RETROSPECTIVE STUDY OF CANINE CUTANEOUS NEOPLASIA

Raimundo Alberto Tostes, Alcides Branco, Filipe Kracinsky Cestari, Tatiane Caleffo, Aline De Marco Viott

¹Correspondência: tostes@ufpr.br

RESUMO: O estudo teve por objetivo estabelecer a prevalência de câncer de pele em cães em casos analisados no Laboratório de Patologia Animal da Universidade Federal do Paraná, Setor Palotina, entre 2010 a 2013. De 1.395 arquivos de biópsia do laboratório, 347 (24,87%) foram categorizadas como neoplasias. As raças mais afetadas foram: poodle (46/13,26%), boxer (27/7,78%), pitbull (19/5,48%), rottweiller (18/5,19%) e cocker spaniel (17/4,9%). A média de idade foi de 7,5 anos. Houve um predomínio de machos (197/56.77%) comparado ao de fêmeas (150/43,23%). As neoplasias mais prevalentes foram: Mastocitoma (62/17,87%), Carcinoma de Células Escamosas (35/10,09%), Melanoma (29/8,36%), Adenoma de Glândula Adanal (25/7,20%), Tumor Venéreo Transmissível Cutâneo (24/6,92%), Lipoma Histiocitoma (22/6,34%), Hemangioma (18/5,19%), (22/6, 34%),Carcinoma Basocelular (17/4,90%) e Hemagiossarcoma (16/4,61). Outras neoplasias somaram 77 casos (22,19%). Apesar de ser concordante com os resultados de estudos nacionais e internacionais similares, os autores destacam a importância do estudo epidemiológico dos tumores cutâneos caninos e da sua relevância no contexto da oncologia veterinária.

Palavras-chave: Cães, Dermatopatologia, Câncer de Pele, Mastocitoma, Carcinoma de Células Escamosas

ABSTRACT: The study aimed to establish the canine skin cancer prevalence in cases analyzed in the Animal Pathology Laboratory of the Federal University of Parana, Sector Palotina between 2010-2013. Of 1,395 lab file skin biopsies, 347 (24.87%) were categorized as neoplasia. The most affected breed were poodle (46/13,26%), boxer (27/7,78%), pitbull (19/5,48%), rottweiller (18/5,19%) and cocker spaniel (17/4,9%). The age average was 7,5 years. There was a predominance of occurrence in males (197/ 56.77%) compared to females (150/43,23%). The most prevalente neoplasia were: Mast Cell Tumor (62/17,87%), Squamous Cell (35/10,09%),Melanoma (29/8,36%), Adanal Gland Carcinoma Adenoma (25/7, 20%),Cutaneous Transmissible Venereal Tumor (24/6,92%), Lipoma (22/6,34%). Histiocytoma (22/6,34%), Hemangioma (18/5,19%), Basal Cell Carcinoma (17/4,90%) e Hemagiossarcoma (16/4,61). Other neoplasia reached 77 cases (22,19%). Although concurring in results with similar studies in national and international the authors highlight the importance of epidemiological study of canine cutaneous tumors and its relevance within the veterinary oncology.

Key Words: Dogs, Dermatopathology, Skin Cancer, Mast Cell Tumor, Squamous Cell Carcinoma

INTRODUCTION

Changes in cultural, behavioral and socioeconomic patterns in recent decades led humans to consider pets under a new social perspective. The concern with appropriate food, on time vaccinations and medications, as a greater dedication signalement, allows a long and better life quality to dogs (SOUZA et al. 2001; LOPES AND SILVA, 2012). Consequently, increased the diagnosis attention to animal neoplastic disorders cases. Whence, skin cancer is highlighted. It is worth highlighting that the National Health Survey, conducted by Brazilian Institute of Geography and Statistics - IBGE, indicates that 44.3% households in Brazil own least at one dog, corresponding to 28.9 million households. IBGE estimates the canine population in Brazilian households at 52.2 million individuals, corresponding to the average of 1.8 dogs per household that has at least one dog. The data demonstrate that in Brazil, there are more pet dogs than children. Paraná is the state where most households have a dog (IBGE, 2015).

Skin is the most common site of occurrence in dogs. cancer (GOLDSCHMIDT HENDRICK, AND 2002; GROSS et al., 2005; MILLER et 2012; HAUCK, 2013). Several al., studies were conducted to characterize the effect of several kinds of skin cancers in small animals and more specifically in dogs. The incidence of cancer in dogs is not fully known and probably varies from one region to another (HAUCK, 2013). In a study on the incidence of cancer in dogs was established а ratio of 1.077 cases/100,000 dogs, in these cases 67.6% were skin cancer or soft tissue (DORN et al., 1968). MACVEAN et al. (1978) found a ratio of 1,126 cases of cancer/100.000 dogs. GOLDSCHMIDT AND SHOFER (1998) found an

incidence of 45% of skin cancer in a study involving 65,000 biopsy samples. HAUCK (2013) refers the percentage of cutaneous tumors in biopsy samples vary between 25.5 to 43%.

The skin harbor a large number of cells in constant renewal, therefore, more susceptible to disorders in their genes coding, implicating in mutations. As an extensive organ, skin is exposed to a wide range oncogenic factors, such as ultraviolet rays (GOLDSCHMIDT & HENDRICK, 2002, GROSS et al., 2005, FABBROCINI et al., 2010). It is also important understand its to morphological constitution. since it facilitates the differentiation between primary secondary and tumors. Understanding these processes allied to the principles that rule the biopsy procedure increases the reliability of histopathological diagnosis. consequently help the clinician in patient follow-up (SOUZA et al, 2001).

Considering the importance of the morbidity. mortality. incidence. and factors related to skin neoplasms, this study aims to conduct a retrospective of analysis of cases cutaneous neoplasia in the Animal Pathology Laboratory of the Paraná Federal University (UFPR) – Palotina Sector.

MATERIALS AND METHODS

Were analyzed archived cases in the Animal Pathology Laboratory of biopsy files in 2010-2013 period. Part of the samples came from Veterinary Hospital Paraná Federal of the University, Palotina Sector. Other samples were submitted by veterinarian clinicians from surrounding cities. All analyzed cases were canines. First, the dermatopathies were cataloged, then screening cancer cases. Analyzes were based on the diagnosis, regardless of their primary or secondary characteristic, the prevalence of race, sex and age of dogs. Breast, oral, genital neoplasms and non-neoplastic skin nodules (cysts and hyperplastic in general) were discarded. Cutaneous cases of transmissible venereal tumor were included. The prevalence of benign and malignant tumors was determined. Races where the prevalence of neoplasia was high, were observed separately the most frequent tumor types. Neoplasms were evaluated based on the Histological Classification of Domestic Tumors of Animals recommended by the World Health Organization (O.M.S.) and Armed Forces Institute of Pathology (A.F.I.P.): the epithelial neoplasia and melanocytic classified according Goldschmidt et al. (1992), and mesenchymal neoplasia of the skin and soft tissue according to Hendrick et al. (1992).

RESULTS AND DISCUSSION

Were examined and investigated 1,395 cases involving skin biopsies. Of this total, 347 (24.87%) were categorized as neoplasia (Table 1).

| Histololical type | amount | % | |
|-------------------------------|--------|-------|--|
| Mast Cell Tumor | 62 | 17,87 | |
| Squamous Cell Carcinoma | 35 | 10,09 | |
| Melanoma | 29 | 8,36 | |
| Perianal Gland Adenoma | 25 | 7,20 | |
| Cutaneous TV T | 24 | 6,92 | |
| Lipoma | 22 | 6,34 | |
| Histiocytoma | 22 | 6,34 | |
| Hemangioma | 18 | 5,19 | |
| Basal Cell Carcinoma | 17 | 4,90 | |
| Hemangiossarcoma | 16 | 4,61 | |
| Trichoepithelioma | 7 | 2,02 | |
| Papiloma | 7 | 2,02 | |
| Sebaceous Gland Adenoma | 7 | 2,02 | |
| Amelanotic Melanoma | 6 | 1,73 | |
| Trichoblastoma | 5 | 1,44 | |
| Fibrosarcoma | 5 | 1,44 | |
| Liposarcoma | 4 | 1,15 | |
| Malignant Histiocytosis | 4 | 1,15 | |
| Perianal Gland Adenocarcinoma | 4 | 1,15 | |
| Fibroma | 3 | 0,86 | |
| Plasma Cell Tumor | 3 | 0,86 | |
| Apocrine Gland Adenoma | 3 | 0,86 | |
| Total | 347 | 100 | |

There was involvement of 27 different races (table 2), the most

common: poodle (46 / 13,26%), boxer (27 / 7.78%), pitbull (19 / 5.48%), rottweiller (18 / 5.19 %) and Cocker spaniel (17 / 4.9%). The number of animals mixed breed is significant and reached 105 cases (30.26%). In 20 samples (5.76%) had no information about racial type (Table 2). The large number of mongrel dogs is explained by the greater frequency of this racial profile assisted at the Veterinarv Hospital of the institution. The age average of affected patients was 7.5 years, but in 21 samples age groups have not been identified, and therefore were excluded from the count. In category of gender is remarkable a higher incidence in males (197 1 56.77%) compared to females (150 / 43.23%).

201 malignant neoplasms were diagnosed (57.92%), in contrast to 146 benign neoplasms (42.08%). The most prevalent neoplasia were Mast Cell Tumor (62 / 17,87%), Squamous Cell Carcinoma (35 / 10,09%), Melanoma (29 / 8.36%), Gland Adanal Adenoma (25 / 7.20 %) Cutaneous TVT (24 / 6.92%), Lipoma (22 / 6.34%), Histiocytoma (22 / 6.34%), Hemangioma (18 / 5.19%), Basal Cell Carcinoma (17/4, 90%) and Hemagiossarcoma (16 / 4.61). The other neoplasia account for 77 cases (22.19%).

The number of biopsy specimens processed in the laboratory is increasing. A important favorer in this situation is the evolution of the pet market in Brazil. Now billionaire, the pet market shows a large increase offer in medical veterinary products supply and (LAMPERT, services 2013). This denotes the direct influence of the greater interest of the owners in your pet's health and consequently a greater willingness to pay for additional tests. In line with this comes the expansion of the diagnosis quality. In effect, 2013 marks the beginning of multiprofessional residence in veterinary medicine in Brazilian vet faculties, expanding professional niches and - as a result - greater supply of veterinary services in the care of repressed demands.

Table 2 – Main breeds affected by cutaneous neoplasia diagnosed in UFPR Veterinary Pathology Laboratory between 2010-2013.

| Breed | N | % | |
|------------------|-----|-------|--|
| SRD | 105 | 30,26 | |
| Poodle | 46 | 13,26 | |
| Boxer | 27 | 7,78 | |
| Pitbull | 19 | 5,48 | |
| Rottweiler | 18 | 5,19 | |
| Cocker | 17 | 4,90 | |
| ∋reat Dane | 13 | 3,75 | |
| Brazilian Fila | 10 | 2,88 | |
| rinscher | 9 | 2,59 | |
| ∋erman Sheperd | 9 | 2,59 | |
| orkshire | 6 | 1,73 | |
| assethound | 5 | 1,44 | |
|)obermann | 5 | 1,44 | |
| ox Paulistinha | 5 | 1,44 | |
| hasa Apso | 4 | 1,15 | |
| biberian Husky | 3 | 0,86 | |
| Solden Retriver | 3 | 0,86 | |
| eckel | 3 | 0,86 | |
| harpei | 3 | 0,86 | |
| rgentine Mastiff | 3 | 0,86 | |
| hitzu | 2 | 0,58 | |
| abrador | 2 | 0,58 | |
| aschund | 2 | 0,58 | |
| chnauzer | 2 | 0,58 | |
| Others | 6 | 1,73 | |
| 1.1.* | 20 | 5,76 | |
| otal | 347 | 100 | |

Considering the 347 samples of neoplasia analyzed in a short timeline, it reiterates the importance of a more critical analysis of the clinical and extended continuity of studies on Unfortunately, it injuries. was not possible association between tumor type and its location, since most of the samples did not have such information. KAMSTOCK et al. (2011) argue that the standardization of requests is critical for proper submission of surgical specimens in such a way that descriptive elements of the lesions, epidemiological data and clinical history are crucial to the quality and diagnostic accuracy.

The Mast Cell Tumor appears as the highest incidence neoplasia

(17.87%), corroborating previous studies cutaneous neoplasias in Brazil on (SOUZA et al, 2001; DE NARDI et al, 2002: VASCONCELLOS E MATERA, 2002; BELLEI et al, 2006; SOUZA et al, 2006; CASAGRANDE et al., 2008; MEIRELLES et al, 2010; ANDRADE et al., 2012; FERNANDES et al., 2015; table 3) and in the world (DORN et al., 1968; GOLDSCHMIDT AND SHOFER, 1998: GOLDSCHMIDT AND HENDRICK, 2002; HAUCK, 2013). The breed showed higher Boxer а prevalence of Mast Cell Tumor and, therefore, according to the knowledge about racial predisposition to this breed (SIMOES et al, 1994; DE NARDI, 2002; CASAGRANDE al, 2008). et А comparative data between different surveys about canine cutaneous neoplasia in Brazil can be seen in table 3.

Is highly relevant the number of animals without any information about race, which negatively impacts on data analysis. The histologic types are diverse with a predominance of Mast Cell Tumors degree I. Important to mention that histological grading has fundamental prognostic implications in Mast Cell Tumors (SABATTINI et al., 2015).

| Neoplasia | Tostes et al. | Andrade et al. | De Nardi et al. | Fernandes et al. | Meirelles et al. | Souza et al. | Vasconcello: e Matera |
|---|------------------|-------------------|--------------------|---------------------|---------------------|-----------------|--------------------------|
| Mast Cell Tumor | 17,87% | 13% | 11.7% | 15,3% | 22,4% | 20,9% | 34% |
| Squamous Cell Carcinoma | 10,09% | 14% | 0,9% | 15,48% | 7,5% | 7,0% | 2% |
| Melanoma | 10,09% | 6% | 1,8% | 5,28% | 3,4% | 3,3% | 5% |
| Perianal Gland Adenoma | 7,2% | 4% | 1,2% | 2,7% | 7,1% | 5,8% | 8 |
| Cutaneous Transmissible Venereal Tumor | 7,0% | 5% | 3,3% | 2.2% | 1,2% | 0,5% | 8 |
| Lipoma | 6,34% | 7% | 2,1% | 3,6% | 7,3% | 5,5% | 23% |
| Hemangioma | 5,19% | 2% | 2,1% | 5,6% | 3,0% | 3,3% | 496 |
| Basal Cell Carcinoma | 4,9% | 4% | 0,3% | 6,73% | 1,0% | 2,0% | 10% |
| Histiocitoma | 6.34% | 7% | 1.8% | 7,65% | 3.8% | 2,6% | |

Mast Cell Tumor, Squamous Cell Carcinoma and Melanoma, together, account for 132 cases (38.04%). In humans, Squamous Cell Carcinoma and Melanoma are notoriously associated as consequence to UV rays prolonged exposure. According to the PAGES Consortium (2013), the last decades recorded the highest average global temperature, as well the longer average sunshine periods. FABBROCINI et al. (2010) emphasize the importance of epidemiological monitoring of cutaneous neoplasias in recent decades. Adding the observation that verv hiah environmental temperatures favor outdoor activities; which turns natural that many homeowners go along with their dogs. Melanocytic tumors, when affecting the skin, have a greater tendency to benignity in contrast to those involving oral and ocular sites, whose behavior - in general - is (DITERS malignant et al. 1983: LACROUX et al., 2012). According LACROIX et al. (2012), melanomas reach 10 to 15% of all cutaneous neoplasias and are particularly aggressive in mucocutaneous joints and extremities. LACROUX et al. (2012) and ROLIM et al. (2012) advert that histopathologic melanoma constituents not always are solid support for prognosis and valorize immunohistochemical panels as а criterion. Vascular tumors reached 9.8% incidence. Hargis et al. (1992) studied dogs with Hemangiomas 212 and Cutaneous Hemagiosarcomas and characterize individuals with short hair and little skin pigment predominantly in the manifestation of these types of cancers in the dermis (65% versus 22% of subjects with the long hair and pigmented skin); the same proportion was observed in animals whose skin of the ventral region is glabra. Indeed, the above authors suggest that short hair, lower skin pigmentation and glabrous areas turns dogs susceptible to higher UV exposure and, by extension, to the development of injury radiation culminating in neoplasia. In this study, the percentage of 9.8% of this type of cancer added non-melanoma to neoplasms (Squamous Cell Carcinoma and Basal Cell Carcinoma - 14.98%) achieved significant 24.78%. In other words, one out four cases of skin cancer is potentially associated with UV rays direct exposure.

Perianal region neoplasia accounted for 8.36% of the cases (7.20% of Adenomas and Adenocarcinomas of 1.15%). Hayes and Wilson (1977) and Martins et al. (2010) emphasize that these neoplasms are frequent in males and rarely seen in females and castrated males, indicating a modulation of these neoplasms by androgenic factors to be elucidated.

Neoplastic lesions of lipocytic origin, usually after their cytodiagnostic confirmation, are surgically excised when causes function harm in adjacent showing organ or fast growth (GHISLENI et al. 2006). Lipomas (6.34%) and Liposarcomas (1.15%), according descriptive compilation of requests, in this study, do not meet these features. The interest in samples histopathologic diagnosis was only confirm the cellular origin and aggressiveness degree of the process, what maybe explains the low number of samples.

The occurrence of 24 cases (7%) Transmissible Cutaneous Venereal highly Tumor (cTVT) is relevant considering its global occurrence. STRAKOVA AND MURCHISON (2014), researching the cTVT prevalence in 109 countries. have confirmed their endemicitv 90 at least countries. reaching all continents. GANGULY et al. (2013) corroborates this research adding the fact that free-living dogs constitute as reservoirs for TVT. AMARAL et al. (2007) point out that the extragenital TVT has predominantly plasmacytoid morphology, which is reflected in a more aggressive biological behavior, both in ability to develop in extragenital locations as metastasize.

Histiocytoma cases added 22 occurrences (6.34%), always characterized as solitary circumscribed nodules measuring 1 to 3 cm in diameter. The Histiocytoma emerges as one of the most prevalent neoplasms in the UK (CLIFFORD et al., 2013), while national studies report a prevalence ranging from 1.8 to 7% (see table 3); therefore, similar to the observed in this study.

the Comparing gender involvement of males occurred in 197 (56.77%) cases and 150 females (43.23%). Gender bias widely favor the predominance females of when considering the occurrence of mammary neoplasms. In the absence of this type of neoplasia, skin neoplasms seems to favor males, according to Brazilian studies (SOUZA et al, 2001; DE NARDI et al, 2002; VASCONCELLOS AND MATERA, 2002; BELLEI et al, 2006; SOUZA et al, 2006; MEIRELLES et al, ANDRADE 2010: et al., 2012: FERNANDES et al., 2015) and corroborated by studies in Europe (DOBSON et al., 2002; MERLO et al., 2008) and North America (BUTLER et 2013). Actually characterize a al., gender bias in cutaneous neoplasia still demand further research and stronger epidemiological evidences.

In this study mean age was 7.5 years, very closer to other similar studies threshold, whose averages range from 7.3 to 8.4 vears (VASCONCELLOS AND MATERA, 2002; BELLEI et al, 2006; MEIRELLES et al, 2010; ANDRADE et al., 2012), delineating that advancing age increases the clinical relevance of the relative risk of neoplasia in dogs. According to indexed literature, the critical period to the neoplasia onset in dogs is 6 to 10 years old (MERLO et al., 2008; BUTLER et al., 2013). About biological behavior, the finding of 57.92% against 42.08% of benign neoplasia is also similar to that observed in similar studies (VASCONCELLOS E MATERA, 2002; MEIRELLES et al, ANDRADE 2010; et al., 2012; FERNANDES et al., 2015), despite BELLEI et al (2006) and Souza et al. (2006) notice higher benign tumors prevalence. Has be assumed that the clinical staging of neoplasms is strongly correlated to the interval time in which the owner realizes the need to seek vet care and the time it actually does.

It is estimated that the wild wolf domestication process resulted in a loss of 5% in the nucleotide diversity; further, formation and racial diversification of modern dogs expanded this loss to about 35% (DOBSON, 2013). Combined genetic factors and the challenges imposed by environmental risk factors is substantial the enormous importance of cutaneous neoplasia in the scope of veterinary oncology.

CONCLUSION

Skin neoplasms are a broad group of skin lesions that must be appreciated from pathological and epidemiological point of view. Although in this study the most frequent neoplasm is the Mastocytoma, strongly associated with genetic profiles, it should also be consider that other cutaneous neoplasia seasonal and environmental suffer influences. It is difficult to set precise causal associations, but it is very important collect morphological and epidemiological descriptions to understand the behavior and manifestation of these neoplasms through time, as well as clarify their expression according to geographic locations.

REFERÊNCIAS

ANDRADE, R.L.F.S.; OLIVEIRA, D.M.; DANTAS, A.F.M. et al. Tumores de cães e gatos diagnosticados no semiárido da Paraíba. Pesquisa Veterinária Brasileira, v.32, n.10, p.1037-1040, 2012. Disponível em http://www.scielo.br/pdf/pvb/v32n10/v32 n10a16.pdf. Acesso em: 01/10/2015. BELLEI, M. H. M.; NEVES, D. S.; GAVA, A. et al. Prevalência de neoplasias cutâneas diagnosticadas em caninos no estado de Santa Catarina, Brasil, no período entre 1998 a 2002. Revista de Ciências Agroveterinárias, vol. 5, n. 1, pp. 73-79, 2006. Disponível em http://rca.cav.udesc.br/rca_2006_1/bellei .pdf. Acesso em: 01/10/2015.

BUTLER, L.M.; BONNETT, B.N.; RODNEY L. Epidemiology and the Evidence-Based Medicine Approach In: In Withrow and MacEwen's Small Animal Clinical Oncology (5th ed.), edited by Withrow, S.J.; Vail, D.M.; Page, R.L. W.B. Saunders, Saint Louis, 2013, Pages 68-80.

CASAGRANDE, T.A. C.; ELIAS, D.S.; MELO, S.R. et al. Estudo retrospectivo do mastocitoma canino no serviço de cirurgia de pequenos animais – Hospital Veterinário da Faculdade de Medicina Veterinária e Zootecnia da Universidade de São Paulo. Archives of Veterinary Science, vol.13, n.3, pp.176-183, 2008.

CLIFFORD, C.A.; SKORUPSKI, K.A.; MOORE, P.F. Histiocytic Diseases. In: In Withrow and MacEwen's Small Animal Clinical Oncology (5th ed.), edited by Withrow, S.J.; Vail, D.M.; Page, R.L. W.B. Saunders, Saint Louis, 2013, Pages 706-709.

DE NARDI, A.B.; RODASKI. S.; SOUSA, R.S. et al. Prevalência de neoplasias е modalidades de tratamentos em cães, atendidos no hospital veterinário da Universidade Federal do Paraná. Archives of Veterinary Science, v.7, n. 2, pp. 15-26, 2002. Disponível em http://ojs.c3sl.ufpr.br/ojs/index.php/veteri nary/article/download/3977/3217. Acesso em: 01/10/2015.

DITERS, R. W.; DUBIELZIGG, R. R.; AGUIRRE, G. D. et al. Primary Ocular Melanoma in Dogs. Veterinary Pathology, vol. 20, pp. 379 – 395, 1983. DOBSON, J.M. Breed-Predispositions to Cancer in Pedigree Dogs. ISRN Veterinary Science, v.2013, p.1-24, 2013. Disponível em http://www.hindawi.com/journals/isrn/20 13/941275/. Acesso em: 01/10/2015.

DOBSON, J. M.; SAMUEL, s.; MILSTEIN, H. et al. Canine neoplasia in the UK: estimates of incidence rates from a population of insured dogs. Journal of Small Animal Practice, v.43, n.6, p.240–246, 2002. Disponível em http://onlinelibrary.wiley.com/doi/10.1111 /j.1748-5827.2002.tb00066.x/abstract Acesso em: 01/10/2015.

DORN, C.R.; TAYLOR, D.O.N.; SCHNEIDER, R. et al. Survey of Animal Neoplasms in Alameda and Contra Costa Counties, California. II. Cancer Morbidity in Dogs and Cats from Alameda County. Journal of National Institute of Cancer, v.40, n.2, p. 307-318, 1968.

FABBROCINI, G; TRIASSI, M.; MAURIELLO, M.C. et al. Epidemiology of Skin Cancer: Role of Some Environmental Factors. Cancers, v.2, n.4, p.1980-1989, 2010. Disponível em http://www.mdpi.com/2072-

6694/2/4/1980. Acesso em: 01/10/2015.

FERNANDES, C.C.; MEDEIROS, A.A.; MAGALHÃES, G.M. et al. Frequência de neoplasias cutâneas em cães atendidos no hospital veterinário da Universidade Federal de Uberlândia durante os anos 2000 a 2010. Bioscience Journal, Uberlândia, v. 31, n. 2, p. 541-548, 2015. Disponível em http://www.seer.ufu.br/index.php/bioscie ncejournal/article/download/22371/1613 2. Acesso em: 01/10/2015.

GHISLENI, G.; ROCCABIANCA, P.; CERUTI, R. et al. Correlation between fine-needle aspiration cytology and histopathology in the evaluation of cutaneous and subcutaneous masses from dogs and cats. Veterinary Clinical Pathology, v. 35, n. 1, pp. 24 - 30, 2006. GOLDSCHMIDT, M.H.; DUNSTAN, R.W.; STANNARD, A.A. et al. World Health Organization International Histological Classification of Epithelial and Melanocytic Tumors of the Skin of Domestic Animals. 2nd series, v.3, Armed Forces Institute of Pathology, Washington, DC, 1992.

GOLDSCHMIDT, M.H.; HENDRICK, M.J. Tumors of the skin and soft tissues. In: MEUTEN, D.J. Tumors in Domestic Animals. Ed. 4. pp. 45-117. Blackwell, Iowa, 2002.

GOLDSCHMIDT, MH; SHOFER, FS. *Skin Tumors of the Dog and Cat.* Oxford: Butterworth Heinemann, 1998, p.1-301.

GROSS, T.L.; IHRKE, P.J.; WALDER, E.J. et al. Skin Diseases of the Dog and Cat: Clinical and histopathologic diagnosis. Ed. 2, pp. 561 – 865, Blackwell, Oxford, 2005.

HAYES, H. M. J.; WILSON, G. P. Hormone-dependent Neoplasms of the Canine Perianal Gland. Cancer Research, v. 37, p2068 – 2071, 1977.

HARGIS. A.M.: IHRKE. P.J.: SPANGLER, W. L. et al. А Retrospective Clinicopathologic Study of 212 Dogs with Cutaneous Hemangiomas and Hemangiosarcomas. Veterinary Pathology, v.29, n.4, p.316-1992. Disponível 328. em http://vet.sagepub.com/content/29/4/316 .full.pdf. Acesso em: 01/10/2015.

HAUCK, M.L. Tumors of the Skin and Subcutaneous Tissues, In Withrow and MacEwen's Small Animal Clinical Oncology (5th ed.), edited by Withrow, S.J.; Vail, D.M.; Page, R.L. W.B. Saunders, Saint Louis, 2013, Pages 305-320.

HENDRICK, M.J.; MAHAFFEY, E.A.; MOORE, F.M. et al. World Health Organization International Histological Classification of the Mesenchymal Tumors of Skin and Soft Tissues of *Domestic Animals.* 2nd series, v.2, Armed Forces Institute of Pathology, Washington, DC, 1992.

INSTITUTO BRASILEIRO DE GEOGRAFIA E ESTATÍSTICA – IBGE. Pesquisa Nacional de Saúde, 2013: acesso e utilização dos serviços de saúde, acidentes e violências: Brasil, regiões unidades grandes е da federação. Coordenação de Trabalho e Rendimento. Rio de Janeiro: IBGE, p. 2015. 100 Disponível em: http://www.ibge.gov.br/home/estatistica/ populacao/pns/2013_vol2/default.shtm. Acesso em: 01/10/2015.

KAMSTOCK, D.A.; EHRHART, E.J.; GETZY, D.M. et al. Recommended Guidelines for Submission, Trimming, Margin Evaluation, and Reporting of Tumor Biopsy Specimens in Veterinary Surgical Pathology. Veterinary Pathology, v.48, n.1, p.19-31, 2011. Disponível em http://vet.sagepub.com/content/48/1/19.f ull. Acesso em: 01/10/2015.

LACROUX, C.; RAYMOND-LETRON, I.; BOURGES-ABELLA, N. et al. Study of canine cutaneous melanocytic tumours: histological evaluation of and immunohistochemical prognostic criteria 65 cases. Revue de Médecine in Véterinaire, v.163, n.8-9, p.393-401, Disponível 2012. em http://www.revmedvet.com/2012/RMV16 3_393_401.pdf. Acesso em: 01/10/2015.

LAMPERT, A. Animais de estimação inspiram mercado bilionário. Jornal do Comércio, Porto Alegre, 04 de março de 2013. Disponível em: http://www.petrede.com.br/2013/servico s/mercado/animais-de-estimacao-

inspiram-mercado-bilionario/ Acesso em: 01/10/2015.

LOPES, K.R.F.; SILVA, A.R. Considerações sobre a importância do cão doméstico (*Canis lupus familiaris*) dentro da sociedade humana. Acta Veterinaria Brasilica, v.6, n.3, p.177-185, 2012.

MACVEAN, D.W.; MONLUX, A.W.: ANDERSON J.R., P.S. Frequency of canine and feline tumors in a defined population. Veterinary Pathology, v.15, p.700-715, 1978. Disponível em http://vet.sagepub.com/content/15/6/700 .long. Acesso em: 01/10/2015.

MARTINS, A.M.C. R. P. F.; GUERRA, J.L.; OLORIS, S.C.S. et al. Expression of Connexins 43, 26 and 32 in normal, hyperplastic and neoplastic perianal dog glands. Brazilian Journal of Veterinary Pathology, v.3, n.1, p.46-51, 2010. Disponível http://bjvp.org.br/wpem content/uploads/2015/07/DOWNLOAD-

FULL-ARTICLE-09-

20881_2010_5_10_59_41.pdf. Acesso em: 01/10/2015.

MEIRELLES, A. E. W. B.; OLIVEIRAS, E. C.; RODRIGUES, B. A. et al. Prevalência de neoplasmas cutâneos em cães da Região Metropolitana de Porto Alegre, RS: 1.017 casos (2002-2007). Pesquisa Veterinária Brasileira, v. 30, n. 11, pp. 968 - 973, 2010. Disponível em http://www.scielo.br/scielo.php?script=sc i arttext&pid=S0100-

736X2010001100011. Acesso em: 01/10/2015.

MERLO. D.F.; ROSSI. L.: PELLEGRINO, C. et al. Cancer Incidence in Pet Dogs: Findings of the Animal Tumor Registry of Genoa, Italy. Journal of Veterinary Internal Medicine, v.22, n.4, p.976-984, 2008. Disponível em

http://onlinelibrary.wiley.com/doi/10.1111 /j.1939-1676.2008.0133.x/abstract. Acesso em: 01/10/2015.

MILLER JR., W.H.; GRIFFIN. C.E. Müller and Kirk's Small Animal Dermatology 7ed. Sant Louis: Elsevier Mosby, 2012, p.774-843 (950pp).

PAGES 2K CONSORTIUM. Continentalscale temperature variability during the past two millennia. Nature Geoscience, v.6, p.339-346, 2013. Disponível em http://www.nature.com/ngeo/journal/v6/n 5/full/naeo1797.html. Acesso em: 01/10/2015.

ROLIM. V.M.: CASAGRANDE. R.A.: T. et al. WATANABE. Melanoma amelanótico cães: estudo em retrospectivo de 35 casos (2004-2010) e caracterização imuno-histoquímica. Pesquisa Veterinária Brasileira, v.32, n.4, p.340-346, 2012. Disponível em http://www.scielo.br/pdf/pvb/v32n4/11.pd f. Acesso em: 01/10/2015.

SABATTINI, S.: SCARPA. F.: BERLATO, D. et al. Histologic grading of canine mast cell tumor: is 2 better than 3? Veterinary Pathology, v.52, n.1, p.70-73. 2015. Disponível em http://vet.sagepub.com/content/early/201 4/02/10/0300985814521638. Acesso em: 01/10/2015.

SMITH, S. H.; GOLDSCHMIDT, M. H.; MCMANUS, P. M.; A Comparative Melanocytic Neoplasms. Review of Veterinary Pathology, vol. 39, pp. 651 -678, 2002.

SOUZA, T. M.; FIGHERA, R. A.; IRIGOYEN, L. F. et al. Estudo retrospectivo de 761 tumores cutâneos em cães. Ciência Rural, v. 36, n. 2, pp. 555 - 560, 2006. Disponível em http://www.scielo.br/pdf/cr/v36n2/a30v36 n2.pdf. Acesso em: 01/10/2015.

SOUZA, V. T. F.; PARAGUASSU, A A.; MOREIRA. E. L. T. Ocorrência de neoplasias em caninos na cidade de Salvador, Bahia (Achados de biopsias). Revista Brasileira de Saúde e Produção Animal. v. 2, n. 2, pp. 53 – 58, 2001.

STRAKOVA, A.; MURCHISON, E.P. The changing global distribution and prevalence of canine transmissible venereal tumour. BMC Veterinary Research, vol.10, n.3 p.168-178, 2014. Disponível em http://www.biomedcentral.com/1746-6148/10/168. Acesso em: 01/10/2015.

VASCONCELLOS, C.H.C.; MATERA, J.M. Estudo clínico-cirúrgico das neoplasias cutâneas e/ou de partes moles: análise de 138 casos. Revista Brasoleira de Ciência Veterinária, supl., v.9, n.1, p.213-215, 2002.