

Prevalence of tumours and tumour-like lesions in domestic and exotic animals from Lower Silesia and its surrounds in Poland in 2014–2017

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Received: February 8, 2022

Accepted: June 29, 2022

Abstract

Introduction: An analysis of samples originating from domestic and exotic animals from Lower Silesia but also from other parts of Poland was carried out based on research conducted in 2014–2017. **Material and Methods:** The materials used for the study were 11,338 tumour samples taken *in vivo* during surgery and as biopsies and posthumously during necropsies. They were sent to the Department of Pathology at Wrocław University of Environmental and Life Sciences for histopathological diagnosis. **Results:** The largest group were canine tumours, of which there were 9,745 (85.95%), followed by feline tumours, totalling 1,397 (12.32%), tumours from exotic animals (186; 1.64%), from horses (7; 0.06%), and from cows (2; 0.02%). A significant number of cases of animals suffering from more than one tumour were also found, which had not been frequently diagnosed previously. **Conclusion:** The number of neoplasms diagnosed in pets and exotic animals is increasing every year. The average animal age at diagnosis continues to fall. The greatest number of neoplasms were diagnosed in mixed-breed dogs and cats, and the number of tumours in a pure breed strictly correlated with breed's popularity in the research period. Mesenchymal tumours are still the most prevalent type of tumours in dogs, while in cats epithelial tumours predominate. The neoplasm case pattern in animals conforms to that in humans in the same area.

Keywords: domestic animals, exotic animals, tumours, neoplasia, cancer.

Introduction

Surveillance of animal tumour incidence and its prediction according to age, breed, and in the specific case of dogs, the use the owner has for the animal, is important in modern veterinary medicine. This is due to the lengthening lifespans of companion animals, the more frequent occurrence of neoplasms, the greater diagnostic capabilities of veterinarians and the growing awareness of owners. These circumstances provide an incentive for research on the development of particular types of neoplastic changes and for veterinarians to conduct a more detailed clinical analysis of the possibility of a neoplasm occurring in a given patient, depending on its species, breed, sex, age, and the anatomical location examined.

Such data is systematically collected and updated in human medicine (9, 15, 19, 26). Appropriate human oncological databases are created on this subject, but none are in veterinary medicine. The desire to provide such information to veterinarians and research centres in Poland and around the world has prompted us to make another attempt to process recent data on the incidence of neoplasms. Our research consisted of the analysis of material originating from animals mainly from the area of Lower Silesia but also from other parts of Poland. It yielded frequency data for tumours in domestic and exotic animals and is preparatory work for future attempts to plan programmes for testing for and combating various types of neoplasms. Such provisions would be a welcome advance in veterinary medicine, given that such healthcare measures are routine activities in human medicine (3, 21, 24).

Material and Methods

The research material consisted of 11,338 tumours originating mainly from the area of Lower Silesia and in a much smaller number from other regions of Poland. The tissue came from dogs, cats, horses, cows and exotic animals and had been excised during surgery or taken as biopsies, or sampled post mortem during necropsies. The tumours were all sent to the Department of Pathology of the Wrocław University of Environmental and Life Sciences for histopathological diagnosis. Tumour sections were fixed in 7% buffered formalin, dehydrated, and then embedded in paraffin blocks. The sections were routinely stained with haematoxylin and eosin, as well as van Gieson, Masson and toluidine blue. In some cases requiring a more accurate diagnosis, immunohistochemical methods were also used.

Tumours were divided into six histological types (7): 1 – germinal, 2 – of organ primordia, 3 – epithelial, 4 – of the nervous system and chromogenic tissue, 5 – mesenchymal and mesodermal, and 6 – complex. Canine mammary tumours were graded according to the system devised by Goldschmidt *et al.* (12).

Results

A total of 11,338 tumours were found in the material sent for histopathological examination over the four-year period of 2014–2017, which gave an average of 2,835 cases per year.

The most numerous group were canine tumours, which numbered 9,745 (85.95%) and included tissue from 350 dogs that had more than one neoplasm. The next group by size were feline tumours, of which there were 1,397 (12.32%), and then in descending order tumours in rats (49; 0.43%), guinea pigs (42; 0.37%), ferrets (34; 0.30%), rabbits (26; 0.23%), hedgehogs (9; 0.08%), hamsters (8; 0.07%), horses (7; 0.06%), parrots (4; 0.03%), and cows, snakes, pigeons and mice (each 2; 0.02%). Tumours in other animal species were single incidences, occurring in a goose, canary, gerbil, hen and ground squirrel among other animals.

Of the 9,395 tumours found in dogs, 61.89% (5,815) were malignant and 38.11% (3,580) were benign. Most tumours in dogs (46.65%; 4,383) were mesodermal and mesenchymal. Neoplasms of epithelial origin comprised 42.09% (3,954). Complex tumours made up the third most frequently identified type at 4.52% (425). Embryonic neoplasms were found in 4.18% (393) of the samples, and neoplasms in nervous system and chromogenic tissue were present in 2.55% (240) (Fig. 1).

An important group were tumours occurring multiply in animals. These were deducted from the total number of tumours, so they were not included in further percentages in order not to distort the statistics. The number

of these cases was 350, comprising 177 (50.57%) in which one of the tumours was malignant, 90 (25.71%) in which two or more were malignant, and 83 (23.72%) in which all tumours were benign. It was difficult to distinguish any trend in how the two types of neoplasms combined.

Lesions were in more than one type of tissue in 195 patients out of the 350 with multiple lesions (55.71%). The remainder were lesions in one type of tissue, of which skin was the dominant one (123; 79.35% of lesions in a single tissue type). No correlation between the occurrence of a neoplasm of a particular type (e.g. melanoma or carcinoma) and the location of its occurrence was established.

There were slightly fewer malignant tumours in males: 4,285 cases (45.61%), compared to 5,110 cases (54.39%) in females. The occurrence of tumours in dogs by age is shown in Fig. 2. There was a clear increase in the incidence of neoplasms from the age of 4 with a peak between approximately 8 and 10 years of age.

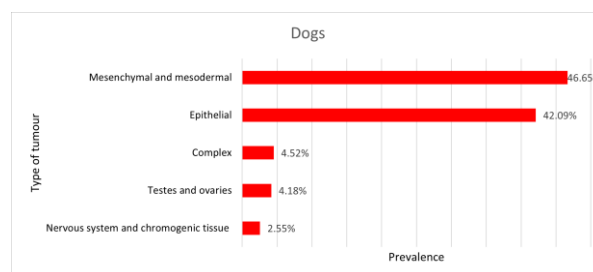


Fig. 1. Tumour tissue locations in dogs

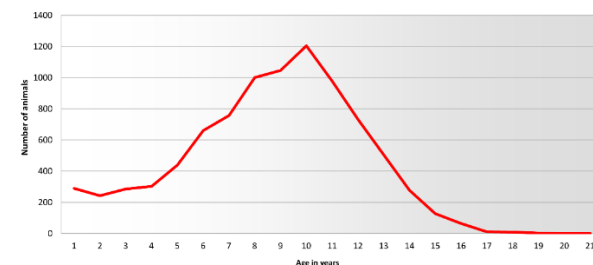


Fig. 2. Tumours occurrence in dogs by age

The highest number of neoplasms, 2,884, was recorded in mixed-breed dogs (30.64% of the total number of canine tissue samples tested). Among purebred dogs, the highest number of neoplasms was found in Labradors (664; 7.06%), then in German shepherds (625; 6.64%), Yorkshire terriers (580; 6.13%), golden retrievers (361; 3.82%), boxers (355; 3.75%), American Staffordshire terriers (292; 3.10%), shih tzu (253; 2.70%), dachshunds (253; 2.70%), cocker spaniels (231; 2.46%), miniature schnauzers (222; 2.36%), French bulldogs (204; 2.16%), beagles (196; 2.10%), Siberian huskies (154; 1.63%), Bernese mountain dogs (145; 1.54%), and West Highland white terriers (142; 1.5%). In other breeds, the incidence of neoplasms did not exceed 1% of the total number of samples tested (Table 1).

Table 1. The manifestation of tumours in individual breeds of dogs

Breed	Number	Percentage	Breed	Number	Percentage
Mixed	2,884	30.64%	Schnauzer	30	0.32%
Labrador retriever	664	7.06%	Akita inu	25	0.27%
German shepherd	625	6.64%	Black Russian terrier	24	0.26%
Yorkshire terrier	580	6.13%	Lakeland terrier	24	0.26%
Golden retriever	361	3.82%	Cane corso Italiano	23	0.24%
Boxer	355	3.75%	Tatra sheepdog	23	0.24%
American Staffordshire terrier	292	3.10%	Chihuahua	21	0.22%
Shih tzu	254	2.70%	Boston terrier	20	0.21%
Dachshund	253	2.70%	Polish hound	20	0.21%
Cocker spaniel	231	2.46%	Scottish shepherd	20	0.21%
Miniature schnauzer	222	2.36%	St. Bernard	19	0.20%
French bulldog	204	2.16%	Polish lowland sheepdog	19	0.20%
Beagle	197	2.10%	English bulldog	18	0.19%
Siberian husky	154	1.63%	Cavalier King Charles spaniel	18	0.19%
Bernese mountain dog	145	1.54%	Shetland sheepdog	18	0.19%
West Highland white terrier	142	1.51%	Welsh terrier	18	0.19%
Fox terrier	78	0.83%	Tosa inu	18	0.19%
Bavarian mountain hound	64	0.68%	Flat coated retriever	16	0.17%
Irish setter	62	0.66%	Scottish terrier	16	0.17%
Bull terrier	61	0.63%	Basset hound	15	0.16%
Weimaraner	59	0.63%	Dalmatian	15	0.16%
Dobermann	58	0.62%	Belgian shepherd	14	0.15%
Poodle	57	0.61%	Pekingese	14	0.15%
Jack Russell terrier	48	0.51%	Briard	13	0.14%
Maltese	48	0.51%	Chinese crested dog	13	0.14%
Miniature pinscher	43	0.46%	English springer spaniel	12	0.13%
Alaskan Malamute	41	0.44%	Newfoundland	12	0.13%
Rottweiler	40	0.43%	Polish greyhound	12	0.13%
Medium schnauzer	40	0.43%	Medium pinscher	11	0.12%
Great Dane	37	0.38%	Airdale terrier	10	0.11%
Giant schnauzer	36	0.38%	Pit bull terrier	10	0.11%
Pug	34	0.36%	Whippet	10	0.11%

The most numerous groups were skin and subcutaneous tissue tumours, and there were 5,086 of these, which accounted for 54.14% of all neoplasms in dogs. The significant locations of skin tumours were eyelids (314; 6.17%), ears (242; 4.76 %) and lips (146; 2.88%), and the notable locations of subcutaneous neoplasms were mammary glands (1,753; 18.66%), the lymphatic system (1,013; 10.78%) and the gastrointestinal tract (617; 6.57%). Other locations did not exceed 4%.

Among tumours located within the skin and subcutaneous tissue, tumours originating from mast cells were the largest contingent, totalling 873 cases (17.17%), and other lesions in this tissue were from histiocytes, of which there were 711 (13.98%), lipomas (557; 10.95%), adenomas (489; 9.62%), adenocarcinomas (375; 7.37%), fibromas (254; 4.99%), fibrosarcoma (252; 4.96%), squamous cell keratoses (202; 3.97%), non-keratinising squamous cell carcinomas (200; 3.93%), melanocytic tumours including malignant melanomas (183; 3.60%), lymphomas (160; 3.15%) and basal cell carcinomas (122; 2.40%). The incidence of other neoplasms did not exceed 2%. The second most common organ tumours in dogs were in mammary glands. The most frequent tumour in this organ was carcinoma with 1,229 incidences, which accounted for 70.11% of all tumours in this gland. Mixed tumours and adenomas appeared much less frequently, with 161

(9.18%) and 152 (8.67%) of these types identified, respectively. The incidence of other neoplasms did not exceed 2%.

The next location in order of prevalence for tumours in dogs was the lymphatic system, where 1,013 were noted. The largest number of tumours, 579, was found in the lymph nodes, and they constituted 57.16% of all lymphatic neoplasms. Of these, approximately 98% were lymphomas. The spleen was second to the lymph nodes with 322 tumours (31.79%). The dominant changes turned out to be angiosarcomas (173; 53.73%) and cavernous haemangiomas (114; 35.40%). As few as 11 lesions were located in the tonsils (1.09%), of which 6 (54.54%) were non-keratinising squamous cell carcinomas. The occurrence of tumours in other parts of the lymphatic system was incidental.

The fourth most common tumour location in dogs was the digestive tract and liver. Most neoplasms were located within the oral cavity, and these totalled 265 (42.95%). Most common in this area were malignant melanomas and fibrosarcomas, both noted in 35 samples (13.21%); nearly as prevalent were non-keratinising squamous cell carcinomas (34; 12.83%) and papillomas (32; 12.08%), and fibromas were also numerous (28; 10.57%). In subsequent sections of the gastrointestinal tract, individual tumours appeared in the throat (8 cases) and stomach (5 cases). Ninety-eight neoplasms were found in the intestines, representing 15.88% of

gastrointestinal tumours. Adenocarcinomas (22; 22.45%), leiomyomas (19; 19.39%) and lymphomas (18; 18.37%) were the most numerous tumour types.

A total of 205 neoplasms were found in the anus and anal sac gland, which constituted 33.23% of all changes in the gastrointestinal tract. The most frequent changes were adenomas (111; 54.15%), followed by adenocarcinomas (68; 33.17%). The liver was the locus of some gastrointestinal tumours (38; ≈6%), of which the most common were liver and biliary tract tumours (15; 39.47%).

Within the male reproductive system, 403 tumours were found, these being 4.29% of all canine and 9.41% of male tumours. The main location of neoplasms were the testes, tumours in which accounted for 89.58% of those in the whole reproductive system. The most common were Leydig cell tumours as 41.82% of all testicular lesions, followed by seminomas as 35.46% and Sertoli cell tumours as 20.78%. Prostate tumours accounted for only 5.71% of all malignancies within the male reproductive system. The number of tumours within the epididymis did not exceed 5%.

Within the female reproductive system, 189 tumours were evident, which accounted for 2.01% of all canine tumours and 3.70% of female neoplasms. The largest number, 72, was located within the vagina; they were 38.10% of all tumours of the female reproductive system. Leiomyosarcomas dominated here as the type of 44.44% of changes in this anatomical region. Ovarian tumours were similar in frequency with 70 incidences (37.04%), and granulosa cell tumours were the most prevalent among them, numbering 32 (45.71%). The uterus was also notable as a tumour location because 28 were found here (14.81%), among which leiomyomas (16; 57.14%) were the dominant lesions.

There were 102 tumours in the urinary tract, accounting for 1.9% of all canine neoplasms. The largest number of them were located in the bladder, which was the site of 67 tumours (65.69%). The most present lesion types were transitional cell carcinomas, 25 sections revealing such changes (37.37%), and carcinomas, 17 examples having been found (25.37%). Kidney tumours accounted for 25 cases (24.51%) of urinary tract tumours (mainly kidney carcinoma, as which 11.44% of tumours in the kidney were classified).

The skeletal system was the location of 79 neoplasms diagnosed in dogs, representing 0.84% of all lesions in the species. The most frequent tumours were osteosarcoma, making up 53.16%, and osteoma, comprising 16.46%; there were also single chondromas, carcinomas and fibromas. One case (0.01%) was observed in the bone marrow in the form of myeloid leukaemia.

Forty-eight tumours were diagnosed in the respiratory system, which accounted for 0.51% of all tumours in dogs. The most frequently affected area was the nasal cavity and it contained 23 (47.92%), including carcinomas, adenocarcinomas and non-keratinising squamous cell carcinomas. Lung tumour formation

(11; 22.92%) was usually manifested as adenocarcinoma or carcinoma *in situ*.

Within the eyeball, 30 (0.32%) malignancies were found, most often melanomas (17; 56.67%). Dogs had thyroid tumours relatively rarely, only 17 such being noted (0.18% of all tumours), and they were adenomas, adenocarcinomas and carcinomas. In the muscular system, only 15 (0.16%) neoplasms were found: lipomas, haemangiomas or spindle cell carcinomas, and 11 neoplasms were noted in the joints, among which there were some in cartilages and some osteomas and sarcomas. Only a single thymoma was found (0.01%).

Tumours in cats accounted for 11.90% of all diagnosed tumours, and 75.11% (1,041 out of 1,386 incidences) were malignant and 24.89% (345 out of 1,386) were benign. Epithelial tumours were the most commonly diagnosed lesions and their proportion was 54.83% (760). Mesenchymal and mesodermal tumours combined to be 41.56% (576). The third most represented type of lesions in cats were complex tumours, comprising 3.32% (46) (Fig. 3).

Neoplasms were more common in females than in males, with 871 (62.84%) against 515 (37.16%) giving the proportionality. An increase in the incidence of tumours was observed between 6 and 10 years of age, and the peak incidence fell between 9 and 12 years of age. The number of cats up to 2 years old with neoplasms was low at 5.18% of the tested animals. The occurrence of tumours in cats by animal age is shown in Fig. 4.

The highest number of tumours, 1,172, was recorded in mixed-breed cats, which constituted 84.56% of all cats tested. Among other breeds, most neoplasms were found in Maine coons (58; 4.18%), followed by Persians (36; 2.60%) and British shorthairs (21; 1.52%). Other breeds did not exceed 1.5%.

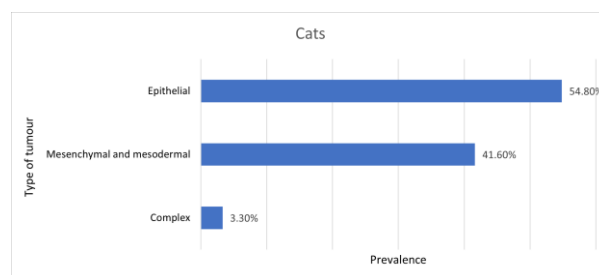


Fig. 3. Tumour tissue locations in cats

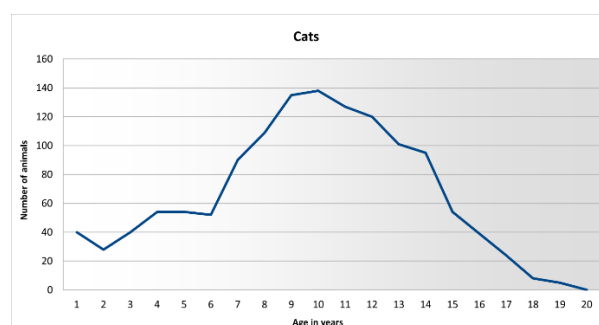


Fig. 4. Tumours occurrence in cats by age

Table 2. The manifestation of tumours in individual breeds of cat

Breed	Number	Percentage	Breed	Number	Percentage
Mixed	1,172	84.56%	Bengal	4	0.29%
Maine coon	58	4.18%	Burmese	3	0.22%
Persian	36	2.60%	Sphinx	3	0.22%
British shorthair	21	1.52%	Cornish rex	2	0.14%
Siberian	20	1.44%	Neva masquerade	2	0.14%
Siamese	15	1.08%	Chartreux	1	0.07%
Russian	11	0.79%	Nebelung	1	0.07%
Ragdoll	9	0.65%	Oriental	1	0.07%

With 629 instances, skin and subcutaneous tissue tumours were the most numerous groups, and 45.38% of the total in cats originated in these locations. Mammary gland tumours were the next most numerous, occurring in 363 (26.19%) tissue sections, and then tumours located within the gastrointestinal tract including the liver (130; 9.38%) and those in the lymphatic system (61; 4.40%). Tumours in other locations, such as the skeletal system, the urinary system and the respiratory system did not exceed 2%.

Among the skin and subcutaneous tissue tumours, the largest proportion was fibrosarcomas, totalling 142 and constituting 22.58%, followed by basal cell carcinomas (62; 9.86%), adenocarcinomas (55; 8.74%), non-keratinous squamous cell carcinomas (50; 7.95%), carcinomas and lipomas (37 of each; 5.88%), adenomas (35; 5.56%) and fibroids (32; 5.08%). The incidence of other neoplasms did not exceed 5%.

The third most common tumour location group in cats was the mammary gland, and the most common tumour found there was carcinoma. There were 161 such neoplasms (44.35%). Cystic adenomas (6.61%) and fibroadenomas (3.58%) were the other notable tumour types. Other neoplasms only occurred sporadically.

The next place by prevalence of tumours in cats was the digestive system. Similarly to the pattern in dogs, the majority of neoplasms, and 76 in total, were located within the oral cavity. The percentage which they represented was 58.46. The dominant lesions in this part of the gastrointestinal tract were non-keratinising squamous cell carcinomas. Twenty-two examples were identified and these were 40.74% of tumours in the mouth. The most common lesion in the intestine was lymphoma (25; 59.52%). Two adenocarcinomas, an angiosarcoma, a carcinoma *in situ* and a cholangiocarcinoma were found in the liver and a carcinoma and an adenocarcinoma in the pancreas.

Lymphatic system malignancies amounted to 61 (4.40%). Neoplastic changes in the skeletal system occurred in 26 individuals and were manifested mainly as osteosarcomas with 15 incidences (57.69%) and less often as osteomas (4 lesions; 15.39%); other changes were only noted sporadically. Few neoplasms were found in other organs and systems.

Besides tumours in dogs and cats, tumours in exotic animals were also analysed. The incidence count was 186, and these accounted for 1.64% of all examined

neoplastic lesions in domestic animals. The largest number were in rats, 49 cases affecting these animals (26.34%), then in guinea pigs (42; 22.58%), ferrets (26; 13.97%) and rabbits (also 26; 13.97%). The remaining exotic species did not exceed 5%.

Rats were prone to neoplastic lesions predominantly in skin and subcutaneous tissue, where 27 tumours (55.1% of all such tissue sections from rats) were located. The lesions were mainly adenomas and adenocarcinomas (11 cases), lipomas, fibroids and fibrosarcomas being less numerous. Eleven neoplasms (22.45%) of adenoma and adenocarcinoma type were found in the mammary gland in these animals, while the urethra, testes, muscle, foreskin, vagina and spleen were less numerous locations of neoplastic lesions. In guinea pigs, the lesions were located mainly in the skin, this tissue presenting 17 predominantly lipoma and fibrosarcoma lesions (40.47% of tumours in this species). The mammary gland was half as frequently affected (9; 21.42%), and here, as in rats, the tumours were adenomas and adenocarcinomas. A similar pattern emerged in rabbits – the most common changes were in the skin. In ferrets it was difficult to determine the dominant location because malignancies were observed to similar extents in the ovaries, adrenal glands, skin and spleen.

Discussion

Our analysis of tumour incidence in the same region of Poland in 2000–2004 (16) showed an annual average of 192 cases of cancer, while in 2005–2008 (17) there was an increase to an average of 488 cases per year. In the years 2009–2011 (5), a still greater number of cases were found in the examined material, since 1,404 of them were recorded per year. The rise over time is also borne out by studies carried out in the years 2012–2013 (6), in which the yearly total was 2,087 cases. The results show rapidly increasing neoplasm detection and incidence in pets. This is a consequence of greater awareness on the part of veterinarians and, thanks to them, similar awareness among animal owners, of the importance of histopathological diagnosis in selecting an appropriate therapy and in making a prognosis. Owners of dogs, cats and exotic animals in particular have assimilated this knowledge. After analysing the

11,388 cases of tumours in domestic animals we examined in 2014–2017, we can conclude that the number of these lesions remains high and has even been increasing on a predictable trend. Similar research results emerged from human medicine data from the Lower Silesian Cancer Registry, which indicated a steady increase in the incidence of malignant neoplasms (25).

After analysing the ages of Lower Silesian dogs diagnosed with cancer, a downward trend can be observed. In studies encompassing the years 1957–1967, the authors found the highest incidence of tumours in dogs between 10 and 12 years of age (13), while research conducted in 2000–2004 (16) and 2005–2008 (17) showed the highest incidence of neoplasms in the age range of 8–9 years. More recent studies (from 2012–2013) showed a marked increase in morbidity from 2 years with a peak at around 7–11 years. In the previously mentioned studies up to 1967 (13), young dogs up to 2 years old were 4.3% of the individuals with neoplasms, in 1976–1995 in the same region they were 4.8% (14), and in the years 2000–2004, also in Lower Silesia, their percentage did not exceed 4.3 (16). In the years 2005–2008, an almost twofold increase in the proportion of young dogs with tumours was observed to 8.2%, and this proportion was constant subsequently in 2009–2011 (5). In previous studies, the incidence rate in dogs up to the age of two decreased to 6.3% (6). In this study, tumours in dogs of the same age were observed in 6.0% of animals. A reduced age of neoplasm incidence is visible compared to Houszka and Kaszubkiewicz (13) mid-century studies. The influence of environmental pollution and changes in animal nutrition may be the explanation for the increase in the number of neoplastic lesions in some systems, e.g. the respiratory, digestive or reproductive systems, both in older and younger animals. Additionally, animal owners' greater awareness of neoplastic diseases and easier access to advanced diagnostic techniques may result in earlier detection of neoplasms and thus lower the average age of diagnosed oncological patients.

The breed category most frequently diagnosed with tumours is mixed breed. This is consistent with the results of other researchers (14), where they constituted 35.7% of dogs with neoplasms. According to Michalska *et al.* (14) their proportion was 27%, according to our own research from 2000–2004 (16) they accounted for 36%, in the years 2005–2008 mixed-breed dogs were 31.7% of the all-breed total with neoplasms (17), in the 2009–2011 period they were 30.1% (5), and in the following two years 29.8% (6). However, when purebred dogs are considered, the number of a given breed with neoplasms reflected the trend in popularity of that breed, in demonstration of which we were able to observe an increased number of cases in Yorkshire terriers or French bulldogs. The upward trend in tumour detection in purebred dogs as a proportion of all canine tumours detected may also indicate that purebred dogs are increasingly often chosen

as companion animals over mixed-breed animals and therefore are more frequently patients of veterinarians. Alternatively, it may imply that purebred dogs are more predisposed to develop neoplasms.

Also in the case of cats, we observed an increase in the number of diagnoses of cancer. In an analysis from 2000–2004, the feline contingent of all animals with neoplasms was 9% (16), over which the present percentage is an increase of one third. Compared to the 2005–2008 proportion (17), that of feline cancer sufferers rose marginally, whereas compared to 2009–2011 when it reached 12.6% (5), a slight fall was recorded. Compared to the most recent previous analysis (6), two and a half times more cases were observed; however, the proportion of cats' tumours in all animal tumours did not change. Similarly to dogs, also in cats the large preponderance of diagnosed tumours in non-breed animals is associated with the substantiality of the majority of non-breed cats in the total population in Poland.

Frequently when humans and animals occupy places in which they are impacted by the same environmental conditions, those conditions are factors in human and animal cancer development equally. Therefore, the analysis of the frequency and type of tumours occurring in our companion animals can serve as a reliable model for research on human neoplasms. Research findings and the derived understanding of tumour origins may lead to new therapies that benefit both humans and animals (22).

Mesenchymal tumours are still the dominant group of tumours in animals (1), whereas epithelial tumours predominate in humans (11). Mastocytoma is one of the most common mesenchymal tumours in animals (18). However, it should be noted that in cats, epithelial tumours are more frequently reported. Also, the most common tumour location and the most rapidly increasing incidence of tumours are interesting. For both male and female animals, the skin is the location. In the case of men, the fastest-rising cases of cancer are those of the prostate (by 25% on average per year), and in women the equivalent cases were cancers of the breast and colon (by 8% on average per year) (4). In animals, neoplastic lesions in the mammary gland were the second-largest incidence of tumours. The canine mammary gland is often exploited as a model for studying neoplastic processes in humans (10). This is related to the histological structure and frequency of changes, which is confirmed by our analysis of such changes in tissue removed from dogs. In contrast to neoplastic lesions in the mammary gland, those in the prostate and colon are much less frequently seen in animals than in humans. This may be associated with lifestyle and nutrition differences between animals and humans. Human lifestyle and nutrition have very significant impacts on the development of tumours within these organs (20, 23), while dogs may not be at risk from the lifestyle and nutrition elements which precipitate human prostate and colon cancers.

It is noteworthy that the current analysis found a significant number of animals suffering from more than one neoplasm, which had not been diagnosed so often in foregoing reports. In this group of patients, there were occurrences of simultaneous malignant neoplasms and mixed occurrences of malignant and benign neoplasms. As mentioned earlier, such changes were quite often observed in canine testes (8). The increasing incidence of multiple primary malignancies clearly indicates the need for the histopathological examination of all surgically removed lesions. Examination of only one of them may not be reliable, may give a false-negative result, and may thereby establish a wrong basis for prognosis and therapeutic management.

Recent trends show that people own exotic animals in ever greater numbers. Comparing the newest data on tumours in these animals with those in the analyses from 2000–2004 (16) and 2005–2008 (17), and especially with the 2009–2011 data with only 66 cases (5), a substantial increase can be noted in the number of lesions. This may be a sign of the fashion for having exotic pets in the home and the consequential larger number of such animals able to be given veterinarian care. It may also imply greater awareness of the owners and improved veterinary care provided to exotic pets.

In conclusion, the analysis of the occurrence of neoplasms in domestic animals in Lower Silesia and neighbouring provinces correlates with the results of the statistics of tumour occurrence in humans in the same area (4). It provides valuable information for veterinary clinicians and veterinary research centres, and can also be a reference for oncologists regarding specific groups of neoplasms in humans and animals. It is important to increase the life expectancy of companion animals that are exposed to the same environmental factors as their owners, where these factors certainly largely determine the development of various types of tumours. These results may also facilitate and encourage future planning of preventive examinations, including animal oncological screening.

Conflict of Interests Statement: The authors declare that there is no conflict of interests regarding the publication of this article.

Financial Disclosure Statement: The source of the funding of research and publication was Wrocław University of Environmental and Life Sciences.

Animal Rights Statement: None required.

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