

## Prevalence of systemic disorders in cats with oral lesions

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**ABSTRACT:** Oral disorders of small animals constitute a problem for veterinarians. Chronic oral infections are commonly seen in domestic cats. The objectives of this study were to characterise feline oral lesions, common feline dental problems, and especially the association of oral disease and systemic disease in cats. Two hundred and twenty cats referred over a period of 33 months to the Internal Medicine Department of our University with signs of oral disorders were included in this prospective study and were examined for the occurrence of the most commonly seen diseases. Infectious diseases which frequently cause ulcers and/or erosions within the mouth and on the tongue, constituted a significant proportion of the cases identified in this study. Feline Coronavirus (FCoV) infection was diagnosed in 36 cats (16%), Feline Calicivirus (FCV) in 17 cats (8%) and 16 cats (7%) had three viral infections (FCoV + Feline Immunodeficiency Virus (FIV) + Feline Leukemia Virus (FeLV)) at the same time. We conclude that oral disorders may be a sign of underlying systemic diseases in cats, especially in those diagnosed with feline viral infections. Other diagnosed diseases included immune-mediated disorders, eosinophilic granuloma complex, gastrointestinal system disorders, nutritional disorders, diabetes mellitus, hepatic disorders and chronic renal failure. Therefore, the first step in preventing oral disease in animals must be routine physical examination which includes a comprehensive oral exam.

**Keywords:** oral disorders; systemic diseases; cats; feline

When evaluating atypical oral lesions, veterinarians should consider the possibility of underlying systemic diseases, as such lesions may develop as a consequence of underlying systemic disease, in particular chronic renal failure, leucopenia and immune disorders as a secondary reaction to feline viral infections and diabetes mellitus (Arzi et al. 2008).

Pathological findings in the oral cavity are often overlooked and are taken to be symptoms of recurrent oral diseases. At this point differential diagnostic considerations become important (Tenorio et al. 1991). Oral diseases in cats are very common (Verhaert and Wetter 2004), and severe inflammation of the oral cavity is often seen in feline patients. Geriatric, immunocompromised cats or animals suffering from chronic systemic diseases have difficulty in fighting these diseases (Tenorio

et al. 1991). The majority of studies examining the relationship between oral infections and systemic diseases are concerned with periodontal diseases. A large number of studies suggest that oral infections, especially periodontitis, are a potential contributing factor to a variety of clinically important systemic diseases (Watson 1994). Abnormalities in the immune system alter a patient's response and lead to opportunistic infections, which contribute to gingivostomatitis (Tenorio et al. 1991). Feline chronic gingivostomatitis (FCGS) is a disease commonly seen in adult cats, and it is characterised by persistent chronic inflammation involving the mucogingival tissues (Li et al. 2000; Wilson 2005). The aetiology of the disease is currently unknown. Bacterial, viral and immunological causes are being investigated, namely plaques, bacteria, calicivirus, herpes, coronavirus, *Hemobartonella henselae*, fe-

line leukemia virus (FeLV), Feline Immunodeficiency Virus (FIV) and immune reactions (Watson 1994). An accurate and rapid diagnosis depends on a complete clinical history and an oral and physical examination (Arzi et al. 2008). When evaluating oral lesions, a systemic approach should be followed to identify and treat concurrent disease processes.

## MATERIAL AND METHODS

Two hundred and twenty client-owned cats of different breeds, ages and of both sexes were presented to the Department of Internal Medicine, Faculty of Veterinary Medicine of Istanbul University, and were included in this study which ran from October 2011 to September 2014. The cats were of different ages; 53 cats were one year old or younger, and 45 cats were more than one to less than or equal three years. One hundred and twenty-two cats were more than three to less than or equal 15 years old. The age range of the cats is given in Table 1. Cats diagnosed with one or more clinical oral symptoms (anorexia, ptyalism, dysphagia, halitosis, oral ulceration, pain on opening the oral cavity) were included in this study. Breeds in the sample group included one hundred and forty-seven mixed breed (67%), 34 Persian (15%), 17 Scottish fold (8%), 11 Siamese (5%), eight Angora (4%) and three Turkish Van (1%) cats. The cats' vaccination history was determined prior to their inclusion in the study. Thirty-two percent of cats had an appropriate vaccination history, while 57% had no vaccination history. Cats with a deficient vaccination history were also identified.

The investigation included the retrieval of a detailed history and a physical examination. Comprehensive oral examinations of cats were carried out after the general physical examination. Some of the cats displayed signs of pain during the clinical examination. Most cats exhibited dysphagia, ptyalism and aggression during the oral examination. The cats with severe oral lesions also had

enlarged mandibular lymph nodes. Blood samples were collected from each cat by jugular or cephalic venipuncture. Complete blood count (CBC), blood serum biochemistry including blood serum glucose, blood urea nitrogen (BUN), creatinine, alanine transaminase (ALT), aspartate aminotransferase (AST) was investigated in all patients. For an accurate diagnosis more detailed analyses were carried out for some cats (urine analysis, urine protein/creatinine ratio, alkaline phosphatase (ALP), total bilirubin (T. Bil.), calcium (Ca) and phosphorus (P)). All cats without a vaccination history and that exhibited specific oral mucosal lesions like gingivitis, gingival-mucosal ulcerations, exudation and periodontitis were tested for feline viral infections. These tests were performed with rapid test kits (FeLV/FIV IC and feline coronavirus (FeCoV), FeCoV IC, Agrolabo s.p.A.) in the faculty's central laboratory.

## RESULTS

Among the 220 cats included in the study, 137 (62%) were male and 83 (38%) were female. The age range of the cats is given in Table 1. Fifty-three cats (24%) were one year old or younger. A wide variety of pathologies was found in the oral cavity. The following oral problems were identified; gingivitis, periodontitis, gingivostomatitis, glossitis, mucosal ulcers, angular cheilitis, halitosis and ptyalism. A cat diagnosed with FCV had a profound ulceration on the tongue (Figure 1).



Figure 1. Gingivitis, caries and oral ulceration on the tongue of 1.5-year-old cat diagnosed with FCV

Table 1. Age range of the cats

Age range (years)	Number of cats
≤ 1	53
> 1 ≤ 3	45
> 3 ≤ 6	36
> 6 ≤ 10	64
> 10 ≤ 15	22

doi: 10.17221/8823-VETMED



Figure 2. A 4.5-year-old male cat, diagnosed with FIV, exhibiting gingivitis, periodontitis and dental plaques; leucocytosis was also found

The most frequent clinical findings were gingivitis (70%), periodontitis (60%), ptyalism (100%), mucosal ulcers (80%) and halitosis (90%). Mandibular lymph nodes were palpably enlarged in 132 (60%) of the 220 cats. Many systemic diseases were detected. They are listed in Table 2. One hundred and fifty-four cats (70%) had single or multiple feline viral infections. Sixty-six cats (30%) showed different kinds of abnormalities: immune-mediated disorders, eosinophilic granuloma complex, gastrointestinal system disorders, nutritional disorders, diabetes mellitus, hepatic disorders and chronic renal failure.

Table 2. Classification and prevalence of the systemic diseases in cats

Diseases	Number of cats	Prevalence (%)
Feline Coronavirus (FCoV)	36	16
FIV	18	8
FeLV	16	7
Feline Calicivirus (FCV)	17	8
Feline herpesviral rhinotracheitis	11	5
FIV + FCoV	19	9
FIV + FeLV	21	10
FIV + FeLV + FCoV	16	7
Immune-mediated disorders	11	5
Eosinophilic granuloma complex	5	2
Gastrointestinal system disorders	10	5
Nutritional disorders	4	2
Diabetes mellitus	6	3
Hepatic disorders	12	5
Chronic renal failure (CRF)	18	8



Figure 3. A 4-year-old male mixed-breed cat diagnosed with EGC with marked oral bleeding and periodontitis showed discomfort during the oral examination

## DISCUSSION

A detailed history allows the veterinarian to make a descriptive examination of the cat's lifestyle and facilitates identification of causative factors of recurrent oral diseases. Critical points include diet, age, onset of clinical symptoms, environmental hazards, chronic illnesses, other systemic illnesses, vaccination and exposure to other pets (Tenorio et al. 1991). In our study, we collected detailed information from every cat owner regarding the above aspects. A thorough physical examination was performed to evaluate patients with oral mucosal lesions. A complete laboratory analysis is valuable and facilitates a correct diagnosis. It should include a complete blood count (for detection of persistent neutropenia), serum chemistry profiles (to detect diabetes, azotemia), thyroid hormone profiles, faecal profiles, toxoplasmosis, as well as evaluation of malabsorption and/or maldigestion, viral profiles, immune profiles, and serum protein electrophoresis (Tenorio et al. 1991). In our study, laboratory tests (CBC, blood serum biochemistry – blood serum glucose, BUN, creatinine, ALT, AST) and rapid tests for feline viral infections were carried out to come to the right diagnosis. White blood cell counts (WBC) were in the normal ranges in 68 (31%) patients with values between  $5.5\text{--}17 \times 10^3/\mu\text{l}$ . One hundred and thirty-five (61%) cats had



leucopenia ( $1.7\text{--}5.0 \times 10^3/\mu\text{l}$ ) and seventeen (8%) were revealed to have leucocytosis ( $19\text{--}42 \times 10^3/\mu\text{l}$ ).

Oral infections are usually associated with various microbes that invade the tissues for unknown reasons. Viral diseases such as FeLV, FIV, FIP, FCV, herpes virus and panleukopenia virus give rise to signs of oral inflammation. Calicivirus and Herpes 1 virus have been seen in cats with gingivostomatitis (Cave et al. 2012). Feline calicivirus causes oral vesicular disease and chronic stomatitis (Poulet et al. 2000). In our study, pyalism incidence increased with the severity of the oral disorders.

FIV-infected cats can show signs of oral inflammation. FCV and FeLV infections tend to occur early in life, while FIV infections are usually seen in older animals (Watson 1994). In our study, the cats diagnosed with FIV were older than seven years. It is not clear whether FIV plays a direct role or whether, like FeLV, it may precipitate gingivitis by its deleterious effect on the immune system (Arzi et al. 2008). FeLV and FIV infections, which have been associated with oral cavity diseases in cats, are believed to have a systemic immunosuppressive effect that allows opportunistic invasion of the oral cavity by other microbes (Kinane and Marshall 2001).

Oral tissues are often a sensitive measure of immunodeficiency. Cats infected solely with FIV had a significantly higher rate of oral disease and more severe oral cavity lesions (Figure 2). FeLV and/or FCV infections synergised with FIV to enhance the severity of oral cavity diseases. The cats diagnosed with combined viral infections in our study had severe oral lesions and deep ulcerations. FIV infection may play a role in promoting oral lesions by predisposing the cats to secondary infections (Tenorio et al. 1991; Arzi et al. 2008). The higher prevalence of retroviral infections in cats with oral disease indicates that almost one in every seven cats with an oral disease has a retroviral infection. Interestingly, oral disease in people has been cited as an early indicator of HIV infection (Lyon 2005). In our study, 70% of cats were diagnosed with single or multiple feline viral infections. There are many outdoor cats in Turkey and that may be a contributing factor to the spread of feline viral infections. Eighty-five (39%) cats in this study were adopted. Thirty-one (14%) of the 220 cats had severe gingivitis and periodontal disease. These were outdoor cats, and were in a multi-cat household.

Nutritional disorders may also contribute to oral disorders in cats (Tenorio et al 1991). In this study,

cats with oral lesions caused by nutritional disorders were fed with home-made and/or canned food. A stray cat's inability to maintain a balanced diet may be due to a lack of appropriate vitamins. Vitamin A is essential for normal immune function, epithelisation and wound healing. B-complex and cobalamin are essential for WBC function, antibody formation and bacterial resistance. Many other vitamins (Vitamin D, thiamine, riboflavin, copper, cadmium, zinc) are important for cellular and epithelial repair of oral lesions (Verstraete and Lommer 2012).

Meticulous oral examination allowed us to document the changes in the oral mucosa, which was icteric in cats with hepatic disorders. Blood serum biochemistry revealed elevated liver enzymes (ALT, AST, ALP, gamma glutamyl transferase (GGT)), while bilirubin levels were elevated in blood and urine. High liver enzyme concentrations can be secondary to hepatic lipidosis. In our study, nine cats were diagnosed with hepatic lipidosis and three with cholangiohepatitis. Seven of the nine cats with hepatic lipidosis died after treatment had begun. All responded to the treatment with resolution of disease.

Renal diseases are usually accompanied by uraemia, which can be a cause of ulcers inside the oral cavity. In our study, 18 patients were diagnosed with chronic renal failure. Azotaemia was attributable to prerenal causes and primary renal failure. Cats suffering from this condition have uremic breath, chronic ulcers in the oral cavity and a show a marked lack of appetite (Ross et al. 2006). In dogs, post-mortem examinations have revealed a correlation between periodontal disease and a variety of degenerative and inflammatory diseases in the liver, kidney, and left AV heart valves. In another retrospective cohort study in dogs, the risk of azotaemia increased with increased severity of periodontitis (Cave et al. 2012). Oral mucosal lesions became more severe with elevated BUN and creatinine levels. Additional blood parameters were analysed to diagnose the type of renal failure (blood serum phosphorus, total protein, albumin, urine analysis and urine protein/creatinine ratio).

Periodontal disease is commonly seen in older animals because they have low immunity and their organ systems, especially the heart, lungs, and kidneys, can be easily affected (Watson 1994; Brook 2008). In our study, periodontitis was commonly seen in cats with diabetes mellitus. The clinical

doi: 10.17221/8823-VETMED

findings were consistent with the existing veterinary literature. Six cats were diagnosed with diabetes mellitus.

Five cats were diagnosed with eosinophilic granuloma complex (EGC). Eosinophilic ulcers were also detected: three cats had lesions on the edge of the upper lip, two had lesions towards the front of the lips. Puffy, thickened ulcers were seen on the edge of the cats' lips. Clinical oral mucosal findings were pyralism, halitosis and dysphagia. The cats were in severe pain and oral bleeding occurred during the oral examination (Figure 3). Three cats were anorexic because of the profound oral mucosal lesions. The diagnosis was confirmed by histopathologic examination.

There are numerous systemic diseases that can have an effect on the canine and feline oral cavity. As such, comprehensive oral examinations should be part of every general physical examination of animals. It must be highlighted that oral lesions may very well be a marker of systemic diseases in cats.

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Received: 2015–06–01

Accepted after corrections: 2016–03–01

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