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Prevalence and diagnostic features of external otitis in dogs and cats in veterinary clinics in Poltava

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Abstract. The relevance of the conducted research was due to the spread of otitis of various aetiologies among dogs and cats. The aim of this work was to study the prevalence of external otitis in small animals, to determine the clinical symptoms of otitis depending on different forms of progression in order to improve the diagnosis of the disease. To achieve this goal, haematological and microscopic types of studies were carried out. Cytological examination of imprint smears established the presence of epiteliocytes, lymphocytes, cerumen and dirt, and in some cases

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otodectic infestation was detected. The diagnosis of infectious diseases was carried out using immunochromatographic methods, where otitis was an accompanying disease. Leucocytosis, neutrophilia and lymphopenia were established, which developed during the acute phase of inflammation, while the chronic process was accompanied by less pronounced changes in the leucogram. Monitoring research of the intensity of otitis spread among dogs and cats was conducted in the city of Poltava in the period from March 2024 to February 2025. The obtained data indicated a significant prevalence of this pathology among dogs in the spring period. In the veterinary clinic "Aibolit" 793 cases of otitis were established, of which 705 in dogs, which amounted to 88.9%, and 88 in cats, which corresponded to 11.1%. In the veterinary clinic "MAXVET" 680 cases of otitis were recorded, among which 609 in dogs, which amounted to 89.6%, and 71 in cats, which made up 10.4%. Breed predisposition to the development of otitis in brachycephalic breeds was revealed. The most common aetiological factors of otitis were established: mechanical injuries, parasitic infestations, and complications as a result of infectious diseases. Clinical symptoms manifested as local redness, swelling of the external ear, itching and pain signs, which were accompanied by the animals' restlessness and constant scratching of the ears and the formation of exudate. The practical value of the obtained results lay in the identification of patterns of spread and aetiological factors of otitis, which expanded the possibilities of the diagnosis

Keywords: aetiology; ear diseases; cytology; haematology; otodectosis

Introduction

The full functioning of the auditory organ was an important condition for maintaining the vital activity of small domestic animals. Any disturbances in the functioning of the auditory system could significantly affect the emotional state of the animal, causing depression, anxiety, or sudden outbursts of aggression. Otitis was a common inflammatory syndrome of infectious, allergic, parasitic, or traumatic aetiology, characterised by lesions of the external, middle, or inner auditory canal, accompanied by local and systemic clinical manifestations and could lead to functional disorders of the auditory system.

D.L. Datsiuk *et al*. (2024) noted that inflammation of the ears in animals significantly affected the quality of life, led to exhaustion, decreased immunity, long-term and costly treatment. In addition, the inflammatory process was usually often complicated by secondary infection. These data were reflected in most of the studies by T. Nuttall (2023), E. Ludewig *et al*. (2024), M. Chupryna (2024). Otitis was no longer considered an isolated disease, but more and more often a complex syndrome, which was often a consequence of an underlying disease, caused by the natural predisposition of the animal's body. The most common primary causes of otitis included foreign bodies (insects, trauma, plant awns), hypersensitivity (in particular, atopy and food allergy), keratinisation disorders (most often primary idiopathic seborrhoea and hypothyroidism) and ear mites, especially in cats. Therefore, systematic diagnosis was necessary to identify the causes and contributing factors, which included: collection of anamnesis data, clinical examination, otoscopic and cytological examination, determination of cultural features and sensitivity, as well as assessment of otitis media and biopsy (in severe and recurrent cases). Depending on the underlying cause, additional tests might be required. Treatment of otitis consisted of identification

and elimination of the main factors and predisposing factors, mechanical removal of foreign elements and washing of the auditory canal, local therapy, systemic therapy if necessary, client education, further monitoring, and if necessary – preventive and supportive therapy.

J. Juhola *et al*. (2024) indicated breed predisposition to the development of otitis in dogs. Otitis was recorded in different breeds, but mixed-breed dogs, pugs, Pekingese, French bulldogs, labradors, clumber spaniels, Jack Russell terriers, chihuahuas, spitz, German shepherds and Cane Corso were more often affected. In general, otitis was one of the most common diseases in dogs. This was associated with bacteria and yeasts, which were considered secondary causes in the occurrence of otitis. M. Gracz *et al*. (2024) proved the presence of altered microRNAs in the serum of dogs affected by external otitis. MicroRNAs could modulate the host's immune response and provide biomarkers for the diagnosis of several inflammatory and infectious disorders. With the application of bioinformatics, it was found that serum microRNAs could participate in the modulation of the host's immune response. The authors demonstrated for the first time that with the help of microRNAs it was possible to effectively determine the number of serum components and its profile, which changed between healthy dogs and those affected by otitis, which could serve as potential biomarkers of the disease.

Thus, otitis in small animals was a common problem of various aetiologies, and therefore there was a wide choice of diagnostic methods. Timely and correct diagnosis, determination of the main causes of the disease, made it possible to apply the correct treatment approach. Therefore, the purpose of the work was to carry out an analysis of the main causes, patterns, and frequency of otitis in dogs and cats, depending on the season and the breed.

Literature Review

Otitis externa was one of the most common pathologies in dogs and cats, requiring long-term and complex treatment. According to J. Bajwa (2019), treatment of otitis included local and complex therapy. A frequent cause of otitis externa, especially with prolonged or improper treatment, was the excessive growth of yeast-like fungi *Malassezia* spp. In the study of S. Hobi *et al*. (2024), it was noted that *Malassezia* dermatitis was a common problem in both dogs and cats, often associated with other dermatological disorders, as well as antibiotic-induced yeast overgrowth. These data were consistent with the study of M. Tuyakhov (2024), in which *M. pachydermatis* was detected in 30% of cases of otitis in dogs, and rare cases of Candida albicans (3.3%) were also recorded, often in association with *Staphylococcus aureus*, *S. pseudintermedius* and *Proteus* spp.

Diagnosis of otitis required a thorough clinical examination and laboratory evaluation. As noted by L.S. Jacobson (2002), it was important to take into account not only infectious but also non-infectious factors that could cause otitis, in particular allergies or anatomical features. In more complicated cases or chronic forms, especially with inadequate housing conditions, otitis media or interna could develop. From an epidemiological point of view, otitis had many preconditions. D.G. O'Neill *et al*. (2021) studied the frequency and risk factors of otitis externa in dogs in the United Kingdom. It was found that certain breeds had a higher risk of the disease, and that care and hygiene conditions were also of great importance. A. Arkhypenko & V. Ushkalov (2021) found that the bacterial community of the serum of healthy dogs was characterised by high variability, with the most common type represented by *Proteobacteria*, *Actinobacteria*, *Firmicutes*, *Bacteroidetes* and *Fusobacteria*. Analysis of both alpha- and beta-diversity between pairs of samples from the left

and right ears of the same dog in the affected group showed greater differences than between paired samples of healthy dogs. In addition, there was a decrease in the number of bacteria in the affected group compared with the control and an increase in the variability of the population structure among animals affected by otitis, which was often associated with the predominance of one bacterial taxon over others. At the same time, *Staphylococcus* and *Pseudomonas* proved to be bacterial genera responsible for most of the differences between the two groups, due to differences in the structure of the bacterial community. The microbiota of the serum in healthy dogs turned out to be a complex bacterial population that underwent significant changes in animals affected by otitis.

Recurrent otitis externa was a common problem in dogs and cats. Thus, according to T. Nuttall (2023), local treatment of each outbreak was successful in the short term, but repeated cycles of inflammation and infection led to chronic inflammatory changes, pain, and antimicrobial resistance. This made outbreaks more frequent and more difficult to control. Over time, changes became irreversible and required total ablation of the auditory canal (lateral osteotomy). Most operations could be avoided if recurrent otitis was treated at an early stage. This required a different way of thinking and approach to diagnosis and treatment. All recurrent ear infections in dogs were secondary infectious processes. To achieve a good long-term outcome in the treatment of the disease, it was important to take all factors into account during diagnosis. It was especially necessary to consider possible complications that developed, in particular the formation of otohaematomas, which prolonged the treatment and rehabilitation process of animals. Traditionally, treatment was carried out in two phases: induction, to induce remission, and then long-term maintenance therapy – to prevent relapses. Treatment had to be appropriate for each dog, but usually involved ear cleaning, local antimicrobial therapy, and administration of topical or systemic glucocorticoids. New methods of treating infection and inflammation would lead to the use of additional options in the future. Understanding the triggers of recurrent otitis in dogs would help clinicians to plan effective treatment regimens that significantly improved the quality of life of the patients and the owners. D.L. Datsiuk *et al*. (2024) pointed out the significant prevalence of combined preparations, which on the one hand were effective in the treatment of otitis, and on the other hand were safe for animals. Such preparations usually had to demonstrate anti-inflammatory, antiparasitic, analgesic and immunomodulatory effects simultaneously. Therefore, the search for and development of new preparations in the system of complex preventive and therapeutic measures, especially for the external ear, was a relevant and promising direction.

A. Lorek *et al*. (2020) confirmed that short focused MRI scanning made it possible to detect inflammation of the mucous membranes, as well as to distinguish avascular material and vascularised soft tissue in the tympanic cavity. During otoscopy of dogs' ears, the tympanic membrane was found intact in 6 of 41 cases (15%), ruptured in 16 of 41 (39%), and invisible in 14 of 41 (34%) cases. At the same time, analysis of cytological samples revealed rod-shaped microorganisms associated with inflammation. M. Gracz *et al*. (2024) indicated the wide use of computed tomography (CT) for dogs and cats for the purpose of rapid and accurate diagnosis, especially in prolonged inflammatory otitis. CT analysis proved to be more sensitive for demonstrating damage to the tympanic bone wall and more effective for detecting abnormal content inside the tympanic bulla. Otitis externa was a common multifactorial disease. J. Korbelik *et al*. (2018) proved that its prevalence among

dogs reached 10%-20%. A frequent aetiological factor was fungi of ten different types. In the microbiota of all affected animals, *Malassezia* genera predominated, accounting for 55.7%-98.4%. In the affected ears there was a decrease in the number and diversity of fungi, with a significantly higher relative number of *Malassezia*. The mycobiota of fungi in dogs' ears was much more complex than revealed in cultural studies.

The study of otitis externa in dogs and cats was a relevant task of veterinary medicine, as it was a common multifactorial disease accompanied by complex inflammatory processes. Timely diagnosis, a deep understanding of pathogenesis, the use of modern imaging methods and the development of effective and safe treatment regimens made it possible to prevent the development of chronic disease, avoid surgical intervention and improve the quality of life of animals. This emphasised the need for a comprehensive approach to the prevention and treatment of otitis in veterinary practice.

Materials and Methods

The research was carried out in the period from 2024 to 2025 in private veterinary clinics of Poltava ("Aibolit", "MAXVET"). The epizootic study was conducted by the method of statistical calculation of clinical cases recorded in the studied veterinary clinics in the autumn, winter, spring and summer periods. In total, 1473 clinical cases were studied, of which 793 in the veterinary clinic "Aibolit" and 680 in the veterinary clinic "MAXVET". The diagnosis of otitis was carried out comprehensively, on the basis of anamnesis data, clinical signs and laboratory studies.

To determine the breed predisposition of dogs to the occurrence of otitis depending on the morphological type of breed (brachycephalic or non-brachycephalic), an analysis of clinical cases recorded in the veterinary clinics was carried out. The data included the breed, age, sex of the animal, as well as the presence of diagnosed external otitis. Breeds were classified as brachycephalic (for example, pug, French bulldog, Pekingese) and non-brachycephalic in accordance with the typical anatomical characteristics of the skull. To brachycephalic cat breeds were attributed, in particular, Persian, Exotic, Himalayan cats, which had a shortened skull structure and narrowed auditory canals. To assess the prevalence of otitis among each group, the percentage ratio of otitis cases to the total number of dogs of the respective group was calculated.

The research and analysis of aetiological factors of otitis in dogs and cats were carried out by means of differential diagnosis of parasitic invasion, bacterial infection and a complex of clinical changes that characterised otitis. In case of suspicion of otodectosis, microscopy of the taken material was carried out for the purpose of detecting *Otodectes* mites. Material from both ears was studied, even in cases of unilateral otitis. Material from the left and right ear was studied separately. The material was taken by immersing a cotton swab into the auditory canal and applying it to a glass slide with a drop of glycerine. All microscopic studies were carried out using a Micromed microscope (XS-5520 LED, China) at magnifications x64, x160. Cytological study of the obtained material was carried out for the purpose of assessing the cytogram (leukocytes, as well as epithelial cells) and microorganisms (bacteria, fungi). For cytological examination, smears of the taken material were prepared. The content of the proximal part of the horizontal canal was mainly studied. For this, an otoscope was carefully introduced into the ear, into the lumen of which, without touching the wall of the vertical canal, a thin cotton swab was introduced. By rotating the cotton swab, a sample of the content (earwax and/or exudate) appeared on the tip of the swab. By this approach, the formation of conglomerates in the auditory canal was avoided, without causing compaction of the content.

Before staining the obtained material, it was fixed by heating the glass slide over a flame. Haematological stains were used for staining preparations (Diff-Quik®, Quick-Diff, Wright-Giemsa, May-Grünwald and others). This process took place in four stages: in the first – haematological eosin-methylene blue stain (according to May-Grünwald) was applied for 2 min; in the second – an aqueous solution of azure-eosin stain (10 drops of Romanowsky-Giemsa stain per 10 mL of buffer), in the volume of 2 mL per slide, exposure 3 min; the third – consisted of washing with water; the fourth – envisaged drying. After staining the preparations, microscopy and evaluation of the preparation were carried out, starting from the smallest magnification (x64). Then the prepared samples were studied under higher magnification (x160). In this case, leukocytes, erythrocytes, epithelial cells, as well as neoplastic cells, yeasts, and bacteria were identified. For a more detailed examination, a magnification of x640 was used, which allowed examination of the cytoplasm of neutrophils and macrophages to detect phagocytosed bacteria as indisputable evidence of infection. By this criterion, pathogenic microorganisms were differentiated from commensals.

Haematological studies were carried out on the basis of the veterinary clinics "Aibolit" and "MAXVET" using the haematology analyser Mindray BC-20S (China). The following indicators were determined: haemoglobin content (g/L), number of erythrocytes (10^{12}/L), MCH (pg), leukocytes (10^9/L), basophils (%), eosinophils (%), neutrophils (%), lymphocytes (%) and monocytes (%). For comparison, three groups of dogs (n = 15) were formed. The first group – control, included clinically healthy animals (n = 5); the second group – included dogs with symptoms of chronic otitis (n = 5), in which itching, redness of the skin in the area of the auricle were noted; the third group – was formed of dogs that had manifestations of acute otitis (n = 5), such as the presence of swelling of the auricle and surrounding skin, the appearance of ear discharge, the presence of deposits in the form of scales and crusts inside the auricle and an unpleasant odour. Except for the control group of animals, the reference analysis, for the following indicators: haemoglobin, g/L; erythrocytes, 10^{12}/L; mean haemoglobin content in erythrocyte (MCH), pg; leukocytes, 10^9/L; basophils %, eosinophils %, neutrophils %, lymphocytes %, and monocytes %, was carried out on the basis of the data of J.W. Harvey (2001).

Differential diagnosis of infectious diseases was carried out comprehensively, taking into account anamnesis data, clinical symptoms and the results of express tests. The research with animals was carried out according to the requirements of international principles European Convention for the Protection of Vertebrate Animals Used for Research and Other Scientific Purposes (1986), Law of Ukraine No. 3447-IV (2006). Statistical processing of the research results included determination of Student's t-test ($P < 0.05$, $P < 0.01$, $P < 0.001$, the results were considered statistically significant with varying degrees of reliability in relation to the values of the corresponding indicator in the control). For statistical processing of the data, the computer programme STATISTICA 7.0 (Stat Soft, USA) was used.

Results and Discussion

The study of the prevalence of otitis registered in the veterinary clinic "Aibolit" established that the largest number of cases was registered in the spring period – 293. Otitis was most often diagnosed in dogs – 250 cases (85.3%). At the same time, the number of otitis cases by aetiological factor amounted to: 174 – allergic, 51 – infectious bacterial, 12 – traumatic, 11 – infectious fungal, 2 – parasitic. In 43 cats, otitis was registered, which amounted to 14.7%.

At the same time, the number of otitis cases by aetiological factor amounted to: 21 – traumatic, 13 – allergic and 9 – parasitic. In the summer period, 222 cases of otitis were recorded. Otitis was most often registered in dogs – in 199 cases (89.6%). At the same time, the number of otitis cases by aetiological factor amounted to: 112 – allergic, 68 – infectious bacterial, 11 – parasitic, 4 – infectious fungal and 4 – traumatic. In cats the number of cases amounted to 23 (by aetiological factor: 7 – parasitic, 15 – traumatic and 2 – allergic). The results of the number of registered otitis cases in dogs and cats in the veterinary clinic "Aibolit" are presented in Figure 1.

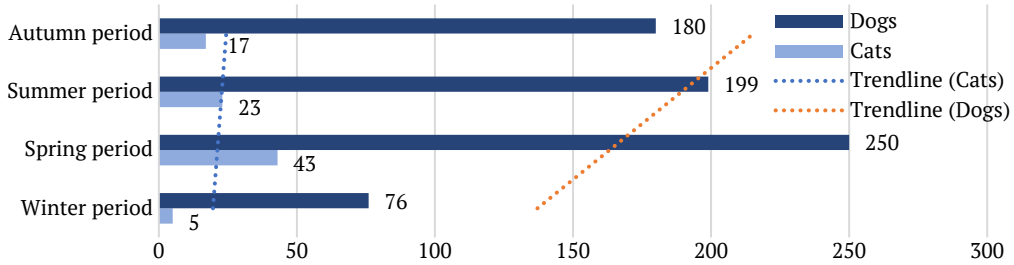

Figure 1. The number of registered cases of otitis in dogs and cats (individuals) in the veterinary clinic "Aibolit" (Poltava)

***Source**: authors' development*

In the autumn period, 197 cases were established, of which in dogs – 180 (91.4%). At the same time, the number of otitis cases by aetiological factor amounted to: 41 – allergic, 101 – infectious bacterial, 26 – infectious fungal, 11 – traumatic and 1 – parasitic. In cats 17 cases of otitis were registered, of which: 5 – parasitic, 7 – traumatic and 5 – allergic. The smallest number of cases was registered in the winter period – 81, of which in dogs – 76 cases (93.8%), of which: 58 – allergic, 28 – infectious bacterial and 4 – infectious fungal. In 5 (6.2%) cats, otitis was diagnosed, of which: in 1 – allergic and 4 – traumatic. The obtained data indicated a significant prevalence of otitis in dogs and most often the disease was registered in brachycephals (pugs, French and English bulldogs, Pekingese) – 368 cases (Fig. 2).

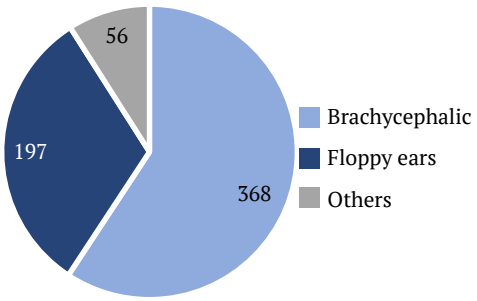

Figure 2. Quantitative ratio and breed predisposition of dogs (individuals) to the occurrence of otitis

***Source**: authors' development*

Similar results were also recorded in the veterinary clinic "MAXVET". In particular, during the study period 680 cases of otitis were registered, of which: in dogs – 609, which amounted

to 89.6%; in cats – 71, which corresponded to 10.4%. The research results of the number of otitis cases in dogs and cats depending on the season are presented in Figure 3.

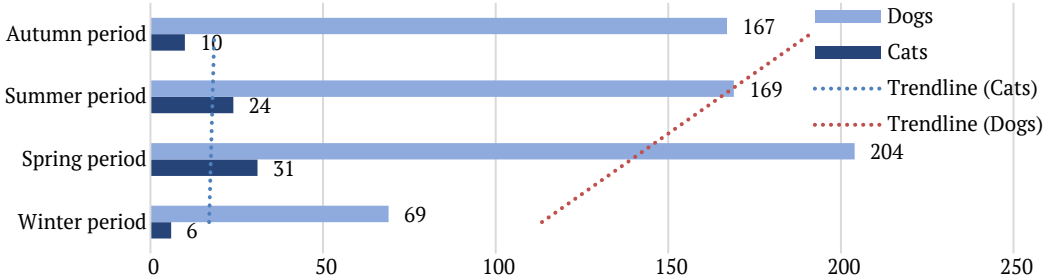

Figure 3. The number of registered cases of otitis in dogs and cats (individuals) in the veterinary clinic "MAXVET" (Poltava)

***Source**: authors' development*

The largest number of otitis cases was registered in the spring period – 235. Otitis was most often registered in dogs – 204 cases (86.8%), of which: 113 – allergic, 46 – infectious bacterial, 10 – infectious fungal, 25 – traumatic and 10 – parasitic. In cats, otitis was registered in 31 cases (13.2%), of which: 7 – parasitic, 16 – traumatic and 8 – allergic. In the winter period otitis was diagnosed in 75 cases. In dogs – 69 cases (92%), of which: 43 – allergic, 1 – infectious viral (complication after carnivorous plague), 15 – infectious bacterial, of which 8 were caused by staphylococci, 7 by streptococci; 2 – infectious fungal and 8 – traumatic. In cats 6 cases of otitis were registered (8%), of which: 4 – parasitic (otodectosis), 1 – allergic and 1 – traumatic.

In the summer period 193 cases of otitis were registered. In dogs – 169 (87.6%), of which: 101 – allergic, 33 – infectious bacterial, 5 – infectious fungal, 19 – traumatic and 11 – parasitic. In cats 24 cases of otitis were registered (12.4%), of which: 7 – parasitic, 15 – traumatic and 2 – allergic. In the autumn period 177 cases of otitis were diagnosed. In dogs – 167 (94.4%), of which: 45 – allergic, 69 – infectious bacterial, 46 – infectious fungal, 5 – traumatic and 2 – parasitic. In cats 10 cases of otitis were registered (5.6%), of which: 1 – parasitic, 5 – traumatic and 4 – allergic. The obtained data indicated a significant prevalence of otitis in dogs, most often it was registered in brachycephals – 404 cases (Fig. 4).

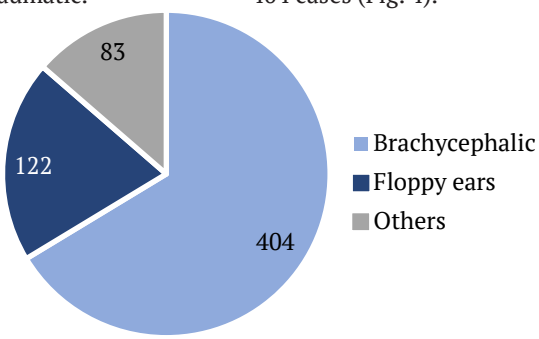

Figure 4. Quantitative ratio and breed predisposition of dogs (individuals) to the occurrence of otitis

***Source**: authors' development*

R. Schuenemann *et al.* (2022) indicated that the only breeds that suffered from chronic otitis were French bulldogs with a prevalence of 35/66 (53%) and pugs with a prevalence of 20/79 (25%). Similar results were described by D. Krainer & G. Dupré (2021), who found that otitis media was more common in French bulldogs than in pugs and was not related to the size of the nasopharynx. Clinical symptoms in dogs with otitis were characterised by a set of non-specific signs, discharges were rarely registered, which were recorded during a prolonged inflammatory process with the subsequent layering of secondary microflora. Cytological examination of ear deposits established the presence of lymphocytes and conglomerates of epithelial cells that had dystrophic features. Unlike bacteria and yeasts present in small numbers in healthy ears, leukocytes appeared in the external ear space exclusively during inflammation by exocytosis through damaged epithelium.

During the study, the diagnosis of otitis in dogs and cats in both clinics was carried out according to a set of non-specific symptoms, among which the most common were: redness and swelling of the external ear (Fig. 5A), constant itching and pain, which manifested as animal restlessness and constant scratching of the ears; formation of exudate, which was released, sometimes with an unpleasant odour. In more complex cases, inflammation of the middle and inner ear could develop, accompanied by the spread of infection, loss of balance, changes in animal behaviour. Diagnosis of these conditions required additional research methods (X-ray, magnetic resonance imaging or computed tomography) in order to assess the depth of the lesion. Carrying out cytological research was effective in all cases of otitis in dogs and cats. Cytological examination could detect and assess the presence of microorganisms, leukocyte cells (Fig. 5B) and mycelium in otomicoses. To detect microorganisms and assess the inflammatory response in the external ear, cytological research was used. Cytological examination of ear deposits in otitis established the presence of epitheliocytes, lymphocytes, sulphur, and dirt. Epitheliocytes (epidermal cells) were present in small numbers.

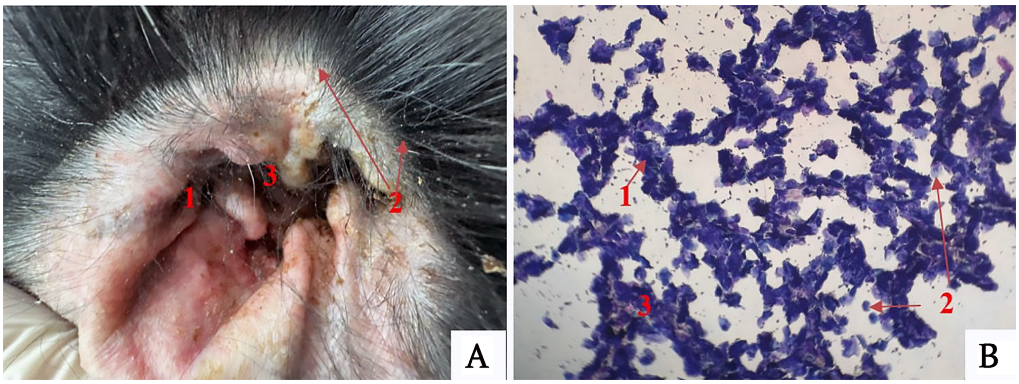

Figure 5. Examples of diagnostic examination results for the detection of otitis

***Note**: A – clinical case of otitis in a dog: 1 – hyperaemia of the skin of the external ear, 2 – discharge of serous exudate, 3 – accumulation of serous exudate and dirt in the lumen of the ear canal. B – cytology of serous exudate from the lumen of the ear canal: 1 – epitheliocytes, 2 – lymphocyte cells, 3 – dirt*

***Source**: photo by the authors*

Otodectosis invasion in cats was an extremely widespread acariasis invasion. *O. cynotis* was a common commensal of the skin microbiota of the external auditory canal of cats, and its impact on the body of cats was possible only with a decrease in the general resistance of the body and dysfunction of organs and systems. In the studied material (crusts and exudate taken from the ears of the studied animals), both mites at different stages of development and the eggs were detected (Figs. 6, 7).

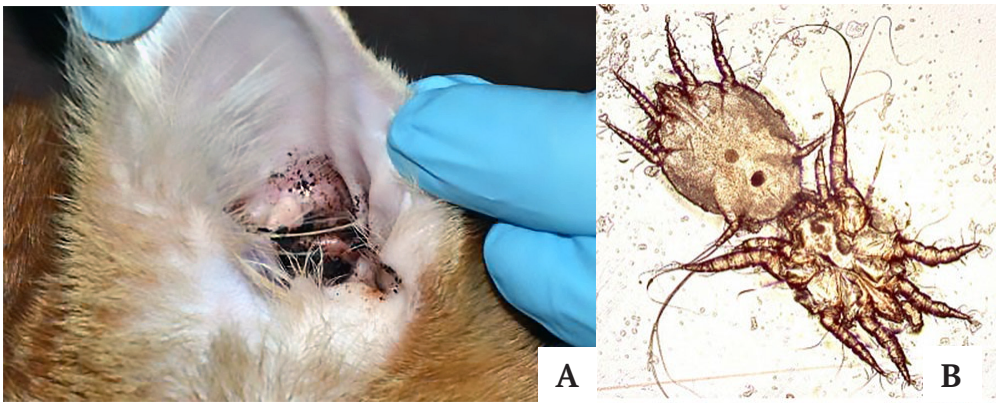

Figure 6. Clinical case of otodectosis in a cat and mite invasion of the genus Otodectes spp
***Note**: A – hyperaemia of the skin of the external ear and layering in the form of serous exudate and dirt in the lumen of the ear canal of the cat are shown; B – mite invasion Otodectes spp., which was detected using microscopy*
***Source**: photo by the authors*

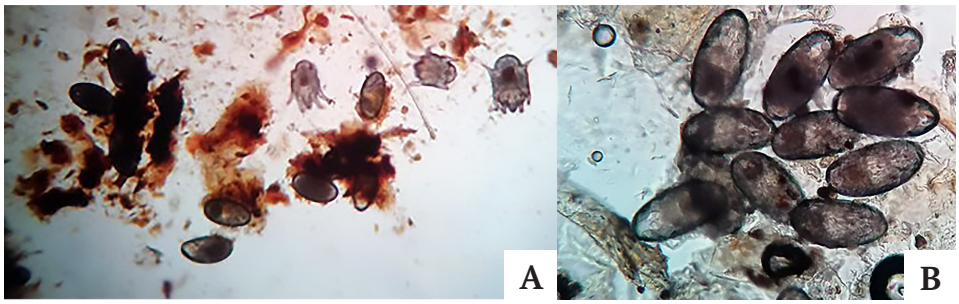

Figure 7. Otodectes cynotis mites at different stages of development
***Note**: A – Otodectes cynotis mites at different stages of development and mite eggs in a sample taken from a cat's ear, ×40; B – Otodectes cynotis mite eggs in a sample taken from a cat's ear, ×100*
***Source**: photo by the authors*

From Figures 6 and 7, it was seen that the pathogen had a flat oval-shaped body, its size varied from 0.6 to 0.7 mm. In the material taken from the sick animal, mites and eggs were found both as single specimens and in large numbers. Considering the localisation

site of the detected mites, as well as the features of the morphological structure of the body, the final diagnosis was established – feline otodectosis. In urban areas, the most common habitat of cats was flats or private houses, as well as streets and yards. Analysing the level of infestation of animals depending on the keeping conditions, it was found that animals kept in private houses or flats without access to the yard were affected the least.

During the study period in veterinary clinics of Poltava, the highest prevalence of otitis among dogs was noted. In the veterinary clinic "Aybolit" 793 cases of otitis were established, of which in dogs – 705, which accounted for 88.9%, in cats – 88, which corresponded to 11.1%. In the veterinary clinic "MAXVET" 680 cases of otitis were registered, among which in dogs 609 cases were recorded, which accounted for 89.6%, in cats – 71 cases, which accounted for 10.4%. A natural predisposition was found in brachycephalic breeds – pugs, bulldogs, and Pekingese. It was established that cats of different breeds turned out to be prone to otodectosis invasion. It was worth noting that the level of infestation in different cat breeds was unequal. In particular, acarological studies proved that crossbreeds were the most susceptible to *O. cynotis* mite infestation. In addition, it was established that such breeds as Scottish Fold, Siamese and Persian cats were quite susceptible to otodectes infestation. The least affected were Burmese, Maine Coon and Bengal cats.

According to the studies carried out on haemoglobin content, the number of erythrocytes and the mean haemoglobin content in the erythrocyte (MCH), it was possible to determine the general state of the organism and the course of pathological changes that occurred in different forms of otitis, as well as to detect latent changes in the organism, the degree of damage, severity of the disease course and existing complications. The research results were presented in Table 1.

Table 1. Indicators of erythropoiesis in the blood of dogs with otitis of different forms

Indicator	Reference data according to J.W. Harvey (2001	Control group, n = 5	Sick dogs (acute otitis), n = 5	Sick dogs (chronic form of otitis), n = 5
Hemoglobin, g/L	124.0-169.0	148.34 ± 3.67	95.63 ± 1.68**	97.61 ± 5.85**
Erythrocytes, 1012/L	5.2-8.8	6.98 ± 0.27	3.73 ± 0.13***	4.21 ± 0.23***
Mean haemoglobin content in erythrocyte (MCH), pg	19.0-25.6	21.82 ± 0.68	24.80 ± 0.44**	23.45 ± 0.82*

Note**: the difference between groups of clinically healthy and sick dogs was reliable at P < 0.05*, P < 0.01**, P < 0.001, compared with the values of the control group*
***Source**: authors' development*

The comparative assessment of erythropoiesis indicators in clinically healthy dogs and in dogs with otitis showed that in dogs with the acute form of otitis, haemoglobin levels decreased by 35.5% (P < 0.01), and with chronic course – by 34.2% (P < 0.01) compared with the control group. This indicated the development of anaemic syndrome against the background of the inflammatory process, which was especially pronounced in the acute stage of the disease. The number of erythrocytes decreased by 46.6% (P < 0.001) in acute otitis and by 39.7% (P < 0.001) in chronic otitis compared with the control group. Such a pronounced erythrocytopenia might have been a consequence of both suppression of erythropoiesis and increased destruction of erythrocytes or blood loss. In the acute course of otitis, the mean haemoglobin

content in the erythrocyte (MCH) on the contrary increased by 13.7% (P < 0.01), and in chronic – by 7.5% (P < 0.01) compared with the control group. This might have indicated compensatory activation of the megaloblastic type of erythropoiesis or a macrocytic nature of anaemia. The obtained results indicated a pronounced anaemic reaction of the dogs' organism to the development of otitis, which was manifested by a decrease in haemoglobin content and erythrocyte count. The increase in MCH could be regarded as a compensatory reaction aimed at maintaining oxygen transport against the background of a reduced number of erythrocytes. The research results indicated that in dogs with otitis, especially with acute course, significant disturbances of the erythropoiesis system were observed. The established decrease in haemoglobin content and erythrocyte count with simultaneous increase in MCH indicated the development of anaemia with signs of compensation. The obtained results could be used as additional criteria for assessing the severity of the inflammatory process and the effectiveness of treatment of sick animals. The clinical condition analysis of dogs with otitis also envisaged the study of the leukocyte profile of the blood. The obtained results are presented in Table 2.

Table 2. Indicators of leukocyte profile in the blood of dogs with otitis of different courses

Indicator		Reference data according to J.W. Harvey (2001)	Control group of animals, n = 15	Sick dogs (acute otitis), n = 5	Sick dogs (chronic form of otitis) (n = 5)
Leukocytes, 109/L		5.9-13.4	8.24 ± 0.55	13.39 ± 0.25 ***	13.04 ± 0.49***
Basophils, %		0.0-1.0	0.4 4 ± 0.13	0.82 ± 0.06	0.35 ± 0.04
Eosinophils, %		3.0-4.0	3.4 1 ± 0.13	4.26 ± 0.20***	2.58 ± 0.43***
Neutrophils, %	Juvenile	0.0-1.0	0.2 6 ± 0.09	0.44 ± 0.17	0.17 ± 0.12
	Band	2.0-5.0	3. 29 ± 0.24	0.54 ± 0.17	3.18 ± 0.16
	Segmented	46.0-57.0	47.25 ± 1.05	56.14 ± 0.46***	45.43 ± 0.16***
Lymphocytes, %		32.0-45.0	34.43 ± 1.13	22.48 ± 1.14**	34.21 ± 1.98
Monocytes, %		2.0-3.0	2.6 8 ± 0.13	1.93 ± 0.22	1.04 ± 0.15

Note**: the difference between groups of clinically healthy and sick dogs was reliable at P < 0.05*, P < 0.01**, P < 0.001, compared with the control group*
***Source**: authors' development*

As a result, it was noted that the number of leukocytes in the blood of dogs with acute otitis increased by 62.5% (P < 0.001), and with chronic course – by 58.3% (P < 0.001) compared with the control group. These data indicated an active inflammatory reaction of the organism, typical for both forms of the disease. In the case of acute otitis, the number of basophils in the blood increased by 1.9 times, whereas with chronic course – it decreased by 1.3 times, but remained within the physiological range. This indicated a minimal contribution of basophil cells to the pathogenesis of otitis. The number of eosinophils in acute otitis increased 1.3 times (P < 0.001) compared with the control group, which might have indicated increased sensitivity or the presence of an allergic component in the course of the inflammatory process. In contrast, with chronic otitis, there was a decrease of 1.3 times, which was probably associated with a decrease in the intensity of the immune response. In the quantitative changes of segmented neutrophils, a divergent dynamic was noted: in acute otitis the content increased 1.2 times (P < 0.001) compared with the control group of dogs, which indicated

an active phagocytic response. In the case of chronic process, on the contrary, there was a slight decrease ($P < 0.001$), which might have been a sign of adaptation or immune exhaustion. In the case of lymphocytes in acute otitis in dogs, a decrease in the number by 1.5 times ($P < 0.01$) compared with the control group was recorded, which might have indicated redistribution of the cell pool in favour of neutrophils in the acute phase of inflammation. In the case of chronic otitis, the number of lymphocytes in the blood of sick dogs remained practically unchanged. The number of monocytes also decreased, but no statistically significant difference was observed. This might have indicated reduced activity of the monocyte-macrophage system in long-term or recurrent inflammation.

Thus, the obtained data indicated that in dogs with otitis, especially in acute form, pronounced changes in the leukogram were observed, which reflected functional tension of the immune system in response to inflammation. The main markers of the acute phase of otitis were leukocytosis, neutrophilia, eosinophilia and lymphopenia. In chronic process, less pronounced changes were observed, but a characteristic gradual decrease in the number of monocytes and eosinophils in the blood was revealed, which indicated transformation of the inflammatory process into a less active phase. The described results could be used as diagnostic criteria for assessing the stage and dynamics of the disease.

The established regularities indicated the presence of an inflammatory type of leukocyte reaction in dogs with otitis, which manifested as pronounced leukocytosis, neutrophilia, lymphopenia and changes in the number of eosinophils and monocytes. In particular, in acute otitis the total number of leukocytes increased, which corresponded to the classical picture of the acute phase of inflammation. These changes, as noted by R. Schuenemann *et al.* (2022), might have been the result of activation of the immune system, in particular stimulation of myelopoiesis under the influence of pro-inflammatory cytokines (IL-1β, TNF-α), which increased the release of neutrophils from the bone marrow. Dominant neutrophilia, which was observed in acute otitis, was a typical manifestation of the infectious–inflammatory process in dogs. It ensured a phagocytic response and was an early marker of bacterial infection. Lymphopenia, registered in animals with acute otitis, was often a component of stress-leukogram, caused by endogenous secretion of glucocorticoids in response to pain or systemic inflammation. Whereas in chronic otitis, the number of lymphocytes remained stable, which indicated a decrease in the activity of the immune response or the development of immunological tolerance.

As noted by T. Nuttall (2023), an increase in the number of eosinophils in the blood during otitis in dogs might have indicated the involvement of hypersensitive or allergic reactions in the pathogenesis of the disease, particularly against the background of parasitic infection or mycotic invasion. A decrease in the number of eosinophils in the case of chronic course of the disease was probably associated with exhaustion of the immune response or suppression of the eosinophil pool. A significant decrease in the number of monocytes in chronic otitis reflected prolonged load on the monocyte–macrophage system, depletion of reserve or transition of the inflammatory process into a less active phase. Thus, the obtained haematological indicators corresponded to the modern understanding of the pathophysiology of otitis in dogs. Leukocytosis with neutrophilia and lymphopenia were informative criteria of the acute phase of inflammation, whereas chronic process was accompanied by less pronounced but stable changes in the leukogram. Special attention should have been paid to the

assessment of eosinophils, since an increase in the number might have been a sign of additional allergic or parasitic component, which had important therapeutic significance.

The results of the conducted study confirmed the high prevalence of otitis in dogs (88.9%-89.6%) compared with cats (11%-14%). Most often otitis was recorded in spring, which was associated with seasonal exacerbation of allergies, increased parasite activity, as well as changes in climatic conditions, which might have contributed to the accumulation of pathogenic microorganisms in the lumen of the ear canal. In dogs, allergic and infectious-bacterial forms of otitis predominated. In cats, traumatic and parasitic forms were most often diagnosed, in particular otodectosis (*Otodectes cynotis*), which was consistent with the data of B. Mosallanej *et al.* (2011). A natural predisposition to otitis was established in brachycephalic breeds (pugs, bulldogs, Pekingese), which was associated with the anatomical features of the auditory canals, and the obtained data coincided with the studies of L.N. Gotthelf (2004).

Cytological examination of the ear content proved its informativeness in establishing the aetiology of otitis. Microscopy itself, as emphasised by R.S. Rosales *et al*. (2024), was an important primary diagnostic stage, which made it possible to identify inflammatory cells, fungal structures, parasites or bacterial microflora. An important complicating factor in treatment was antibiotic resistance of pathogens, as revealed by G. Borriello *et al*. (2020). Cases caused by *Pseudomonas aeruginosa* required special attention, as this bacterium was able to form biofilms, which significantly reduced the effectiveness of antibiotic therapy (Tanveer *et al*., 2024).

Compared with the clinical data obtained in this study, which confirmed a high level of leukocytosis, neutrophilia, eosinophilia in acute forms of otitis and the development of anaemic syndrome (reduction of Hb, RBC), the results of C. Lecchi *et al.* (2021) indicated an increased number of pro-inflammatory cytokines (IL-1β, TNF-α). It was also important to take into account the data of S. Hobi *et al.* (2024), which indicated a disturbance of the normal bacterial composition of microorganisms as a potential therapeutic feature, especially in recurrent forms of otitis. J.W. Harvey (2001) described in detail the diagnostic and therapeutic strategies, which fully coincided with the approaches implemented in veterinary clinics of Poltava: cytological diagnostics, antibiotic sensitivity testing, local and systemic therapy depending on the form and aetiology of the disease. In addition, the results of the present study were consistent with the data of L.S. Jacobson (2002), who pointed out the importance of considering morphological changes in the chronic course of the disease, as well as with E. Milne *et al.* (2020), who described the use of antibiotic therapy effective against resistant strains of microorganisms. Prevention of chronic otitis was possible only under conditions of comprehensive veterinary supervision, as indicated by M.B. Mascarenhas (2022).

Thus, otitis was a common disease among dogs and cats, especially in the spring period, with a predominance of cases among mixed-breed dogs, pugs, French bulldogs and labradors. The most frequent causes were mechanical injuries, parasitic infestations and complications of infections, and the symptoms were itching, pain, exudate and redness of the auricle. Acute otitis was accompanied by anaemia and pronounced leucocytosis, whereas in the chronic course a moderate decrease in haemoglobin and a persistent increase in the level of leucocytes were noted.

Conclusions

The obtained data indicated a significant prevalence of otitis among dogs, especially in the spring period. In the veterinary clinic “Aibolit”

793 cases of otitis were identified, of which 705 were dogs, which amounted to 88.9%, and 88 were cats, which amounted to 11.1%. In the veterinary clinic "MAXVET" 680 cases of otitis were identified, of which 609 were dogs, which corresponded to 89.6%, and 71 were cats, which amounted to 10.4%. Otitis was registered in different breeds, but it was most often observed in mixed breeds, pugs, French bulldogs, Pekingese, Labradors, Clumber spaniels, Jack Russell terriers, Chihuahuas, Spitz, German shepherds and Cane Corso. It was established that cats of different breeds were prone to otodectosis invasion. It was worth noting that the level of invasion in different cat breeds was not the same; it was proved that the most susceptible were cats: crossbreeds, Scottish Fold, Siamese and Persian. The least vulnerable breeds were Burmese, Maine Coon and Bengal cats. The most frequent aetiological factors of otitis media were: mechanical injuries, parasitic invasions and complications of infectious diseases. Diagnosis of otitis media in dogs and cats was carried out on the basis of a set of non-specific symptoms, among which the most common were: redness and swelling of the external ear, constant itching and pain, manifested by animal restlessness, constant scratching of the ear, exudate formation, sometimes with an unpleasant odour. Cytological examination of ear deposits in otitis media showed the presence of some epithelial cells, lymphocytes, sulphur, and dirt. Inclusions of melanin granules were found in the cytoplasm of keratinocytes. Haematological indicators in the acute course of otitis were characterised by a decrease in haemoglobin level by 35.5% and the development of anaemia. In addition, an increase in the blood of the number of leukocytes by 65.2%, segmented neutrophils by 1.2 times, basophils by 1.9 times and eosinophils by 1.3 times was found, which was caused by the acute inflammatory process against the background of the underlying disease. The chronic course of otitis was characterised by a decrease in blood haemoglobin content by 34.2% and an increase in the number of leukocytes by 58.3%, which was caused by the prolonged course of the inflammatory process.

In-depth study of the aetiological factors of otitis in dogs and cats, taking into account breed, age and seasonal features, remained a relevant and promising area of veterinary medicine. Further research had to be aimed at improving methods of early diagnosis, in particular non-invasive laboratory and visualisation approaches, as well as at a comprehensive assessment of immunological, haematological and cytological changes in various forms of otitis. This made it possible to improve the personalised approach to the treatment and prevention of the disease, taking into account the individual characteristics of animals.

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Conflict of Interest

None.

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Поширеність та діагностичні особливості зовнішніх отитів у собак та котів в умовах ветеринарних клінік м. Полтава

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Анотація. Актуальність проведених досліджень зумовлена поширенням отитів різної етіології серед собак та котів. Метою цієї роботи було дослідити поширеність зовнішніх отитів у дрібних тварин, визначити клінічні симптоми отитів в залежності від різних форм перебігу для покращення діагностики захворювання. Для досягнення поставленої мети проводились гематологічні та мікроскопічні види досліджень. Цитологічним дослідженням мазків відбитків встановлено наявність епітеліоцитів, лімфоцитів, сірки та бруду, подекуди виявлено отодектозну інвазію. Діагностику інфекційних хвороб здійснювали за допомогою імунохроматографічних методів, де отит був супутнім захворюванням. Встановлено лейкоцитоз, нейтрофілію та лімфопенією, що розвивались під час гострої фази запалення, тоді як хронічний процес супроводжувався менш вираженими змінами в лейкограмі. Моніторингове дослідження інтенсивності поширення отитів серед собак та котів проводилось в місті Полтава у період з березня 2024 року до лютого 2025 року. Отримані дані свідчать про значну поширеність цієї патології серед собак у весняний період. У ветеринарній клініці «Айболить» встановлено 793 випадки отиту, з них у собак – 705, що становило 88,9 %, а у котів – 88, що відповідало 11,1 %. У ветеринарній клініці «MAXVET» зафіксовано 680 випадків отиту, серед яких у собак зареєстровано 609, що становило 89,6 %, а у котів – 71, що складало 10,4 %. Виявлено породну схильність до розвитку отиту в брахіцефальних порід. Встановлено найпоширеніші етіологічні чинники отитів: механічні пошкодження, паразитарні інвазії та ускладнення внаслідок інфекційних захворювань. Клінічні симптоми проявлялися локальним почервонінням, набряком зовнішнього вуха, свербіжем та больовими ознаками, що супроводжувалось занепокоєнням тварин і постійним розчухуванням вух та утворенням ексудату. Практична цінність отриманих результатів полягає у виявленні закономірностей поширення та етіологічних чинників отитів, що розширює можливості їх діагностування

Ключові слова: етіологія; хвороби вух; цитологія; гематологія; отодектоз