor.
   d. Feline squamous cell carcinoma is associated with minimal expression of COX-2.

10. Which statement regarding nasal foreign bodies in cats is false?
    a. Most foreign material is inspired into the anterior nares and is found in the ventral meatus just caudal to the nares.
    b. Sneezing, gagging, and attempted swallowing are common signs.
    c. Retroflex rhinoscopy allows visualization of the nasopharynx.
    d. Nasal lavage is often effective for removal.