Sickness Rate of Service Dogs in Cynological Centers of Ukraine

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Abstract. Service dogs are an important asset of law enforcement agencies. Therefore, understanding their medical problems, knowing general characteristics such as numbers, age, breed, gender, and purpose is crucial to maintaining their health and readiness to perform complex tasks. Analysis and dissemination of such information is an urgent task for specialists and scientists dealing with the problems of keeping, providing, and veterinary care for service dogs. The purpose of this study was to analyse the results of statistical reports on the incidence of service dogs from 24 regional canine centres of law enforcement agencies of Ukraine. In total, data on 822 service dogs and records of 839 cases of diseases were considered. Data on the number, age, gender, and direction of use of service dogs were also analysed. It was found that internal non-contagious ailments were identified among the diseases. Most of the problems were with the gastrointestinal tract: dyspepsia, alimentary enteritis, and gastritis. It was found that among the diseases of the visual and hearing organs, otitis media and cataracts were most often detected. Traumatic injuries accounted for 16.7% of all records, most of which were classified as wounds. It was found that every seventh disease was related to the skin. Among them, two diseases had a considerable predominance: dermatitis and eczema. Another group was detected with a frequency of more than 5% – parasitic diseases, of which babesiosis was the most common. The study also found that one in twenty animals had diseases of the musculoskeletal system, of which arthritis and hip dysplasia were mainly found. Statistical calculations have shown heterogeneity in the distribution density of dogs, both in relation to the population and the area of the region. Chernivtsi Oblast had the best density indicators, and Zhytomyr Oblast had the lowest. Among service dogs, females have an advantage – sexual differentiation was 1/1.15. An even distribution of the number of service dogs by age was found, ranging from 2 to 7 years, with a weighted average age of 4.9 years. The most common breeds were: German and Belgian shepherds, as well as Labrador. Special and search dogs prevailed for their intended purpose. The practical value of this study lies in the fact that certain patterns of morbidity of service dogs provide an opportunity to change the strategy of their selection, training, and treatment to use this valuable resource more effectively

Keywords: cynological units, differentiation of diseases, number, age, breeds, sex, areas of use of service dogs

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INTRODUCTION

Since their domestication over 30,000 years ago, dogs have played a significant role in human evolution (Wang *et al.*, 2016). Domestic dogs (*Canis lupus familiaris*) are common in modern society, helping people in various situations. Among domestic animals, dogs have the most developed intelligence. In tests of elementary mental activity, they demonstrate high results, inferior only to great apes, dolphins, and some birds. For instance, dogs successfully solve cognitive tasks to extrapolate the direction of movement of an object and tasks to operate with the empirical dimension of shapes. S. Coren (2016) points out that according to several behavioural indicators, the mental abilities of dogs are close to those of a human child aged 2 to 2.5 years. The strongest instinct of a dog is social behaviour, which manifests itself not only in relation to its species, but also in interspecific interaction. After studying about 500 mammals, Oxford University scientists S. Shultz & R. Dunbar (2010) reported that dogs are the most social of domestic animals. The listed aspects made it the best friend and helper of human from all domesticated animals.

However, dogs have some qualities that allow using them as helpers for special needs. The value of dogs lies in the ability to perform tasks that humans cannot perform, such as detecting odours. Search for explosives, drugs, psychotropic substances, search work, security, and protection – these are functional properties that allowed distinguishing some breeds in the group of service dogs for performing specialised tasks.

Bezpalova *et al.* (2019) note that today, both in Ukraine and around the world, service (working) dogs are used for a vast range of activities – from protection to involvement in combat operations. They are usually used in the field of law enforcement and rescue structures (army, border guards, police, fire departments, customs, mountain rescue services, etc.) where the conditions of maintenance and use differ substantially from the environment where domestic dogs exist.

Service dogs of cynological units of law enforcement agencies perform a variety of tasks, which are usually characterised by considerable deviations from the average loads inherent in pets. This determines the specific features of their maintenance and use, which in turn creates the presence of specific health issues.

Issues with the incidence of service dogs are widely covered in the scientific literature. Currently, there is no centralised method for tracking traumatic injuries or illnesses in service dogs used in law enforcement or the armed forces. However, a memorial site has been created that contains an extensive list of service dogs that have died or been euthanised in service from 1940 to the present day, and new cases are regularly added (Cortina, 2022). M. Martini *et al.* (2017) note that collecting data on the causes of injury or death in dogs can help develop new treatment, care, and training strategies that can increase their survival.

Numerous results of studies on the incidence of service dogs have been published. Various causes of their death, euthanasia, or culling are reported in the studies, the main ones being osteoarthritis, degenerative joint disease (Parr *et al.*, 2013; Moore *et al.*, 2001), neoplasia (Evans *et al.*, 2017; Jennings & Butzin, 1992), as well as diseases of the gastrointestinal tract (Moore *et al.*, 2008; Andrews *et al.*, 2018). Among similar studies conducted in Ukraine, it is necessary to pay attention to the papers of Levchenko (2008), Fasolia (2011), Gudyma (2013), Demchuk *et al.* (2005).

The development of a progressive approach to animal husbandry sets new, more humane requirements for animals. M. Demchuk and O. Staennyi (2005) point out that the realisation that an animal is not a mechanism endowed with receptors and reflexes, but a living being with its inherent behaviour, feelings of fear, pain, joy, with its individual needs and personality, not only physiological, but also mental, is necessary for every person. M. Cobb *et al.* (2021) emphasise that the issue of morbidity of any dog, including service dogs, should be considered in a broader aspect, namely, from the standpoint of the animal welfare concept. D. Mellor *et al.* (2020) argue that the current idea of animal welfare comprises 5 domains: 1 – nutrition, 2 – physical environment, 3 – health, 4 – behavioural interactions, 5 – mental state. Two of them, the health and mental state of the animal, directly affect the incidence of service dogs.

Data collection for all domains is of broad practical importance. The identified quantitative characteristics allow analysing and identifying the causes of diseases, generalising by breed, age, features of maintenance and performance of official tasks, etc. Equally important is the creation of open databases, based on which to determine the full profile of the risk to which dogs are exposed. Maintaining healthy police dogs costs up to $1,500 per year (Royal Canadian Mounted Police, 2022). Given the massive costs of acquiring, training, and maintaining highly qualified animals, such as service dogs, information from such databases can change strategies for selecting, training, and treating animals to make better use of this valuable resource.

In modern society, statistics is one of the main tools for analysing any data. Processing and analysis of information allows obtaining the necessary generalisations and draw conclusions about further correction at the macro- and micro-levels of the phenomena and processes under study. *The purpose of this study* was to evaluate statistical data on the morbidity, breed, age, and gender structure of service dogs in the dog training centres of law enforcement agencies of Ukraine.

MATERIALS AND METHODS

To fulfil this purpose, statistical research methods were used, namely: a one-time observation plan and a variational method of grouping by the features under study.

Indicators for calculations were taken from a specialised reporting form, developed by scientific and pedagogical staff of the department, which was sent by the organisation department of the canine service of the National Police of Ukraine to all canine centres. Statistical observations were based on the annual reports of 24 dog training units of the law enforcement agencies of Ukraine for 2021. The objects of observation were service dogs. The study took place in four stages.

The first stage included receiving reports from 24 dog training centres according to a specialised reporting form. The main information concerned the incidence of service dogs. A total of 839 cases of pathologies and lesions were described. The reports also contained information on the total number of dogs, their gender, and breed differentiation, the age of the animals and the number depending on the area of application. The status of animal sterilisation was not recorded.

At the second stage, the received data was verified.

At the third stage, two databases were formed: database 1 – indicators of morbidity of service dogs; database 2 – indicators of the number, age, breeds, gender, and area of use of service dogs.

The final fourth stage included statistical calculations and analysis of the results obtained.

Calculations were performed in the standard Microsoft Excel 2013 package.

RESULTS AND DISCUSSION

The extent of diseases in dogs depends on many factors. The study of Uddin *et al.* (2021) shows that such dependence can be based on age, gender, breed, and even season. For service dogs, the risk level for pathologies and lesions increases due to the specifics of the tasks they perform. Therefore, first, the authors consider the statistical calculations regarding the number, breed, age, and gender differentiation and the distribution by purpose of service dogs from 24 cynological centres of Ukraine.

Number of service dogs. The study used data on 822 dogs. The number of service dogs in regional dog training centres of Ukraine is presented in Figure 1.

***Figure 1**. Number of service dogs in dog training centres of Ukraine*

The number of service dogs involved in the law enforcement agencies of different countries varies substantially. There are also no registers of their number, which generates different information. In 2010, D. Watson, director of the North American Police Dog Association, estimated that there could be about 50,000 active police dogs in the United States. But that figure may be higher now, given the growing need for trained pups to help officers and sniff out bombs and drugs (Surprising cause of…, 2021). There are about 2,500 animals working in the UK police force (Who we help, 2004). The official police report of the Ministry of Defence shows that the real number of dogs in this department from 2012 to 2018 ranged from 210 to 283 individuals (Police Dog and Police Horse…, 2019).

The kennel unit of the Sri Lanka Police currently has about 250 working dogs in 56 different locations in the country (Dissanayake *et al.*, 2021). The Finnish police employ 260 police dogs and 240 dog handlers (Police dogs, 2022). There are about 2,500 combat and service dogs in the service of the US Army (Lagutchik *et al.*, 2018).

However, an essential point of such statistics is not the quantity, but the quality of providing service dogs to certain regions in different countries. Therefore, truthful information is statistics of relative indicators that show the density of dogs per unit area or the population of the region where the dog training unit patrols. The following is a comparison of the results of the authors' own research and data from three urban and county dog training centres in Poland, which geographically borders

Ukraine and has many similar socio-cultural features (Gąsiorowski, 2019). The comparison results are presented in Table 1. Ukraine is represented by three regions: Chernivtsi, Dnipropetrovsk, and Zhytomyr oblasts, respectively, with the highest, average, and minimum density in terms of the ratio of population and service dogs.

Table 1. *Density of service dogs in different regions of Ukraine and Poland*

Regions	Number of service dogs (N)	Population, people (P)	Area, km² (S)	P/N	S/N
Ukraine					
Dnipro	79	3,176,648	31,914	40,211	404
Zhytomyr	24	1,208,212	29,832	50,342	1243
Chernivtsi	30	901,632	8,097	30,054	270
Poland					
Bydgoszcz	89	2,086,210	17,972	23,441	202
Białystok	64	1,188,800	20,187	18,575	315
Gorzów	29	1,018,084	13,988	35,106	482

Source: *compiled by the author*

Density indicators for Ukraine are worse than in Poland, except for the Chernivtsi Oblast. But the real need for service dogs is mainly determined by the number of tasks they have to perform, although relative indicators usually correlate with the population density of the region (Shichor *et al.* 1979; Nolan, 2004).

Distribution by gender. The generalised results of the study of the sexual differentiation of service dogs showed that females are more often used in cynological units of Ukraine, and the ratio between males and females is 1/1.15.

Both males and females are excellent service dogs. But statistics from the United States, Canada, Great Britain, Australia, and New Zealand show that males significantly outnumber females. Thus, females make up only 15% of working dogs in Alberta (Canada). In the United States, most dogs that work for the police are males (Is There a Reason…., 2022). During operations Desert Shield and Desert Storm, the United States deployed 118 military working dogs to the Persian Gulf theatre. The sex ratio was 80% of intact males, 12% of neutered females, and 8% of neutered males (Burkman *et al.*, 2001).

Gender plays a substantial role in the abilities of a service dog, such as the ability to detect drugs. German Shepherd males are much easier to train than females. Intact German Shepherd males and females are much more trainable than castrated dogs (Abdel Fattah & Abdel-Hamid, 2020). Male dogs are more aggressive and stronger, so they are often chosen for police service. Most K9 dogs are males. However, females are increasingly joining the work as K9 service dogs (K10 Workingdogs, 2022). But they are used more for a special purpose: detecting bombs, drugs, contraband, etc.

Age indicators. Analysis of the distribution of service dogs by age in selected cynological centres of Ukraine showed a uniform distribution of the number with a gradation of 12 months, except for young (up to 1 year, 1.95%) and old dogs (over 7 years, 17.9%) (Table 2). The weighted average age of a service dog was 4.9 years.

Table 2. *Distribution of service dogs by age*

Age of the dog	Up to 1 year	1-2 years	2-3 years	3-4 years	4-5 years	5-6 years	6-7 years	Over 7 years
Amount, %	1.95	11.9	14.8	16.2	14.8	13.5	8.2	17.9

Source: *compiled by the author*

Since different breeds are used in law enforcement, the lifespan of service dogs can vary greatly. In general, their life age can range from 9 to 15 years. According to a survey of police canines in New Zealand, the average age of 158 service dogs was 3.2 years (Baltzer *et al.*, 2019). A similar figure for 1,220 police dogs referred to Baghdad Veterinary Hospital in 2015-2017 was 4.6 years (Tamimi & Wali, 2019). The average age of military working dogs used during Operation Iraqi Freedom II was 6.33 years (Toffoli & Rolfe, 2006).

A thorough investigation of the age indicators of service dogs divided into seven categories of service is presented in the paper (Kania-Gierdziewicz *et al.*, 2018). Considerable variability in the age of dogs at the time of discharge was observed depending on the type of service. Thus, dogs used in riot control units were released at the age of 5.1 years, and service dogs of the patrol and investigative service and anti-terrorist units – at the age of 7 years. The oldest age at the time of release was reached by dogs of the patrol, investigative, and guard

service, which were 9 years old or older at the time of discharge. Service life was highest in patrol and investigative dogs, at 7.6 and 7.5 years, respectively. The length of service in certain groups showed similar trends to those observed for the previously considered indicator, i.e.,

the age at dismissal. Gender differentiation. The service dog breeds in 24 cynological centres of were analysed. It was established that 6 breeds are mainly used in law enforcement agencies, among which Labrador, German and Belgian Shepherds are most often involved (Fig. 2).
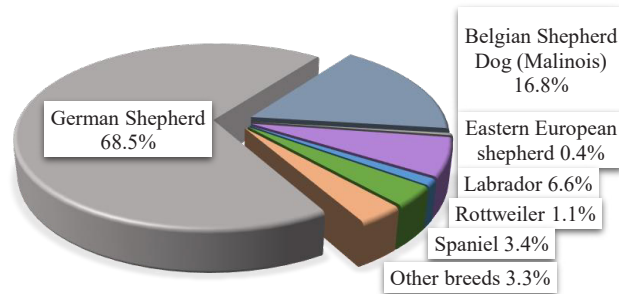

Figure 2. Number of service dogs in dog training centres of Ukraine

According to K-9, the most popular breeds are German Shepherds, Belgian Malinois, Dutch Shepherds, and sometimes hybrids of these breeds. Rottweiler, Dobermann, and Flemish Bouvier are less popular. Other breeds are more commonly used as searchers (National Police Dog Foundation, 2021).

The UK Metropolitan Police has approximately 320 dogs working in 6 key locations in North, South, East, and West London, including a dog training facility. Approximately 60% are general purpose dogs. These are mainly German Shepherds or Belgian Malinois. The remaining 40% are specialised search dogs (English springer spaniels, Labradors, and cocker spaniels) (Metropolitan Police Service, 2016).

In the Polish police, the best breed is the German Shepherd. Research results show that more than 73% of dog handlers work with dogs of this breed. Belgian Shepherds are less popular, as only 14.9% of the surveyed dog handlers work with them. The Labrador breed is the least used (1.95%) (Gąsiorowski, 2019).

Similar information can be found in the review (Zink & Schlehr, 2020), which states that the German Shepherd, Belgian Malinois, and Labrador Retriever are the most common breeds of working dogs.

A similar pattern is observed among military dogs. An analysis of the release of 268 US Department of Defense service dogs between 2000 and 2004 found that the main breeds were German Shepherds (120 animals) and Belgian Malinois (100 animals) (Evans, 2007).

Areas of use. Service dogs perform various tasks. They are used in activities related to the search for narcotic drugs (weapons, money), prevention of terrorist manifestations, search for explosives, detention of individuals who are trying to leave the crime scene, when searching for tools or means of committing an offence, to help search for the bodies of dead or missing people, to identify traces of blood, to maintain public safety and order, etc. (Allsopp, 2012). Therefore, the number of service dogs and how they are used may vary. This is also related to the developed strategies of countries according to their policies and needs to achieve the most efficient operation of the dog training service.

In practice, depending on the functional use, the following groups of service dogs are most often distinguished: search, patrol-search, special, convoy, sentry. According to this distribution, an analysis of the use of service dogs of the law enforcement agencies of Ukraine was carried out (Table 3).

Table 3. Distribution of service dogs of law enforcement agencies of Ukraine depending on the application

Search	Special	Patrol and search services	Convoys	Sentries	Backup services	Other
38.81	41.73	7.66	1.46	2.31	7.3	0.24

Source: compiled by the author

As of April 2019, 646 dog handlers and 929 service dogs worked in the dog training units of the National Police of Ukraine, of which 390 or 42% were search dogs (Garmash, 2019).

For instance, in Turkey, dog handlers are trained in six different areas: narcotics, explosives, arms smuggling,

intelligence, corpses and patrol dogs, and the most suitable field of activity for each dog is determined through special ability tests, after which training is carried out in a particular area (Sebnem Ozcan *et al.*, 2009).

In Poland, most dog handlers work with patrol and tracking/sniffing dogs (50.65%). They accompany

police officers on patrol and take part in measures to ensure and restore public order during mass events, mass gatherings and pursuits of suspected criminals, ambushes, and blockades. Overall, more than half of the dogs have single skills compared to individuals that have "dual" skills. Among the categories of dogs with special abilities, the group of dogs trained to detect the smell of drugs is most represented (11.69%). A small percentage of dogs are trained to detect the smell of explosives (3.25%) (Gąsiorowski, 2019).

Morbidity of service dogs. In the study, 839 records of diseases of service dogs in the cynological centres of Ukraine were analysed. They are divided into 10 sectors (Fig. 3). This differentiation allows identifying the 5 most common groups of diseases (together 82.9%), for further and more thorough analysis.
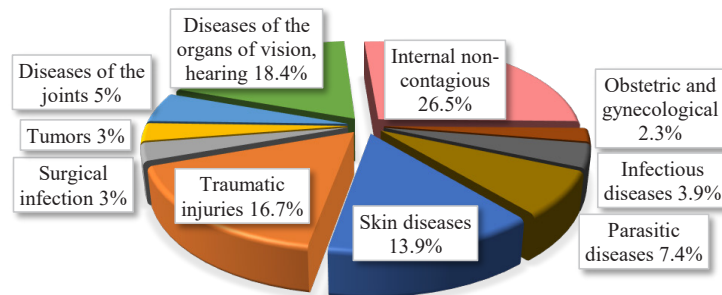

Figure 3. *Group differentiation of diseases of service dogs of canine centres of Ukraine*

It was found that more than a quarter of all cases are related to internal non-infectious diseases, most of which are associated with the gastrointestinal tract. The following positions were taken by diseases of the visual and hearing organs, injuries, skin diseases, and parasitic ones.

There are some scientific papers that provide generalised data from large-scale studies on the incidence of service dogs. Thus, an analysis of the incidence of 1,220 police dogs sent to the Baghdad Veterinary Hospital in 2015-2017 (mainly German Shepherds and Belgian Malinois, whose average age was 4.6 years) showed that congestive heart failure, babesiosis, various malignant tumours, and intestinal parasites were diagnosed most often (Tamimi & Wali, 2019).

In the paper cited earlier, Uddin *et al.* (2021) analysed data on 1,557 cases of various diseases collected in the registration book of the Dhaka Central Veterinary Hospital (Bangladesh). The results showed that the highest proportional morbidity was noted for infectious diseases (53.8%), followed by non-infectious diseases (23.4%) and the lowest for non-specific (22.7%) cases.

Quantification of medical problems in 774 military working dogs (US) and analysis of factors associated with common diseases between one and six years of age (mean 2.6±0.5) revealed that 83% of dogs had non-surgical medical problems. The most common of these were dermatological (25%), alimentary (21%), dental (15%), soft tissue injuries (10%), and musculoskeletal conditions (4%) (Schuh-Renner *et al.*, 2021).

A retrospective study of the causes of death or euthanasia of 927 U.S. military working dogs found that 76.3% of cases were associated with appendicular degenerative joint disease, neoplasia, spinal cord disease, non-specific ageing, and stomach inversion. The authors of the study also claim that for most military service dogs, death or euthanasia is the result of several diseases usually associated with old age (Moore *et al.*, 2001).

Analysis of the incidence of service dogs in Ukraine showed that the largest share of problems is associated with internal non-infectious diseases (26.5%), most of which are related to the gastrointestinal tract (69.8%). Among the pathologies of the gastrointestinal tract, there are three problems: dyspepsia, alimentary enteritis, and gastritis (Fig. 4). These diseases cover almost three-quarters of all problems with the digestive system and just over half (51.3%) of all internal non-infectious diseases.
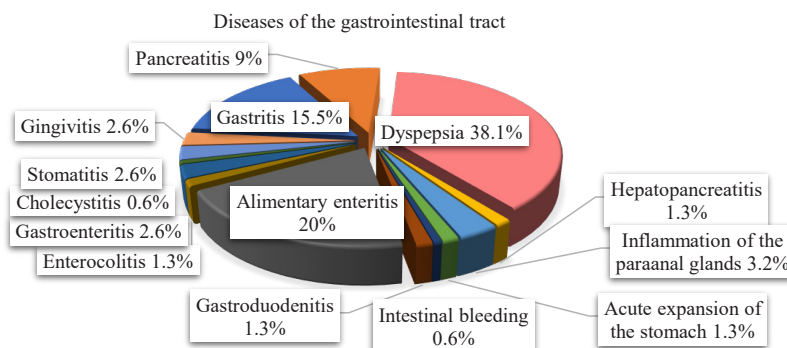

Figure 4. *Distribution of gastrointestinal diseases in service dogs of Ukraine*

Among other non-infectious diseases that are not related to the digestive system, most of the records were related to the respiratory system (8.1%) and allergies (5.4%).

The study by J. Alves *et al.* (2021) analysed dyspepsia problems in service police dogs. Among 188 animals with an average age of 5.2 years (80 Malinois, 52 German Shepherds, 25 Labradors and 19 Dutch Shepherds), the prevalence of diarrhoea was 10.6%, and 4% were diagnosed with a liquid form. In 151 police dogs (sentries and search for explosive objects) used to protect organisations of high economic importance and tourism in Egypt, diarrhoea occurred in 9.1%, vomiting – in 5.2% (Haithem *et al.*, 2011). G. Rakha *et al.* (2015) conducted an extensive study of 3,864 dogs in the city of Cairo, which showed that diarrhoea with vomiting occurred in 29.2% of animals.

Alimentary enteritis is mainly caused by improper feeding of dogs, i.e., it occurs due to problems with the upkeep and maintenance of animals. This arouses the interest of researchers in this problem rather as management and upkeep features than the morbidity of dogs, despite their purpose. In a study of military dogs, Schuh-A. Renner *et al.* (2021) showed that among the most common non-surgical medical problems, alimentary problems were also in second place (21% of records).

Regarding gastritis, the study by N. Tamimi and A. Wali (2019) indicated a small proportion of animals that had a similar pathology in service dogs (0.66%). In the study of J. Alves *et al.* (2021), a comparable situation was found in domestic dogs (1.94%).

Problems with the organs of sight and hearing in Ukrainian service dogs were noted in 154 records. Most diseases of the visual organs are associated with cataracts (7.75% of all records), hearing organs – with otitis media (9.65% of all records) (Fig. 5).
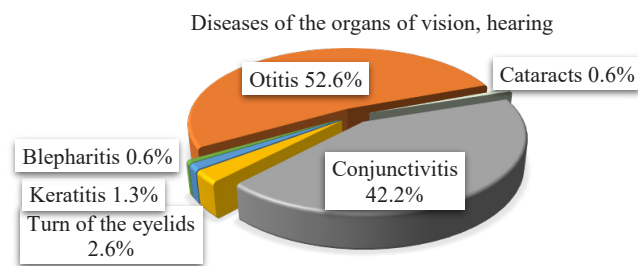
Diseases of the organs of vision, hearing

Figure 5. Diseases of the visual and hearing organs in service dogs of Ukraine

Eye diseases substantially affect the professional fitness of dogs. Thus, ophthalmic diseases in police and military dogs were the cause of 1.4% of medical emergencies (Parr *et al.*, 2013), 2.4% of discharges from service (Evans *et al.*, 2007) and 11% of deaths and euthanasia (Moore *et al.*, 2001). In a study of 71 service dogs (61 police, 10 handlers), eye abnormalities were found in 38 (54%) animals, the most common of which was primary cataract (Oliveira *et al.*, 2020).

Analysis of the spread of otitis media had different results. In the previously cited work (Tamimi & Wali, 2019), the prevalence of otitis in service police dogs is 2.95%. In the general population of dogs, otitis is more common. A detailed analysis of a random sample of 3,884 dogs in England revealed that otitis externa was the most common type (prevalence 10.2%, 95% CI: 9.1-11.3) (Neill *et al.*, 2014). Comparable results were obtained in South Korea, where ear and mammary gland diseases accounted for 10.4% (Kim *et al.*, 2018). In the study of pathologies of service dogs of Ukraine, traumatic lesions were found to be the third most common. It is logical that for this category of pathologies, the predominant share is occupied by wounds (62.1%) because most of the tasks performed by dogs are associated with traumatic risks (Fig. 6).
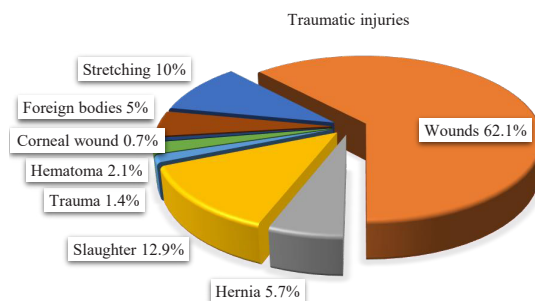
Traumatic injuries

Figure 6. Traumatic lesions of service dogs of Ukraine

Trauma, defined as tissue damage caused by violence or accident that occurs suddenly and involves physical damage to the body, is a common cause of morbidity and death in dogs. In Fleming *et al.* (2011), large-scale epidemiologic studies of age-, size-, and breed-specific mortality in North American dogs from 1984 to 2004 show that trauma accounts for 11-13% of all animals evaluated in urban veterinary hospitals. Among the

causes of death of 74,556 dogs, trauma was the second most common cause of death in young dogs (after infectious diseases) and adult dogs (after neoplasia).

A statistical evaluation of the trauma of 315 client dogs from 4 veterinary hospitals (USA) showed the following distribution of injuries: blunt (54.9%), penetrating 34%, unknown 11.1% (Hall *et al.*, 2014).

A retrospective study of the deaths of 867 civilian U.S. law enforcement dogs in the line of duty from 2002 to 2012 found that in 318 cases, the deaths were classified as traumatic. Causes of death or euthanasia included: motor vehicle collision (25.8%), heatstroke (24.8%) and penetrating ballistic injury (23%) (Stojsih *et al.*, 2014).

Interesting results were obtained in the works of P. Fox *et al.* (2008) and K. Slensky *et al.* (2004), which identified the types and incidence of acute injuries and illnesses to working dogs during deployment and rescue operations at the World Trade Center following the September 11, 2001, terrorist attack. The first study examined 27 dogs of the New York City Police Department, the

second – 96 search and rescue dogs. Specific conditions related to cuts accounted for 9.3 cases per 1,000 hours of active deployment in the first study, and 5 cases per 1,000 hours of search in the second.

Another study (Edwards *et al.*, 2021) compared the prevalence of injury types among military working, operational, and civilian dogs (193, 35, and 20,699 records, respectively) showed that all groups showed similar trends in injury type. Penetrating injuries were the most common, followed by blunt injuries for civilian and operational dogs. An equal proportion of blunt and penetrating injuries was observed in military dogs. Furthermore, in the study by Takara & Harrell (2014) it is shown that, among the biggest problems of military dogs, non-combat-related soft tissue injuries accounted for 21%.

The next part of the presented study concerns skin diseases in service dogs of Ukraine. Most skin problems related to two diseases: eczema and dermatitis (Fig. 7). In 117 records about skin diseases, eczema accounted for 6.67%, dermatitis – 6.91% (of the total number of records).
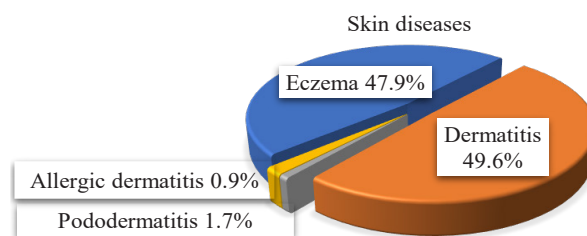
Skin diseases

Eczema 47.9%

Dermatitis 49.6%

Allergic dermatitis 0.9%

Pododermatitis 1.7%

Figure 7. *Skin diseases in service dogs of Ukraine*

The skin is the largest organ of the body with many functions such as thermoregulation, immune defence, sensory perception, vitamin D production, and it acts as a barrier between the animal and its environment.

For instance, according to the results of research by Hierdieva *et al.* (2020) on the spread of diseases of non-contagious aetiology in the city of Dnipro, it was established that 20.75% of all cases concern skin diseases. In the structure of these pathologies, dermatitis and eczema are found in the absolute majority, which make up 38.16% and 24.32% of cases, respectively.

Police dogs in Egypt had serious skin diseases. Itching as a sign of a skin problem was recorded in every fourth animal (24.8%) (Haithem *et al.*, 2011). Ticks (16.4%) created more problems. A similar result was obtained for military dogs. The most common non-combat-related problems were dermatological conditions (25%) (Takara & Harrell, 2014). Thus, every fourth to fifth dog has problems with skin diseases. This applies to both special animals and pets. In the study of the incidence of service dogs in Ukraine, the fifth place in frequency of distribution belongs to parasitic diseases (Fig. 8).
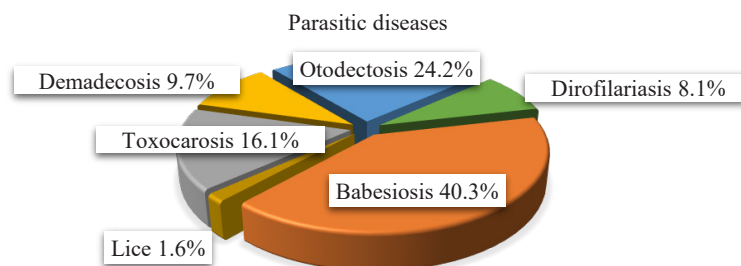
Parasitic diseases

Demadecosis 9.7%

Otodectosis 24.2%

Dirofilariasis 8.1%

Toxocarosis 16.1%

Babesiosis 40.3%

Lice 1.6%

Figure 8. *Parasitic diseases of service dogs of Ukraine*

More than 80% of the problems related to three parasitic diseases. The following were the most common of them: babesiosis (40.3%), otodectosis (24.2%) and toxocarosis (16.1%).

Studies of the incidence of service dogs in Ukraine have established significant problems with babesiosis. This disease is spreading rapidly in Central and North-Eastern Europe, and its appearance correlates with the rapid and successful spread of the decorative dog tick (*Dermacentor reticulatus*) population in this area (Bajer *et al.*, 2022). As a result of epizootological monitoring of babesiosis in dogs (Mokryi & Ksyonz, 2017), 7,866 cases of the disease were registered in Poltava over a 9-year period (from 2007 to 2016). Among sick animals, males outnumber females by 20%. Dogs aged 2 to 3 years are the most affected (11.1-16%). Regarding the breed ratio, most cases concern pure-bred dogs (20.9%), German shepherds (13.9%) and Rottweilers (7.5%).

Comparable results were found in a study of 242 blood samples from K9 police dogs in Egypt. Haematological, biochemical, and oxidative stress analysis of blood performed together with expression analysis using two genes (interferon-gamma [IFN-γ] and tumour necrosis factor-alpha [TNF-α]) showed that 25.6% of blood samples were positive for *B.vogeli* infection. Infection rates were higher in males than in females (Zaki *et al.*, 2021).

Some canine parasitic infections, even if they have little or no effect on the dog itself, are zoonotic and capable of causing disease or disease in humans (Saari *et al.*, 2019).

Studies of non-systemic ecto- and endoparasitism in dogs in Spain (Martínez-Carrasco *et al.*, 2007) showed that faecal stages of parasites were found in 25% of dogs. The species frequency was 6-10% for *Toxocara canis*, *Ancylostomatidae spp.*, *Toxascaris leonina* and *Isospora canis* and 0.4-1% for *Trichuris vulpis*, *Giardia lamblia* and *Dipylidium caninum*. Fleas, ticks, and lice were found in 38%, 6% and 2% of stray dogs.

A study of the prevalence, intensity, and risk factors of ectoparasite infection among 333 dogs was conducted in Nigeria. Two hundred and seventy-one dogs (81.4%) were infected with at least one type of ectoparasite, and multiple infestations were registered, mainly among females. Six species of ectoparasites of three taxa were identified: ticks (*Rhipicephalus sanguineus sensu lato*, *Haemaphysalis leachii* and *Amblyomma variegatum*), fleas (*Ctenocephalides canis* and *C. felis*) and louse (*Heterodoxus spiniger*). The most common was *R. sanguineus s.l.* (70.3%), followed by *C. felis* (42.1%) and *H. spiniger* (30%) (Abdulkareem *et al.*, 2018).

Faecal samples from 180 police and domestic dogs in Egypt were collected and then analysed (Ahmed *et al.*, 2014) by various flotation and sedimentation methods. The prevalence of gastrointestinal parasites in police dogs was 7.5%, and in domestic dogs – 40%. Examination of the faeces of 120 police dogs revealed *Toxocara canis* eggs in 0.8%, *Ancylsotoma caninum* in 1.7%, *Trichuris vulpis* in 0.8%, *Cystoisospora canis* in 4.2%, and *Giardia species* in 1.7%.

A study of 39 police dogs in Iraq aged 6 months to 12 years showed that 15 (38.46%) animals were diagnosed with moderate or severe microfilariasis (Al-Salihi *et al.*, 2019). A monitoring programme, aimed at diagnosing subcutaneous heartworm and heartworm in working (police and military) dogs in Slovakia, was performed in the period from September 2007 to February 2008. 710 dogs (591 police and 119 military) were examined for the presence of microfilariae in the blood. They were found in the samples of 118 (20%) police and 10 (8.4%) military dogs. In several areas of southern Slovakia, the prevalence of subcutaneous dirofilariasis in working dogs exceeded 40% (Miterpáková *et al.*, 2010).

In a study of 668 dogs in Sri Lanka, 25.3% were infected with 7 variants of haemoparasites. The prevalence of infections among military dogs was 22.5%, of which *B. gibsoni* was the most common (13.8%) (Rajakaruna *et al.*, 2021). Among other pathologies, it is important to pay attention to diseases of the musculoskeletal system because the mobility of service dogs can be decisive for the performance of most of the tasks set before them, and, as a rule, is the main reason for the culling of animals. In our study, 5% of animals with such diseases were found, of which arthritis and hip dysplasia were found in 66.7% and 23.8% of cases, respectively.

It is known that the peculiarity of German shepherds, which comprise the majority of personnel in canine units, is orthopaedic problems. Thus, according to A. Worth *et al.* (2013), the reasons for the loss or retirement of New Zealand police German Shepherds of the nominal age for planned retirement (8 years) reached only 40% of dogs. The main reason for culling was the inability to cope with physical demands (65%) due to diseases of the musculoskeletal system. A comparison of emergency department medical records at the University of Pennsylvania Veterinary Hospital from July 2008 to July 2010 showed that orthopaedic issues in German Shepherds were significantly more common in police dogs compared to domestic dogs (Parr & Otto, 2013).

Within the scope of this work, it is practically impossible to give a comprehensive description of all diseases and pathologies of service dogs of the security forces of Ukraine. Out of more than 80 names, a significant part of the diseases in the records occupies less than 1%. In addition, a dog can have two or more diseases at the same time (Galatyuk *et al.*, 2019). The reports did not indicate the presence of multiple pathologies, but many animals had more than one disease, as evidenced by the preponderance of the number of entries (839) over the official number of dogs (822). Therefore, this topic requires further research on the study of multiple pathologies of service dogs.

CONCLUSIONS

An analysis of the records of the incidence of service dogs in 24 cynological centres of Ukraine showed that 82.9% of all cases refer to five groups of diseases: internal

non-contagious diseases (26.5%), organs of vision and hearing (18.4%), traumatic lesions (16.7%), diseases skin (13.9%) and parasitic diseases (7.4%).

The most common diseases and pathologies were dyspepsia, alimentary enteritis, gastritis, otitis, cataract, traumatic wounds, dermatitis, eczema, and babesiosis. It was found that one in twenty animals had problems with the musculoskeletal system, of which arthritis and hip dysplasia were the most common.

Statistical features of the number, breed, age, and sex structure of service dogs have been established. In the cynological centres of Ukraine, the most common breeds were the German Shepherd – 68.5%, the Belgian Shepherd – 16.8% and the Labrador – 6.6%, while special (41.9%) and search (39%) dogs prevailed by purpose. The predominance of females (53.4%) over males was also revealed, which is not characteristic of canine units of the power structures of other countries.

Given the high costs incurred by state and local governments in acquiring, training and maintaining highly trained dogs, as well as the entire infrastructure that supports the canine service, it would seem appropriate to create a broad database that would be distributed across government levels and include all issues that refer to service dogs considered in this work. It is also important to study these issues in dynamics. This will enable a more thorough determination of the full risk profile to which service dogs are exposed. Open information provides the opportunity to identify certain patterns that can be used to change selection, training, and treatment strategies to more effectively use this valuable resource.

Because service dogs are an indispensable asset to law enforcement agencies, gaining a better understanding of their common medical problems and associated risk factors is critical to maintaining their health and readiness for challenging tasks. Identifying the diseases and their causes that shorten a dog's life span would allow the introduction of preventive medicine and treatment methods to increase their longevity. In addition, improved knowledge of medical data can improve preparedness and focus training for veterinary canine service professionals responsible for the comprehensive veterinary care of service dogs. Thanks to veterinarians and scientists working to advance service dog knowledge, service dog care can be improved to help secure the future of this valuable resource that helps humanity solve complex problems.

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Захворюваність службових собак в кінологічних центрах України

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Анотація. Службові собаки є важливим активом силових структур. Тому розуміння їх медичних проблем, знання загальних характеристик, таких як чисельність, вік, порода, стать, призначення є вирішальним для підтримки їх здоров'я та готовності до виконання ними складних завдань. Аналіз та поширення подібної інформації є актуальним завданням для спеціалістів та науковців, які займаються проблемами утримання, забезпечення, та ветеринарного обслуговування службових собак. Тема науково-дослідної роботи полягає в аналізі результатів статистичних звітів щодо захворюваності службових собак з 24 регіональних кінологічних центрів силових структур України. Всього розглянуто дані по 822 службовим собаками та записи про 839 випадків захворювань. Також проаналізовано дані щодо чисельності, віку, статі та напрямку використання службових собак. Було виявлено, що серед захворювань визначалися внутрішні незаразні хвороби. Найбільше проблем було з шлунково-кишковим трактом: диспепсія, аліментарний ентерит і гастрит. Встановлено, що серед хвороб органів зору та слуху найчастіше виявлялися отити та катаракта. Травматичні ураження склали 16,7% від усіх записів, більшість яких класифікувалася як рани. Встановлено, що кожне сьоме захворювання було пов'язано зі шкірою. Серед них значне переважання мали дві хвороби: дерматит та екзема. З частотою понад 5% виявлялася ще одна група – паразитарні хвороби, з яких найбільш поширеним був бабезіоз. Також у дослідженні виявлено, що кожна двадцята тварина мала захворювання опорно-рухового апарату, з яких переважно зустрічалися артрит і дисплазія кульшового суглобу. Статистичні розрахунки показали неоднорідність щільності розподілу собак, як по відношенню до чисельності населення, так і до площі регіону. Найкращі показники щільності мала Чернівецька, а найменші – Житомирська. Серед службових собак перевагу мають самки – статева диференціація склала 1/1.15. Виявлено рівномірний розподіл чисельності службових собак за віком в межах від 2 до 7 років з середньозваженим значенням віку у 4,9 року. Найбільш поширеними породами виявилися: німецька та бельгійська вівчарки, а також лабрадор. За призначенням переважали спеціальні та розшукові собаки. Практична цінність даного дослідження полягає в тому, що визначені закономірності захворюваності службових собак, дають можливість для зміни стратегії їх відбору, навчання та лікування, щоб більш ефективно використовувати цей цінний ресурс

Ключові слова: кінологічні підрозділи, диференціація захворювань, чисельність, вік, породи, стать, напрями використання службових собак