CANINE AND FELINE ORAL TUMORS AND TUMOR-LIKE LESIONS A RETROSPECTIVE STUDY OF 206 CASES (2018 – 2022)

Georgi Popov

University of Forestry, Faculty of Veterinary Medicine, Sofia, Bulgaria
E-mail: gpopov@ltu.bg
ORCID: 0000-0001-6746-3753 G.P.

ABSTRACT

Tumor and tumor-like lesions in the oral cavity of dogs and cats are common in the clinical practice. Their diagnosis requires pathomorphological examination, because of the similar macroscopic appearance. The aim of the present study was to retrospectively analyze tumors and tumor-like lesions of the oral cavity in dogs and cats, and to assess the prevalence, as well as age, sex and breed predisposition. A total of 206 cases of oral cavity lesions (126 dogs; 80 cats) diagnosed cytopathologically and histopathologically between 2018 and 2022 were included. The malignant tumors were predominated in dogs, mainly melanomas and fibrosarcomas. In cats, tumors and tumor-like masses in the oral cavity were of approximately equal prevalence, with lympho-plasmacytic gingivitis and squamous cell carcinomas predominating, respectively.

Key words: dogs, cats, oral lesions, histopathology, retrospective analysis.

Introduction

Tumors and tumor-like lesions in the oral cavity are among the most common pathologies in pet animals. In dogs, oral neoplasias represent about 5% of all tumors (Munday et al., 2017), and about 65% of them are malignant (Vos & Gaag, 1987). In cats, oral tumors range from 6 to 10% of all neoplasias, with approximately 90% of these being malignant (Stebbins et al., 1989). Clinically, animals with neoplastic and neoplastic-like lesions in the oral cavity demonstrate feeding problems, increased salivation, halitosis, pain and discomfort in the mouth area, vomiting (Munday et al., 2017), and in some cases difficulty in breathing (Hunt et al., 2002). Both categories of lesions have similar macroscopic morphological and sometimes clinical appearance, which requires their cyto-pathological and histopathological examination in order to be differentiated. The oral cavity is a sensitive area for clinical interventions in domestic animals and taking biopsy sample is often difficult, especially in aggressive ones. For this reason, when cytological sample should be taken, it is often necessary the animal to be sedated. According to our experience, in cases when the lesions are well defined and the total surgical excision is possible, the owners often prefer the total excision instead of taking sample only, with subsequent cytopathological and histopathological examination, in order to prevent re-anesthetization of the animal.

The cytological findings, obtained by fine-needle aspiration, insertional (non-aspiration), and impression biopsies, are often sufficient and definitive for establishing a diagnosis in various oral lesions (Bonfanti et al., 2015). The histological examination reveals a more precise and detailed diagnosis, reporting the degree, in the case of malignant tumor formations, and predicting the development of the disease, respectively.

Worldwide, there is a significant number of studies that analyze the incidence of specific canine and feline oral lesions (Liptak & Withrow, 2013; Gargner et al., 2015; Wingo, 2018). For Eastern Europe similar researches are quite limited (Mikiewi et al., 2019; Putnová et al., 2020; Öztürk et al., 2022), and in Bulgaria such an analyze is reported by single authors (Dinev et al., 2003).

The aim of the current study was to perform a retrospective analysis, according to age, sex and breed, of the canine and feline oral tumor and tumor-like lesions, diagnosed in the Pathomorphological Laboratory of the Faculty of Veterinary Medicine at the University of Forestry, Sofia, Bulgaria, during the period 2018-2022.

Materials and methods

Retrospective analysis was performed on oral lesion samples from 206 animals. The canine cases were 126, respectively 71 males and 55 females, in the range of 1 to 16 years old. The feline cases were 80, respectively 38 males and 42 females, in the range of 1 to 17 year old.

Cytological examination was performed using the Hemacolor® (Merck, Germany) Rapid Staining method. Samples were processed according to the manufacturer's requirements, firstly dried at room temperature, then passed sequentially through a fixative solution, two color reagents, and a buffer solution.

Histological samples were fixed in 10% buffered neutral formalin solution. The fixed materials were dehydrated in ascending grades of alcohol – 50°, 60°, 70°, 80°, 90°, 96° and absolute alcohol. After dehydration, the samples were cleared in xylene and embedded in paraffin blocks. Sections with thickness of 5 μm were performed with a rotary microtome. The sections were attached to slides by histological glue and again processed with xylene, and then rehydrated by a descending alcohol row - absolute alcohol, 96°, 90°, 80°, 70°, 60°, 50°, and finally were stained with Hematoxylin-Eosin (Bancroft & Gamble, 2008). Microscopic examination and photography were performed with a Levenhuk D740T light microscope with integrated camera.

Results

All of the canine and feline cases were diagnosed in five years period (2018–2022).

Canine lesions

The sex distribution in all canine cases was 56.35% male (71/126) and 43.65% female (55/126). Lesions predominated in mixed-breed animals (Table 1).

Of all examined lesions, 14.29% were tumor-like, in which gingival hyperplasias with an inflammatory component prevailed (7.94% of all lesions and 55.56% of tumor-like). Next in incidence was pyogranuloma, a chronic inflammatory reaction, which represented 3.97% of all cases and 27.78% of tumor-like pathologies. Single cases of pemphigus vulgaris, eosinophilic granuloma, and one periodontal cystic structure were also reported in the current category. Tumor-like lesions were found mainly in dogs with a mean age of 6.68 years, with the range of 1 year to 16 years old. The sex distribution was equal, 9 cases of each gender.

Table 1: Breed distribution of canine cases

Breed	Cases/%
Mixed	41/32.54
Yorkshire terrier	12/9.52
Labrador retriever	8/6.35
Cocker Spaniel	6/4.76
Chihuahua	5/3.97
German shepherd	5/3.97
Golden retriever	5/3.97
Rottweiler	4/3.17
Pit bull	4/3.17
Pug	4/3.17
Boxer	3/2.38
Japanese chin	2/1.59
Spitz	2/1.59
Husky	2/1.59
French Bulldog	2/1.59
Cane Corso	2/1.59
Jack Russell terrier	2/1.59
Maltese dog	2/1.59
Beagle	2/1.59
Other breeds (Alaskan Malamud, English Bulldog, Bull Terrier, Bulgarian Shepherd, Dachshund, Irish Setter, Papillon, Pinscher, Samoyed, Central Asian Shepherd, Hungarian Vizsla, Shih Tzu, Mini Schnauzer)	Single case

Benign tumors were 38.09% of all examined lesions, with the highest incidence of fibromatous epulis (19.84% of all cases and 52.08% of all benign neoplasias). In this type of tumors, 56% (14/25 cases) had bone metaplasia. Next in incidence were fibromas and papillomas, which accounted for 8.73% and 6.35% of all cases and 22.92% and 16.67% of benign tumors, respectively. Single cases of plasmacytoma were identified, and also one of histiocytoma and rhabdomyoma. The range of dogs age was from 1 to 13 years, with the mean age of 6.71 years. Of all benign tumors, around 67% (32/48) were diagnosed in male dogs.

Sixty malignant neoplasias were diagnosed, which corresponded to 47.69% of all lesions. The most common malignant tumors were melanomas, which represented 15.87% of the studied lesions and 33.33% of the malignant ones. Next in incidence were fibrosarcomas and squamous cell carcinomas, which accounted for 13.49% and 9.52% of all cases and 28.33% and 20% of malignant tumors, respectively. Five poorly differentiated tumors and four mastocytomas were diagnosed, corresponding to 3.97% and 3.17% of examined lesions and 8.33% and 6.67% of malignant tumors. One case each of pleomorphic sarcoma and myxosarcoma were also identified. The mean age of animals with malignant neoplasia was 9.73 years, and this type of tumors were diagnosed in dogs from 1 year to 15 years of age. The sex distribution was equal, 30 cases of each gender. Detailed data on the incidence and age distribution of the various oral lesions in dogs are shown in Table 2.

Table 2: Canine tumors and tumor-like lesions

LESIONS	CASES/%	MEAN AGE (RANGE)
Tumor-like lesions /14.29% of all lesions/		
Gingival hyperplasia with an inflammatory reaction	10/7.94	7.2 (1–16)
Chronic inflammatory reaction, pyogranuloma	5/3.97	6.2 (3–10)
Pemphigus vulgaris	1/0.79	7
Eosinophilic granuloma	1/0.79	6
Periodontal cyst	1/0.79	14
Benign tumors /38.09% of all lesions/		
Fibromatous epulis	25/19.84	7.96 (5–12)
Fibroma	11/8.73	6.09 (311)
Papilloma	8/6.35	1.75 (1–3)
Plasmacytoma	2/1.59	8.5 (611)
Histiocytoma	1/0.79	3
Rhabdomyoma	1/0.79	13
Malignant tumors /47.62% of all lesions/		
Melanoma	20/15.87	11.15 (6–15)
Fibrosarcoma	17/13.49	8.65 (2–14)
Squamous cell carcinoma	12/9.52	10.58 (7–14)
Poorly Differentiated tumor	5/3.97	10 (114)
Mastocytoma	4/3.17	9.75 (811)
Pleomorphic sarcoma	1/0.79	11
Myxosarcoma	1/0.79	7

Feline lesions

The sex distribution in all feline cases was 52.5% (42/80) female and 47.5% (38/80) male. Lesions prevailed in cats of mixed breed 82.5% (Table 3).

Table 3: Breed distribution of feline cases

Breed	Cases/%
Mixed	66/82.5
European Shorthair	5/6.25
Persian	3/3.75
Other breeds (British Shorthair, Maine Coon, Ragdoll, Siamese, Sphynx, Turkish Angora)	Single case

Tumor-like lesions accounted for 55% of all examined cases. Lymphoplasmacytic gingivitis was found with the greatest incidence, which corresponded to 30% of all examined lesions and 54.54% (24/44) of tumor-like ones. Eosinophilic granuloma and purulent stomatitis were found next, occupying 10% and 8.75% of all cases, respectively, and 18.18% and 15.90% of tumor-like pathologies. The least incidence were chronic inflammatory reactions/pyogranulomas (6.25%). The sex distribution in the current category was 59.1% (26/44) male and 40.9% (18/44) male.

Only 8.33% of the feline oral neoplastic lesions were of benign behavior. Single cases of fibromatous epulis and fibroma were identified. Animals with benign lesions had a mean age of 7.66 years, with the youngest was of 3 years and the oldest being of 12 years old.

The remaining 91.67% of the neoplastic lesions were malignant. Squamous cell carcinomas prevailed, which corresponded to 23.75% of all examined lesions and 52.78% of neoplastic ones. In the next place were fibrosarcomas and melanomas, which occupied respectively 10% and 5% of all formations and 22.22% and 11.11% of neoplastic ones. Single cases of lymphosarcoma and poorly

differentiated tumor were identified. The mean age of the animals with malignant tumors was 9.74 years, with the youngest being 4 years old and the oldest being 17 years old. Of all malignant tumors, around 67% (22/33) were diagnosed in female cats. Detailed data on the incidence and age distribution of the diagnosed feline oral lesions are shown in Table 4.

Table 4: Feline tumors and tumor-like lesions

LESION	CASES/%	MEAN AGE (RANGE)
Tumor-like lesions /55% of all cases/		
Lymphoplasmacytic gingivitis	24/30	6.33 (1–15)
Eosinophilic granuloma	8/10	5.38 (1–13)
Inflammatory reaction - purulent stomatitis	7/8.75	4.85 (1–8)
Chronic inflammatory reaction, pyogranuloma	5/6.25	5.25 (4–14)
Benign tumor lesions /3.75% of all lesions/		
Fibromatous epulis	2/2.5	10 (8–12)
Fibroma	1/1.25	3
Malignant tumor lesions /41.25% of all lesions/		
Squamous cell carcinoma	19/23.75	10.44 (5–17)
Fibrosarcoma	8/10	7.25 (4–14)
Melanoma	4/5	10.25 (7–13)
Lymphosarcoma	1/1.25	11
Poorly differentiated tumor	1/1.25	17

Discussion

In the present study, the canine oral lesions were found to be primarily neoplastic. Tumor-like lesions occupied only 14.29% of the cases, without sex predisposition, and most of which were hyperplastic pathologies. Affected animals with gingival hyperplasia had a mean age of 7.2 years, with the youngest being one year old. Gingival hyperplasia is common in dogs, especially brachycephalic breeds. Gingival hyperplasia can be localized or generalized, covering one or several teeth, respectively. It represents an overgrowth of the gum tissues, mainly the fibrous connective tissue of the submucosa (Gelberg, 2017). Gingival hyperplasia often occurs together with an inflammatory reaction.

In contrast to the canine cases, in cats the tumor-like lesions and tumors were in almost a same proportion, 55% and 45%, respectively. The neoplastic-like lesions were found in cats with mean age 6.33 years and the prevalence was slightly prominent in male ones (59,1%). The most common pathologies were lymphoplasmacytic gingivitis. The current lesion was diagnosed in a wide age range (Table 4). Lymphoplasmacytic gingivitis belongs to the pathologies of idiopathic origin, and the term originates from the main histopathological finding. Lymphoplasmacytic gingivitis is often associated as a concomitant lesion in various viral and bacterial infections. Macroscopically, the gums are red and painful, and the mucosa is hyperplastic and sometimes ulcerated. Microscopically, chaotically arranged aggregates of lymphocytes and plasma cells, often with the presence of hemorrhages and necrotic areas are observed.

In neoplastic lesions of dogs, which occupied around 85% of cases, the ratio between benign and malignant was approximately equal, with a slight prevalence of malignant neoplasias (Table 2). The benign tumors showed a marked predominance in males (66,7%). In this category, fibromatous

epulis was more common. In the studied period, this lesion was diagnosed 25 times, which corresponded to slightly more than 52% of all benign neoplasias diagnosed in dogs. The term "fibromatous epulis" is nowadays increasingly replaced with the term "peripheral odontogenic fibroma", due to their genesis is related to the periodontal ligament (Munday et al., 2017). These benign neoplasias are differentiated from gingival hyperplasia in that they are usually solitary and well demarcated and have a higher cellularity. Dense collagen accumulations and a lower degree of cell population are found in gingival hyperplasias. Bone metaplasia is often found in fibromatous epulis and in the current study was detected in 56% of the cases.

Malignant melanomas prevailed of the malignant neoplasias in dogs. These tumors were more than 33% of all diagnosed malignant tumors. Historically, all melanocytic neoplasms of the lips and oral cavity were considered highly malignant. However, this statement was somewhat challenged with the identification of subgroups of canine oral melanocytic tumors that have a more favorable prognosis (Esplin, 2008). But it should be noted, that no oral melanocytic neoplasia in dogs should be unequivocally classified as benign, but can only be subclassified as low- to high-grade malignant melanomas (Munday et al., 2017). In veterinary medicine, melanomas in the oral cavity, as well as those affecting the eye and meninges, are markedly malignant (Manov, 2019). These are the most common malignant oral tumors in dogs (Bergman, 2007). However, their diagnosis can be challenging because of varying degrees of pigmentation, and sometimes lack thereof, as well as variations in cellular morphology (Spangler & Kass, 2006). Grossly, these tumors are often dark brown to black in color (Fig. 1A), but sometimes the pigmentation may be obscured by overlying mucosa or various tissue growths. Essential for the microscopic diagnosis is the presence of melanin-containing cells in the parenchyma of the tumor structure (Fig. 1B). In cases of achromatic melanomas, histochemical confirmation of the diagnosis is necessary.
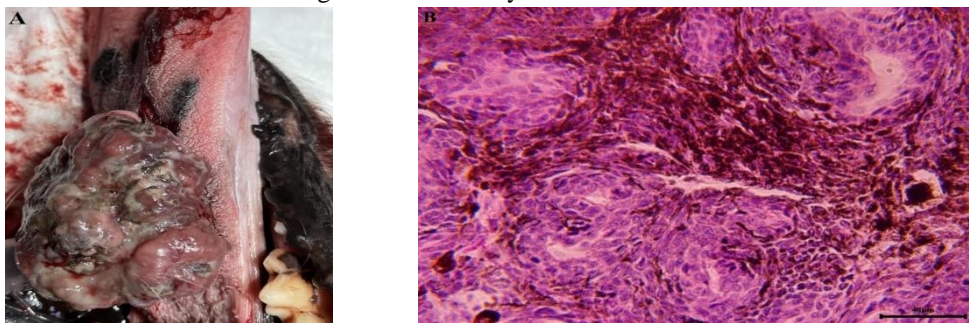

Figure 1: Malignant melanoma of the buccal mucosa and tongue in a dog. A. Macroscopic view – massive, ulcerated formation, with nodular surface and presence of dark brown to black foci. B. Microscopic view – bundles of round to slightly elongated melanin-containing cells in the neoplastic parenchyma. (H&E, x400)

Next in incidence, with a slight difference, were fibrosarcomas, which were accounted for 28.33% of malignant neoplasias and were diagnosed mainly in dogs with a mean age of 8.65 years. This type of tumor was found to have a tendency to develop in younger dogs compared to malignant melanomas and squamous cell carcinomas (Todoroff & Brodey, 1979). Fibrosacomas are dense, poorly-defined lesions that are mainly seen on the maxillary or mandibular gingiva in the oral cavity (Hoyt, 1984). They are usually solitary, pale lesions that may be ulcerated (Fig. 2A). Oral fibrosarcomas have infiltrative growth, affect the surrounding tissues, and often involve the underlying bone (Munday et al., 2017). Microscopically, spindle-shaped cells of different degrees of differentiation are found (Fig. 2B) with the presence of various mitotic count. The tumor is well vascularized and

myxomatous microfoci as well as cartilaginous or bone metaplasia can be found in the tumor parenchyma (Dinev, 2014).
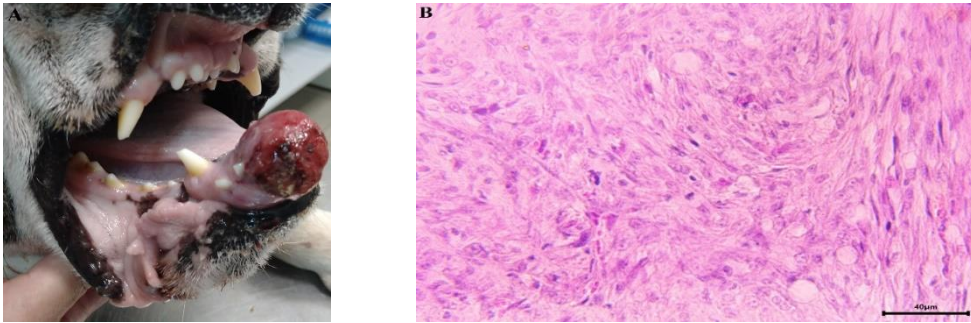

Figure 2: Oral fibrosarcoma in a dog. A. Macroscopic view – massive, round, ulcerated lesion affecting the rostral part of the mandible. C. Microscopic view – spindle-shaped cells with prominent nucleoli, marked anisocytosis and anisokaryosis in parenchyma of the tumor formation. (H&E, x400)

In cats, only 8.33% of the oral neoplasia were benign, and all of them were of fibrous origin. Single cases of fibromatous epulis and fibroma were detected. All other tumors were malignant, predominated in females (66,7%), and most of which were squamous cell carcinomas (SCC). This type of tumor was accounted for just over 57% of all examined malignant tumors. SCC is the most common oral neoplasia in cats, horses and productive animals (Munday et al., 2017). The mean age of tumor development in cats is around 13 years, ranging from 1.5 to 22 years of age (Martin et al., 2011). In the current study, the mean age of the affected cats was about 10.5 years, and the youngest and oldest were 5 and 17 years of age, respectively. The macroscopic appearance of the lesion varies from nodular, meaty masses (Fig. 3A) to variable in sized, prominent plaques with an ulcerated surface. In cats, SCC are highly invasive but have low metastatic potential (Munday et al., 2017). Histopathologically, the parenchyma of the tumor consists of neoplastic squamous cells (Fig. 3B), which morphological appearance and arrangement can vary significantly. Some authors subdivide squamous cell carcinomas into subtypes, according to their histological appearance and search for a correlation with the development and prognosis of the tumor, as such studies have already been done in dogs (Nemec et al., 2012).
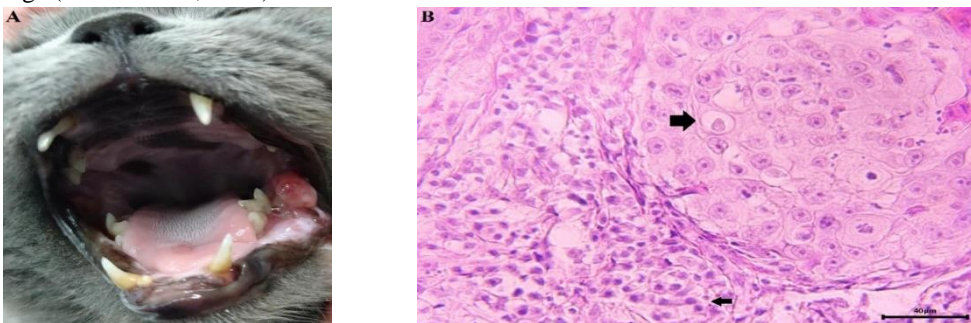

Figure 3: Oral squamous cell carcinoma in a cat. A. Macroscopic view – Nodular, ulcerated lesion affecting the gingival and buccal mucosa. B. Microscopic view – nests of squamous epithelial cells forming the tumor parenchyma. Cells are of varying degrees of maturity, with those in the periphery being small and basophilic (small arrow), while those centrally located are larger with eosinophilic cytoplasm (large arrow). (H&E, x400)

Conclusion

Lesions in the oral cavity in the studied dogs were mainly neoplastic, with the ratio between benign and malignant being approximately equal. Fibromatous epulis is the most common benign tumor seen mainly in middle-aged to elderly dogs. Of the canine malignant tumors, malignant melanoma predominates, which is mainly observed in dogs over 10 years old. The second most common malignant oral tumors in dogs were fibrosarcomas, which were mainly diagnosed in dogs of advanced age, but under 10 years old. No sex predisposition was found in the general prevalence of canine and feline oral lesions, but benign neoplasms in dogs were predominated in males and malignant neoplasms in cats were predominated in females. In cats, tumors and tumor-like lesions were of approximately equal incidence. Lymphoplasmacytic gingivitis is the predominant neoplastic-like lesion that can be seen in a wide range of age categories. Squamous cell carcinoma was the most common feline neoplasia in the oral cavity which was mainly found in adult cats.

References

1. Bancroft J, Gamble M. (2008). *Theory and practice of histological techniques.* 6th ed. Edinburgh: Churchill Livingstone.

2. Bergman, P. (2007). *Canine oral melanoma*. Clinical techniques in small animal practice, 22, 55–60.

3. Bonfanti U., W. Bertazzolo, M. Gracis, P. Roccabianca, G. Romanelli, G. Palermo, E. Zini. (2015). *Diagnostic value of cytological analysis of tumours and tumour-like lesions of the oral cavity in dogs and cats: A prospective study on 114 cases.* The Veterinary Journal, 205, 322–327.

4. Dinev, I., I. Borissov, D. Bakalov. (2003). *Incidence of canine neoplasms-a retrospective histopathological study. IV. Oropharyngeal tumours.* Bulgarian Journal of Veterinary Medicine, 6, 237–244.

5. Dinev I. (2014). *Obshta veterinarna pathologiya*, 1st Edit., Daga+, Stara Zagora, 302–313.

6. Esplin, D. (2008). *Survival of dogs following surgical excision of histologically well-differentiated melanocytic neoplasms of the mucous membranes of the lips and oral cavity.* Veterinary Pathology, 45, 889–896.

7. Gardner H, J. Fidel, G. Haldorson, W. Dernell, B. Wheeler. (2015). *Canine oral fibrosarcomas: a retrospective analysis of 65 cases (1998-2010).* Veterinary and Comparative Oncology, 13, 40–47.

8. Gelberg, H. (2017). *Alimentary system and the peritoneum, omentum, mesentery, and peritoneal cavity.* In: Pathologic basis of veterinary disease, 6th Edit., J. Zachary Ed., Elsevier, St. Louis, Missouri, 324–411.

9. Hoyt R. (1984). *Oral malignancy in the dog.* Journal of the American Animal Hospital Association, 20, 83–92.

10. Hunt, G., M. Perkins, S. Foster, V. Barrs, G. Swinney, R. Malik. (2002). *Nasopharyngeal disorders of dogs and cats: a review and retrospective study.* Compendium on Continuing Education for the Practicing Veterinarian -North American Edition, 24, 184–200.

11. Liptak J., S. Withrow. (2013). *Oral tumours.* In: Withrow & MacEwen's Small Animal Clinical Oncology, 5th Edit., S. Withrow, D. Vail, Eds., Elsevier Saunders, Philadelphia, 381–398.

12. Manov V. (2019). *Morphologichna characteristica na nyakoi neoplazii pri zhivotnite*, Panev Publishing, Sofia, 92–94.

13. Martin C., S. Tannehill-Gregg, T. Wolfe, T. Rosol. (2011). *Bone-invasive oral squamous cell car-*

cinoma in cats: pathology and expression of parathyroid hormone-related protein. Veterinary Pathology, 48, 302–312.

14. Mikiewicz M., K. Pazdzior-Czapula, M. Gesek, V. Lemishevskyi, I. Otrocka-Domagala. (2019). *Canine and Feline Oral Cavity Tumours and Tumour-like Lesions: a Retrospective Study of 486 Cases (2015-2017)*. The Journal of Comparative Pathology, 172, 80–87.

15. Munday J., C. Löhr, M. Kiupel. (2017). *Tumors of the alimentary tract*. In: Tumors in domestic animals, 5th Edit., D. Meuten Ed., Wiley & Sons Inc., Ames, Iowa, 499–601.

16. Nemec A., B. Murphy, P. Kass, F. Verstraete. (2012). *Histological subtypes of oral non-tonsillar squamous cell carcinoma in dogs.* Journal of Comparative Pathology, 147, 111–120.

17. Öztürk, H., P. Kecici, G. Yüzbaşioğlu, A. Gürel. (2022). *Retrospective Study of Feline Oral Cavity Neoplasms and Non-neoplastic Lesions, Between 2010 and 2020.* Acta Veterinaria Eurasia, 48, 12–17.

18. Putnová, B., J. Burová, M. Georgiou, T. Fichtel, L. Stehlík, L. Frgelecová, M. Škorič. (2020). *Occurrence site of canine oral lesions: a retrospective study of 659 cases.* Acta Veterinaria Brno, 89, 179–187.

19. Spangler W., P. Kass. (2006). *The histologic and epidemiologic bases for prognostic considerations in canine melanocytic neoplasia*. Veterinary Pathology, 43, 136-149.

20. Stebbins K., C. Morse, M. Goldschmidt. (1989). *Feline oral neoplasia: a ten-year survey.* Veterinary Pathology, 26, 121–128.

21. Todoroff R., R. Brodey. (1979). *Oral and pharyngeal neoplasia in the dog: a retrospective survey of 361 cases.* Journal of the American Veterinary Medical Association, 175, 567–571.

22. Verhaert, L. (2010). *Oral proliferative lesions in the dog and cat.* European Journal of Companion Animal Practice, 20, 1–13.

23. Vos J., I. Gaag. (1987). *Canine and feline oral-pharyngeal tumours*. Zentralbl Veterinarmed A 34, 420–427.

24. Wingo K. (2018). *Histopathologic diagnoses from biopsies of the oral cavity in 403 dogs and 73 cats.* Journal of Veterinary Dentistry, 35, 7–17.