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НАУКОВИЙ ВІСНИК ЛЬВІВСЬКОГО НАЦІОНАЛЬНОГО УНІВЕРСИТЕТУ ВЕТЕРИНАРНОЇ МЕДИЦИНИ ТА БІОТЕХНОЛОГІЙ ІМЕНІ С.З. ГЖИЦЬКОГО

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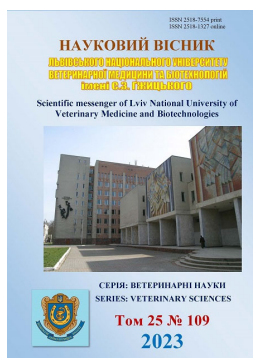
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Mammary tumors of the dog and the cat: modern approaches to classification and diagnosis (review)

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The study of oncopathology of the mammary gland of cats and dogs is a very relevant problem. This is evidenced by the presence of numerous scientific works and experimental research data of scientists from many countries. For a long time, there were no systematic approaches to the nomenclature and classification of canine and feline mammary gland tumors. That is why different countries of the world had their own national approaches to defining these pathologies. Long-term incomplete analysis of clinical cases, gaps in histopathology and interpretation of the obtained results were reflected in contradictory results, inaccuracies in terminology, definition of diagnosis and interpretations. This also inhibited clinical and experimental research, development and testing of effective drugs. Accumulation of clinical data, consolidated work of morphologists became the basis of lively discussions, which in turn was reflected in decisions to create unified classifications. Histological classification became the basis for the division of tumors of the mammary gland of cats and dogs. When conducting a scientific review, modern data from information resources and information from numerous international symposia and conferences were used. The authors also highlighted the key mechanisms of immune regulation of the oncogenic process. The role of immune cells, mediators of immune protection, in the development of oncopathology of the mammary gland is emphasized. Certain immunological tumor markers have been characterized, which are of great importance in the early stages of diagnosis. Special instrumental methods used by veterinary medicine doctors in routine diagnostics are also described. Prospects for the use of cell therapy with the use of modern immunological technologies were also made. The publication has a review and analytical nature and aims to attract the attention of scientists, diagnosticians and clinicians of various profiles to this issue, which will certainly become a continuation in the study of oncopathology. The unified classification will definitely be useful to scientists and practicing doctors, will enrich their knowledge about the mechanisms of tumor growth. We believe that a unified classification will allow researchers to use informative methods of diagnosis – both as a powerful tool in making an accurate diagnosis, and for effective approaches to differentiation and treatment strategies for patients.

Key words: mammary gland, dogs, cats, tumors, immune system.

Introduction

The majority of researchers are inclined to the polyetiological theory of the occurrence of mammary gland neoplasias in dogs and cats (Santos et al., 2015; Lidbury et al., 2017; Soremno et al., 2020; Zappulli et al., 2021). Among other species, zorema, mice have been confirmed to be of viral origin (oncornavirus). The formation and functioning of the mammary gland occurs under the influence of various hormones. To date, the influence of

sex and other hormones and the induction of target cells through the receptor system are being studied (Allison et al., 2020; Torrigiani et al., 2022). Gene polymorphisms and regulation (SNP) in exon 9 of BRCA1 and 24 of BRCA2 were studied in dogs during the development of neoplasia in the mammary gland. Endocrine changes, obesity and associated diseases are factors in the development of mammary gland pathology (Webster et al., 2020; Zhelavskiy et al., 2020; Zhelavskiy, 2021). Exogenous use of hormones (megestrol acetate and

medroxyprogesterone acetate) increases the risk of neoplasia in the mammary gland of cats and dogs (Rasotto et al., 2017; Valdivia et al., 2021).

The aim of the review was to carry out a scientific review of modern information resources, information from international symposia and conferences on the nomenclature and classification of breast tumors, as well as strategies for the treatment of oncopathology in cats and dogs.

Literature review

Immune defense mechanisms play an important role in the development of reproductive pathology (Zhelavskiy et al., 2020; Nascimento et al., 2022). It has been proven that from the beginning of neoplasia the migration of immune cells to the zone of the pathological process takes place (Zelavskiy, 2004; Sfacteria et al., 2021).

Previous studies have shown that the presence of tumor-infiltrating lymphocytes has an independent positive prognostic value in patients with breast cancer (Zhelavskiy, 2009; Tramm et al., 2018). Indeed, recent studies demonstrated that lymphocytes infiltrating the tumor were more frequently observed in the microenvironment of triple-negative breast cancer, with those located in the stromal compartment predicting longer survival (Nawaz et al., 2018; Thike et al., 2019).

Today, it is possible to determine the expression of various markers (CD3, CD4, CD8, CD20, CD56, FoxP3, CD68 and CD163) in total, stromal and intratumoral, tumor-infiltrating lymphocytes and tumor-like lymphocytes and associated macrophages (Zhelavskiy, 2021; Zhelavskiy et al., 2022; Nascimento et al., 2022).

The adaptive immune response includes B-lymphocytes (CD20⁺) and T-cells (CD3⁺), including CD4⁺ T-helper 1 and cytotoxic T-lymphocytes (CD8⁺), which oppose the development and progression of the tumor. It has been shown that CD8⁺ lymphocytes infiltrating the tumor play an important role as an antitumor component and are associated with better survival. Conversely, CD4⁺ T-helper 2 and FoxP3⁺ regulatory T-cells can promote immune escape of the tumor. In addition, NK cells (CD56⁺) are part of the innate immune system and are able to kill cancer cells without prior sensitization (Tramm et al., 2018; Nascimento et al., 2022).

Tumors of the mammary gland are common in cats and are a common oncological pathology. According to researchers, more than 85 % of registered cases of neoplastic mammary changes are malignant. Breast tumors are often represented by carcinomas consisting of one type of neoplastic epithelial cells. There are also reports of cases of benign lesions of the mammary gland, which are described as hyperplastic (or dysplastic) lesions (Misdorp et al., 1999; Zhelavskiy, 2019; Tan et al., 2020).

There are numerous data on the classification of neoplastic changes in the mammary gland of cats. Despite this, the international classification of the David Thompson Foundation deserves attention. According to the morphological principles of the tumor of the mammary gland of cats, it includes: simple, ductal and intraductal papillary adenomas, which in turn is divided

into ductal ectasia, lobular hyperplasia, epitheliosis, papillomatosis and fibroadenomatous changes (Willmann et al., 2021; Zappulli et al., 2021).

According to statistics, feline fibroadenomatosis (FAD) is one of the most common non-malignant diseases of the mammary gland. Morphologically, this neoplasia consists of both stromal ("fibro") and epithelial glandular ("adeno") proliferation. There are also other names in the literature: fibroepithelial hypertrophy, fibroadenomatous hyperplasia of the mammary gland, hypertrophy/hyperplasia/fibroadenomatous complex of the mammary gland. The clinical frequency of the lesion in the cat population can range from 13 to 20 %. It has been proven that hyperplastic changes in the mammary gland are hormone-dependent. Risk groups are cats in the period of estrus, pregnant, but also females, and cats that received sex hormone therapy (for example, megestrol acetate and medroxyprogesterone acetate) or with a history of neuro-endocrine changes (Zhelavskiy, 2017).

There are also changes in the nomenclature of canine mammary gland tumors. Numerous studies, various classifications by approach in determining the morphological diagnosis have been subject to debate and discussion (Thike et al., 2019). New studies have given scientists a basis for a new assessment of the classification of mammary gland tumors in cats. According to the modern classification (Zappulli, et al., 2019) (Table 1) there are detailed clarifications regarding fibroadenomatosis of cats. Previously (WHO, 1999), feline fibroadenomatosis of the mammary gland was included in focal changes of this organ.

Fibroadenomatosis is common among cats, although there is no conclusive evidence of its existence in dogs. Histologically, there are similar changes, but the tumors are a nodular formation with well-defined boundaries or a single or multinodular tumor that affects one or rarely more mammary glands. Usually, hormone dependence is not manifested in dogs (Table 2).

Clinical diagnostic criteria. Currently, histopathological diagnosis is the gold standard in establishing an accurate diagnosis of breast tumors. Despite this, doctors should give importance to physical examination, X-ray diagnostics and sonographic examination.

Doctors also have the method of Fine Needle Aspiration (FNA). Biopsy, often performed under the control of an ultrasound sensor, is a technological, minimally invasive, fast method. Pathologists often use Robinson's classification in practice, which allows for the assessment of cytological signs: hypercellularity, variable cell size and shape (pleomorphism, anisocytosis, macrocytosis), variable size and shape of the nucleus (anisokaryosis, macrokaryosis), increased nuclear-cytoplasmic ratio; large, protruding or multiple nucleoli, formation of nuclei; chromatin purification, chromatin clumping; the presence of abnormal multinucleated cells and mitotic indicators. As practice shows, FNA results have a reliability of 66.7–100 %.

Ultrasound (B-mode, dopplerography) is also used to diagnose breast tissue neoplasms. Valuable data are the use of quantitative acoustic radiation-force pulse elastography.

Table 1

Davis Thompson Foundation classification of canine mammary tumours (Zappulli et al., 2019), associated ICD-O-3.2 codes

Lesions	ICD-O-3.2 Codes	Category
1. Hyperplasia/Dysplasia		
1.1 Duct ectasia (DE)	NA	H
1.2 Lobular hyperplasia (LH) (adenosis)		
1.2.1 regular (LH-R)	NA	H
1.2.2 with secretory activity (LH-S)	NA	H
1.2.3 with fibrosis (LH-F)	NA	H
1.2.4 with atypia (LH-A)	NA	H
1.3 Epitheliosis (EP)	NA	H
1.4 Papillomatosis (PAP)	8060/0	H
2. Benign epithelial neoplasms		
2.1 Simple benign tumours		
2.1.1 Adenoma—simple (SAD)	8211/0	B
2.1.2 Myoepithelioma (MEP)	8982/0	B
2.2 Non-simple benign tumours		
2.2.1 Complex adenoma (CAD)	8983/0	B
2.2.2 Benign mixed tumour (BMT)	8940/0	B
2.2.3 Fibroadenoma (FAD)	9010/0	B
2.3 Ductal-associated benign tumours		
2.3.1 Ductal adenoma (DAD)	8147/0 *	B
2.3.2 Intraductal papillary adenoma (IDPA)	8503/0	B
3. Malignant neoplasms		
3.1 Carcinoma—in situ	not applied	
3.2 Simple carcinomas		
3.2.1 Tubular (including cribriform) carcinoma (STC)	8211/3	M
3.2.2 Tubulopapillary carcinoma (STPC)	8263/3	M
3.2.3 Solid carcinoma (SoC)	8230/3	M
3.2.4 Invasive micropapillary carcinoma (IMPC)	8507/3	M
3.2.5 Comedocarcinoma (CoC)	8501/3	M
3.2.6 Anaplastic carcinoma (AC)	8021/3	M
3.3 Non-simple carcinoma		
3.3.1 Carcinoma arising in complex adenoma/benign mixed tumour (C in B)	8941/3 *	M
3.3.2 Complex carcinoma (CC)	8983/3	M
3.3.3 Carcinoma and malignant myoepithelioma (C&MM)	8562/3	M
3.3.4 Mixed carcinoma (MC)	8940/3	M
3.4 Ductal-associated carcinoma		
3.4.1 Ductal carcinoma (DC)	8147/3 *	M
3.4.2 Intraductal papillary carcinoma (including papillary-cystic) (IDPC)	8503/3	M
4. Malignant epithelial neoplasms-special types		
4.1 Squamous cell carcinoma (SCC)	8070/3 *	M
4.2 Adenosquamous carcinoma (ASC)	8560/3 *	M
4.3 Mucinous carcinoma (MuC)	8480/3	M
4.4 Lipid-rich carcinoma (LRC)	8314/3	M
4.5 Spindle cell carcinoma (SPC)	8572/3 *	M
4.6 Malignant myoepithelioma (MM)	8982/3 *	M
5. Malignant mesenchymal neoplasms		
5.1 Osteosarcoma (OC)	9180/3 *	M
5.2 Chondrosarcoma (CS)	9220/3 *	M
5.3 Fibrosarcoma (FS)	8810/3 *	M
5.4 Hemangiosarcoma (HS)	9120/3 *	M
5.5 Other sarcomas (other S)	8800/3 *	M
6. Carcinosarcoma (CS)	8980/3 *	M
7. Hyperplasia/dysplasia of the Teat		
7.1 Melanosis of the skin of the teat (Skin M)	ND	H
7.2 Hyperplasia of the teat (TH)	ND	H
8. Neoplasms of the teat		
8.1 Benign ductal-associated neoplasms		
8.1.1 Ductal adenoma	8147/0 *	B
8.1.2 Intraductal papillary adenoma	8503/0	B
8.2 Malignant ductal-associated neoplasms		
8.2.1 Ductal carcinoma	8147/3 *	M
8.2.2 Intraductal papillary carcinoma	8503/3	M
8.3 Carcinoma with epidermal infiltration (Paget-like disease) (C-EI)	8540/3	M

Notes: NA, not available; H, hyperplasia/dysplasia; B, Benign tumour; M, malignant tumour. * Code assigned also when name of histotype was different but histological description identical between human and canine lesions.

Table 2
Histological Classification of Mammary Tumors of the Dog and the Cat (Misdorp et al., 1999)

<i>CANINE</i>
Malignant Tumors
1.1 <i>Noninfiltrating (in situ) carcinoma</i>
1.2 <i>Complex carcinoma</i>
1.3 <i>Simple carcinoma</i>
1.3.1 Tubulopapillary carcinoma
1.3.2 Solid carcinoma
1.3.3 Anaplastic carcinoma
1.4 <i>Special types of carcinomas</i>
1.4.1 Spindle cell carcinoma
1.4.2 Squamous cell carcinoma
1.4.3 Mucinous carcinoma
1.4.4 Lipid-rich carcinoma
1.5 <i>Sarcoma</i>
1.5.1 Fibrosarcoma
1.5.2 Osteosarcoma
1.5.3 Other sarcomas
1.6 <i>Carcinosarcoma</i>
1.7 <i>Carcinoma or sarcoma in benign tumor</i>
Benign Tumors
2.1 <i>Adenoma</i>
2.1.1 Simple adenoma
2.1.2 Complex adenoma
2.1.3 Basaloid adenoma
2.2 <i>Fibroadenoma</i>
2.2.1 Low-cellularity fibroadenoma
2.2.2 High-cellularity fibroadenoma
2.3 Benign mixed tumor
2.4 Duct papilloma
Unclassified Tumors
Mammary Hyperplasias/Dysplasias
4.1 <i>Ductal hyperplasia</i>
4.2 <i>Lobular hyperplasia</i>
4.2.1 Epithelial hyperplasia
4.2.2 Adenosis
4.3 <i>Cysts</i>
4.4 <i>Duct ectasia</i>
4.5 <i>Focal fibrosis (fibrosclerosis)</i>
4.6 <i>Gynecomastia</i>
<i>FELINE</i>
Malignant Tumors
1.1 <i>Noninfiltrating (in situ) carcinoma</i>
1.2 <i>Tubulopapillary carcinoma</i>
1.3 <i>Solid carcinoma</i>
1.4 <i>Cribriform carcinoma</i>
1.5 <i>Squamous cell carcinoma</i>
1.6 <i>Mucinous carcinoma</i>
1.7 <i>Carcinosarcoma</i>
1.8 <i>Carcinoma or sarcoma in benign tumor</i>
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2.1 <i>Adenoma</i>
2.1.1 Simple adenoma
2.1.2 Complex adenoma
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2.2.1 Low-cellularity fibroadenoma
2.2.2 High-cellularity fibroadenoma
2.3 <i>Benign mixed tumor</i>
2.4 <i>Duct papilloma</i>
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4.1 <i>Ductal hyperplasia</i>
4.2 <i>Lobular hyperplasia</i>
4.2.1 Epithelial hyperplasia
4.2.2 Adenosis
4.2.3 Fibroadenomatous change (feline mammary hypertrophy, fibro-epithelial hypertrophy)

- 4.3 Cysts
- 4.4 Duct ectasia
- 4.5 Focal fibrosis (fibrosclerosis)

Current prospects for cell therapy. The essence of the latest biotechnological techniques in cancer immunotherapy is that the doctor "adjusts" the body's immune system to identify and destroy cancer cells. Numerous studies confirm that inhibitors of immune checkpoints are the optimal approach to immunotherapy, as the immune system itself "prepares" for effective cancer control. The latest methods of treatment of patients with oncogenic pathology, which are based on the management of cytotoxic activity of T cells, are becoming increasingly important in medical practice (Nascimento et al., 2022).

This cell technology is carried out as a method of modifying the receptors of immunocompetent cells, and using the receptor structures of chimeric antigens. It is well known that lymphocytes are able to migrate throughout the body, using specific receptors to recognize foreign, mutated and oncogenic cells, as well as trigger a cascade of immune responses aimed at destroying the pathogen. Such censorship functions are possessed by a subpopulation of cytotoxic T cells (Zhelavskiy & Shunin, 2017; Sfacteria et al., 2021).

In the oncogenic process, the altered cells can "hide" from immune cells, which leads to the development of the disease. Today, the latest techniques make it possible to recognize oncogenic cells, in particular using dendrocytes, which are a kind of migrating spy cells (The Nobel Prize in Physiology or Medicine 2011 Ralph M. Steinman "For his discovery of the dendritic cell and its role in adaptive immunity").

Dendritic cells absorb and cleave proteins, as well as transfer adsorbed protein components of MHC II. Antigen presentation by active dendrocytes with T-lymphocytes occurs directly in the lymph node (Tramm et al., 2018; Zhelavskiy, 2018).

After that, activated T-killers actively multiply and form a specific clone of anti-cancer cells. In the future, cloned T-killers (on the surface of which there are protein molecules MHC I) begin to migrate throughout the body in search of oncogenic target cells. Upon recognition, the T-killer initiates apoptosis (programmed death) of the oncogenic cell.

Chimeric antigen receptor (CAR) T-cell therapy technology is becoming increasingly important in oncology, enabling clinicians to genetically reprogram patients' own immune cells and direct them to search for and attack cells with oncogenic changes. The essence of the technique is to conduct preclinical incorporation "training" of immunocompetent cells, aimed at stimulating their proliferation with the subsequent introduction of cell culture to the patient (Zhelavskiy, 2019; Nascimento et al., 2022).

Clinicians claim that the advantage of CAR therapy is the ability of inoculated immunocompetent cells to further actively multiply in the patient's body and potentiate their own immune mechanisms of antitumor protection.

Treatment of patients using the TCR Engineered T Cells method is also promising. The essence of cell

therapy is to use specific T-lymphocytes, which on their surface contains a receptor (TCR), which is a complex of integral proteins of the membrane. Stimulation of TCR T lymphocytes occurs with the participation of MHC molecules, which is a necessary condition in the antigen presentation of oncogenic cells (Tramm et al., 2018).

Also noteworthy are the studies of James P. Allison and Tasuku Honjo (The Nobel Prize in Physiology or Medicine 2018 was awarded jointly to James P. Allison and Tasuku Honjo “for their discovery of cancer therapy by inhibition of negative immune regulation”) proteins that block the immune system in oncogenic diseases. Their research is based on fundamentally new approaches to managing the inhibitory potential of the immune system to attack the tumor (Sfacteria et al., 2021).

Conclusion

Accumulation of clinical experience and histopathological data made it possible to improve the classification of tumors mammary gland in cats and dogs. The unified classification will definitely be useful to scientists and practicing doctors, it will enrich their knowledge about the mechanisms of tumor growth. We believe that a unified classification will enable researchers to make accurate diagnoses, will be the basis for differentiation and patient treatment strategies.

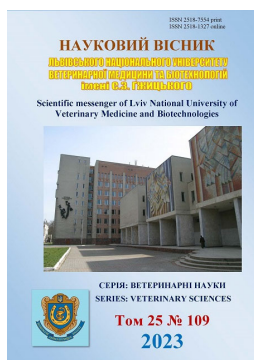
Conflict of interest

The authors declare that there is no conflict of interest.

References

- Allison, K. H., Hammond, M. E. H., Dowsett, M., McKernin, S. E., Carey, L. A., Fitzgibbons, P. L., Hayes, D. F., Lakhani, S. R., Chavez-MacGregor, M., & Perlmutter, J. (2020). Estrogen and Progesterone Receptor Testing in Breast Cancer: American Society of Clinical Oncology/College of American Pathologists Guideline Update. *Arch. Pathol Lab. Med.*, 144, 545–563. DOI: 10.5858/arpa.2019-0904-sa.
- Lidbury, J. A., Hoffmann, A. R., Ivanek, R., Cullen, J. M., Porter, B. F., Oliveira, F., Van Winkle, T. J., Grinwis, G. C., Sucholdolski, J. S., & Steiner, J. M. (2017). Interobserver Agreement Using Histological Scoring of the Canine. *J. Vet. Intern. Med.*, 31(3), 778–783. DOI: 10.1111/jvim.14684.
- Misdorp, W., Else, R. W., & Hellmén, E. (1999). Histological classification of mammary tumors of the dog and the cat. In: World Health Organization, ed. *International Histological Classification of Tumours of the Domestic Animals, Second Series. Vol VII.* Washington, DC: Armed Forces Institute of Pathology, American Registry of Pathology, 11–56.
- Nascimento, C., Gameiro, A., Correia, J., Ferreira, J., & Ferreira, F. (2022). The Landscape of Tumor-Infiltrating Immune Cells in Feline Mammary Carcinoma: Pathological and Clinical Implications. *Cells*, 11(16), 2578. DOI: 10.3390/cells11162578.
- Nawaz, M. A., Sewissy, A. A., & Soliman, T. H. A. (2018). Automated Classification of Breast Cancer Histology Images Using Deep Learning Based Convolutional Neural Networks. *Int. J. Comput. Sci. Netw. Secur.*, 18, 152–160. DOI: 10.1109/ACCESS.2018.2831280.
- Rasotto, R., Berlato, D., Goldschmidt, M. H., & Zappulli, V. (2017). Prognostic Significance of Canine Mammary Tumor Histologic Subtypes: An Observational Cohort Study of 229 Cases. *Vet. Pathol.*, 54(4), 571–578. DOI: 10.1177/0300985817698208.
- Santos, M., Correia-Gomes, C., Santos, A., de Matos, A., Dias-Pereira, P., & Lopes, C. (2015). Interobserver Reproducibility of Histological Grading of Canine Simple Mammary Carcinomas. *J. Comp. Pathol.*, 153(1), 22–27. DOI: 10.1016/j.jcpa.2015.04.005.
- Sfacteria, A., Napoli, E., Rifici, C., Comisso, D., Giambone, G., Mazzullo, G., & Marino, G. (2021). Immune Cells and Immunoglobulin Expression in the Mammary Gland Tumors of Dog. *Animals*, 11(5), 1189. DOI: 10.3390/ani11051189.
- Soremno, K. U., Worley, D. R., & Zappulli, V. (2020). Tumors of the Mammary Gland. In: Vail D. M., Thamm D. H., Liptak J. M., editors. *Withrow and MacEwen’s Small Animal Clinical Oncology*. 6th ed. Elsevier; St. Louis, MO, USA, 604–625.
- Tan, P. H., Ellis, I., Allison, K., Brogi, E., Fox, S. B., Lakhani, S., Lazar, A. J., Morris, E. A., Sahin, A., & Salgado, R. (2020). The 2019 World Health Organization classification of tumours of the breast. *Histopathology*, 77(2), 181–185. DOI: 10.1111/his.14091.
- Thike, A. A., Brogi, E., Harada, O., Oyama, T., & Tse, G. (2019). Fibroadenoma. In: WHO Classification of Tumours Editorial Board, editor. *WHO Classification of Tumours*. 5th ed. IARC Press; Lyon, France: Breast Tumours, 82–101.
- Torrigiani, F., Moccia, V., Brunetti, B., Millanta, F., Valdivia, G., Peña, L., Cavicchioli, L., & Zappulli, V. (2022). Mammary Fibroadenoma in Cats: A Matter of Classification. *Veterinary sciences*, 9(6), 253. DOI: 10.3390/vetsci9060253.
- Tramm, T., Di Caterino, T., Jylling, A. M. B., Lelkaitis, G., Laenholm, A.V., Rago, P., Tabor, T. P., Talman, M. L. M., Vouza, E., & Sci Comm, P. (2018). Standardized assessment of tumor-infiltrating lymphocytes in breast cancer: An evaluation of inter-observer agreement between pathologists. *Acta Oncol.*, 57(1), 90–94. DOI: 10.1080/0284186x.2017.1403040.
- Valdivia, G., Alonso-Diez, A., Perez-Alenza, D., & Pena, L. (2021). From Conventional to Precision Therapy in Canine Mammary Cancer: A Comprehensive Review. *Front. Vet. Sci.*, 8, 1–33. URL: <https://www.readcube.com/articles/10.3389/fvets.2021.623800>.
- Webster, J. D., Dennis, M. M., Dervisis, N., Heller, J., Tanaka, Y., Koyama, K., Horiuchi, N., Watanabe, K., & Kobayashi, Y. (2020). Relationship between Histological Grade and Histopathological Appearance in Canine Mammary Carcinomas. *J. Comp. Pathol.*, 179, 59–64. DOI: 10.1016/j.jcpa.2020.07.004.
- Willmann, M., Yuzbasiyan-Gurkan, V., Marconato, L., Dacasto, M., Hadzijušufovic, E., Hermine, O., Sadovnik, I., Gamperl, S., Schneeweiss-Gleixner, M., & Gleixner, K.V. (2021). Proposed Diagnostic Criteria and Classification of Canine Mast Cell Neoplasms: A Consensus Proposal. *Front. Vet. Sci.*, 8, 755258. DOI: 10.3389/fvets.2021.755258.

- Zappulli, V., Baldassarre, V., Brunetti, B., Burrari, G.P., Cocumelli, C., Grieco, V., Iussich, S., Maniscalco, V., Mariotti, F., & Millanta, F. (2021). Linee Guida per la Diagnosi dei Processi Iperplastici/Displastici e Neoplastici della Mammella del Cane e del Gatto; AIPVet: Dolenjske Toplice, Slovenia.
- Zappulli, V., Peña, L., Rasotto, R., Goldschmidt, M.H., Gama, A., Scruggs, J. L., & Kiupel M. (2019). Mammary tumors. In: Kiupel M., editor. Surgical Pathology of Tumors in Domestic Animals. Volume 2. Davis-Thompson DVM Foundation; Washington, DC, USA, 86–89.
- Zhelavskiy, M. M. (2004). Nespetsyfnchna reaktyvnist orhanizmu koriv pry mastyti. Naukovyi visnyk Lvivskoi natsionalnoi akademii veterynarnoi medytsyny im. S. Z. Hzhyskykoho, 6(2(1)), 31–35 (in Ukrainian).
- Zhelavskiy, M. M. (2009). Funktsionalnyi stan ta apoptoz fahotsytiv sekretu molochnoi zalozy koriv pry subklinichnomu mastyti. Visnyk Bilotserkivskoho derzhavnoho ahrarnoho universytetu: zbirnyk naukovykh prats, 60(1), 57–60 (in Ukrainian).
- Zhelavskiy, M. M. (2017). Ontogenetic features of the formation of local immune protection of the mammary gland of cows (literature review and original research). Scientific Messenger of Lviv National University of Veterinary Medicine and Biotechnologies named after S. Z. Gzhyskyj, 19(79), 3–8. DOI: 10.15421/nvlvet7801.
- Zhelavskiy, M. M. (2018). The role of epithelial cells in implementation of immune protection of the reproductive animal system local immunity. Abstracts Conference Modern Methods and Prevention in Veterinary Medicine (Lviv, November 29-30, 2018) Stepan Gzhyskyi National of Veterinary Medicine and Biotechnologies Lviv, Lviv, 164–165.
- Zhelavskiy, M. M. (2019). Immunobiological aspects of cow lactation. The Scientific Messenger of Lviv National University of Veterinary Medicine and Biotechnology. Series “Veterinary Sciences”, 21(95), 3–8. DOI: 10.32718/nvlvet9501.
- Zhelavskiy, M. M. (2019). Study of innate factors in the local immune defense of the genital organs of dogs and cats. The Scientific Messenger of Lviv National University of Veterinary Medicine and Biotechnology. Series “Veterinary Sciences”, 21(93), 98–102. DOI: 10.32718/nvlvet9317.
- Zhelavskiy, M. M., & Shunin, I. M. (2017). The status of extracellular antimicrobial potential of phagocytes genitals of cats. Scientific Messenger of Lviv National University of Veterinary Medicine and Biotechnologies named after S.Z. Gzhyskyj, 19(73), 71–74. DOI: 10.15421/nvlvet7315.
- Zhelavskiy, M. M., Kernychnyi, S. P., Dmytriv, O. Ya., & Betlinska, T. (2022). Cellular aging and immunity. Ukrainian Journal of Veterinary and Agricultural Sciences, 5(1), 8–16. DOI: 10.32718/ujvas5-1.02.
- Zhelavskiy, M. M. (2021). Biotechnological methods in reproductive medicine. Modern aspects of treatment and prevention of animal diseases: materials of the 5th All-Ukrainian Scientific and Practical Internet Conference, October 20-21, Poltava, 55–57.
- Zhelavskiy, M. M. (2021). Modern biotechnology in immunology of reproduction. Modern aspects of treatment and prevention of animal diseases: materials of the 5th All-Ukrainian Scientific and Practical Internet Conference, October, 57–59.
- Zhelavskiy, M., Kernychnyi, S., Mizyk, V., Dmytriv, O., & Betlinska, T. (2020). The importance of metabolic processes and immune responses in the development of pathology of cows during pregnancy and postpartum periods. Ukrainian Journal of Veterinary and Agricultural Sciences, 3(2), 36–41. DOI: 10.32718/ujvas3-2.06.
- Zhelavskiy, M., Shunin, I., & Midyk, S. (2020). Extracellular antibacterial defense mechanisms of neutrophil granulocytes and their role in pathogenesis of pyometra (cases) in cats. Polish Journal of Natural Sciences, 35(3), 363–378. URL: <http://www.uwm.edu.pl/polish-journal/sites/default/files/issues/articles/09-zhelavsky.pdf>.



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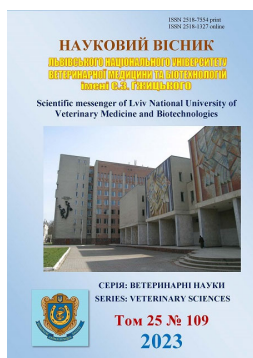
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НАУКОВИЙ ВІСНИК
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