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Natural pathology of the Baboon (*Papio spp*.)

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Abstract

Background—Baboons are useful animal models for biomedical research, but the natural pathology of the baboon is not as well defined as other non-human primates.

Methods—A computer search for all morphologic diagnoses from baboon necropsies at the Southwest National Primate Research Center was performed and included all the natural deaths and animals euthanized for natural causes.

Results—A total of 10,883 macroscopic or microscopic morphologic diagnoses in 4297 baboons were documented and are presented by total incidence, relative incidence by sex and age-group, and mean age of occurrence. The most common diagnoses in descending order of occurrence were hemorrhage, stillborn, amyloidosis, colitis, spondylosis, and pneumonia. The systems with the most diagnoses were the digestive, urogenital, musculoskeletal, and respiratory.

Conclusion—This extensive evaluation of the natural pathology of the baboon should be an invaluable biomedical research resource.

Keywords

diseases; monkey; non-human primates; pathology; spontaneous; survey

The baboon is an increasingly important non-human primate model used in biomedical research. Accurate, extensive information about the natural pathology of the baboon is required for many aspects of biomedical research [59]. Baboons are currently studied for nutrition, fetal development and loss, endometriosis, infectious diseases, drug abuse, xenotransplantation, and epilepsy [7, 50, 53, 57–59, 61]. Veterinarians and researchers can use the frequency of different diseases to aid in diagnosis, make decisions on prognosis, foresee the possible interference with specific experimental procedures, and determine whether the baboon is an appropriate model [14, 17]. Numerous articles have been published on individual diseases in baboons [59], but the frequency of spontaneously occurring disease in baboons is not generally available in the literature. To our knowledge, only two previous studies looked at the prevalence of disease in baboons; both were conducted over 35 years ago and had relatively few numbers of animals. One evaluated 100 baboons directly from the wild [31]; the other study evaluated 105 captive baboons [26]. We document the

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spontaneous pathology over a 20-year period in the Southwest National Primate Research Center at the Southwest Foundation for Biomedical Research (SFBR) baboon colony. The analysis of this information will further define the baboon as an animal model and give insight into the natural pathology of the baboon.

Materials and methods

During the 20-year period covered in this manuscript (1988–2007), the approximate average baboon population was 5000 animals, 63% female and 37% male, and an average age of 8.3 years (females) and 5.6 years (males). Baboons were housed in two 6-acre metal and concrete corrals, gang cages, and individual metal cages if special handling was required (i.e. for medical care). Animals were fed commercial monkey chow, and water was provided *ad libitum*. The diets were supplemented with an enrichment fare of grains, fruits, and vegetables. All animal care and procedures were approved by the Southwest Foundation for Biomedical Research Institutional Animal Care and the Use Committee.

All baboons that died or were euthanized were necropsied, and tissues were collected for histologic evaluation as required for diagnosis. Tissues were fixed in 10% neutral buffered formalin, processed conventionally, embedded in paraffin, cut at 5 μm, and stained with hematoxylin and eosin or other stains as needed for diagnosis. When indicated, individual tissues were frozen in liquid nitrogen and stored at −80°F, fixed in 2% glutaraldehyde for electron microscopy, placed in normal saline or transport medium for cytogenetic evaluation, cultured for bacteria and viruses, or frozen in O.C.T. compound for frozen sectioning. Further evaluation using immunohistochemistry was performed as required. The necropsy and histologic evaluation were performed by board-certified veterinary pathologists. Conventional nomenclature was used for all lesions, and results were stored in an internal database (apath). Microscopic findings that were equivocal or otherwise challenging were reviewed by three to five other board-certified veterinary pathologists. If deemed necessary, cases were referred to the Armed Forces Institute of Pathology (AFIP) or other individual pathologists with expertise in the field.

A computer search of the pathology database for all gross and microscopic diagnoses relating to baboons was performed. Biopsies and animals on study were excluded. The original medical records, gross necropsy reports, and histopathology reports were retrieved if necessary for the clarification of diagnoses or organs affected. A total of 4297 baboon necropsies were evaluated for this study, these include all baboons that died or were euthanized for natural causes. Stillbirths were considered separate animals with an age of zero; the ages of the dams were not recorded.

Statistical methods

The cumulative incidence of diagnoses was calculated using the census data for the years 1988 to 2007. The tables were made by using the Statistical Analysis System software (SAS 9.1.3, SAS, Cary, NC, USA).

Because of the high number of morphologic diagnoses, evaluation to identify an association with sex was preceded by performing a Bonferroni correction to generate an adjusted alpha. For an adjusted alpha of 0.05, the alpha of the test was determined to be 0.0002154. A function was created in R [38] that takes as arguments a vector with the number of affected males for each morphologic diagnosis, a vector with the number of affected females for each morphologic diagnosis, the total number of males, and the total number of females. The function iterates through each number for each diagnosis and computes the two-sided Fisher’s exact test for independence. Values ≤0.0002154 were considered significant.

Diagnoses that by definition are restricted to one gender (i.e. ovarian cyst, endometriosis, and orchitis) were excluded.

Results

Over the 20-year period of the study, 4297 baboons were necropsied, and a total of 10,883 diagnoses were made. Table 1 presents the morphologic diagnoses in order by frequency of occurrence, with mean age, numbers of male, female, and unknown sex, and the total number of affected animals per age-group at necropsy. The most common diagnoses in descending order of occurrence were hemorrhage (n = 811, 7.45%), stillborn (n = 636, 5.84%), amyloidosis (n = 559, 5.14%), colitis (n = 558, 5.13%), spondylosis (n = 445, 4.09%), and pneumonia (n = 364, 3.34%).

Table 2 presents the number of diagnoses by organ in descending order of occurrence by body system and then organ, with selected references. The systems with the most diagnoses in descending order of occurrence were the digestive (n = 3038, 27.92%), urogenital (n = 2129, 19.56%), musculoskeletal (n = 1330, 12.22%), and respiratory (n = 1235, 11.35%).

Table 3 presents the eight most common diagnoses for each of the eight age-groups (perinatal (<1 year), infant (1 to <2 year), juvenile (2 to <6 years), young adult (6 to <11 years), adult (11 to <16 years), older adults (16 to <21 years), elderly (21 to <25 years), and aged (25 years and older). Table 4 summarizes the number of animals in each age-group and the number of each sex by age-group.

Figure 1 demonstrates an alternate way to visualize the data. It illustrates the distribution of eight of the more common diagnoses by age at necropsy: colitis, pneumonia, myocarditis, lymphosarcoma, spondylosis, amyloidosis, dermatitis, and nephritis. Although a degenerative disease like amyloidosis is often considered a disease of aged or older animals, occurrence of amyloidosis started as early as 2 years of age. As can be seen by the graphs, pneumonia and colitis are common diagnoses early in life, whereas spondylosis is more common later in life.

The frequency of many of the morphologic diagnoses was too low to express a detectable sex difference. Twelve diagnoses showed an association with sex. Males more often were diagnosed with pneumonia, airsacculitis, gingivitis, and glossitis. Females were more likely to be diagnosed with cyst, amyloidosis, steatosis, carcinoma, leiomyoma, adenocarcinoma, nephritis, and dermatitis. Although stillborn and inanition were more frequently diagnosed in males and hemorrhage in females, all three of these diagnoses included many baboons of unknown gender, making any association suspect.

Discussion

We report 10,883 spontaneous morphologic diagnoses identified in 4297 baboons at necropsy over a 20-year period. The systems with the most diagnoses were the digestive (n = 3038, 27.92%), urogenital (n= 2153, 19.78%), musculoskeletal (n = 1330, 12.22%), and respiratory (n = 1235, 11.35%). The most common overall diagnoses in descending order of occurrence were hemorrhage (n = 811, 7.45%), stillborn (n = 636, 5.84%), amyloidosis (n = 559, 5.14%), colitis (n = 558, 5.13%), spondylosis (n = 445, 4.09%), and pneumonia (n = 364, 3.34%). As would be expected, the most common diagnoses varied with age.

The most common diagnoses in baboons dying at <1 year of age were related to perinatal death (stillbirth, *in utero* death, dystocia, and atelectasis) or poor maternal care (inanition). Cannibalism and hemorrhage were also frequently seen in this age-group and likely also resulted from a difficult birthing process or poor maternal care.

Poor maternal care likely continued to account for many of the most common conditions seen in infant (1 to <2 years) baboons such as inanition, dehydration, and hemorrhage; hemorrhage in this group was often secondary to trauma. Inflammatory disease first becomes prominent in this age-group, with pneumonia and colitis appearing as common findings and continuing in all age-groups from infancy (1 to <2 years) to adults (11 to <16 years, pneumonia) and older adults (16 to <21 years, colitis). Infancy (1 to <2 years) was the only age-group with necrosis as one of the most frequent findings. This generally involved the oral cavity, gingiva, and tongue and was suspected to be a sequela of infection by herpesvirus papio 2, which is common in the colony [30, 60].

Juvenile baboons (2 to <6 years), like infants, have many diagnoses related to inflammatory disease (pneumonia and colitis) and trauma (hemorrhage). Inanition and emaciation were among the most common findings in these animals. Emaciation and inanition in these baboons could suggest inadequate food intake, but is more likely a result of other disease processes, such as colitis. Colitis was the most frequent diagnosis in this cohort and far exceeded the number of colitis diagnoses in all the other groups. Hyperplasia was also commonly diagnosed in juveniles. The majority of these were lymphoid hyperplasia within the lymph node or spleen and were likely a result of the high number of colitis diagnoses in this age-group.

Young adult baboons (6 to <11 years) display a more diverse group of diagnoses. This is the only group where lymphosarcoma and trichobezoar are in the top eight diagnoses. The reason why this age-group appears overrepresented is not known. Dermatitis is also seen with increased frequency in the young adult and adult baboons (6 to <16 years), with a large proportion associated with African histoplasmosis, as previously reported [8]. Amyloidosis also becomes a common finding in the young adult baboon (6 to <11 years) and is one of the two most common diagnoses in all subsequent age-groups. Amyloidosis has been reported a number of times in baboons, and the relative frequency of naturally occurring amyloidosis suggests the baboon might be a useful animal model for naturally acquired amyloidosis in humans [25]. Amyloidosis occurs in a range of tissues, including kidney, liver, spleen, lymph nodes, gastrointestinal tract, salivary gland, and endocrine tissues. The largest numbers of cases of amyloidosis were in the islets of Langerhans, with 319 cases. Islet amyloidosis has been reported to be associated with diabetes mellitus in these baboons [17].

In addition to the diseases of young adults, adult baboons (11 to <16 years) are the first group to have nephritis as a common diagnosis. Nephritis remains one of the top eight diagnoses in all subsequent agegroups. This is also the only age-group where gastritis is frequently seen. Myocarditis is in the top eight diagnoses in adults and also in older adults (16 to <21 years) and may have an association with infection by Trypanosoma cruzi [2].

Degenerative diseases become more common in older adult baboons (16 to <21 years). Hyperplasia and atrophy of different organs, spondylosis, and cysts in endocrine organs, pancreas, and kidney become common findings. Spondylosis is the second most frequent diagnosis in this group and the most common in all subsequent age-groups.

Spondylosis and arthritis are common in elderly (21 to < 25 years) and aged (≥ 25 years) baboons, and baboons could serve as a natural model for these conditions. Endometriosis was the eighth most common diagnosis in aged (≥ 25 years) baboons, and we have previously reported endometriosis in this baboon colony [10]. Although endometriosis is not in the top eight diagnoses in the older adults (16 to <21 years) and elderly (21 to < 25 years), it was seen in greater numbers in those two groups than in the aged (≥ 25 years) baboons.

Few morphologic diagnoses appeared to have a sex association. This was likely in part due to the high number of diagnoses with few affected animals. This necessitated more stringent

statistical criteria to identify an association and may have resulted in not identifying some diagnoses. The eight diagnoses with an identified female sex association (cyst, amyloidosis, steatosis, carcinoma, leiomyoma, adenocarcinoma, nephritis, and dermatitis) were predominantly diseases of older baboons. Although other biological factors have not been thoroughly investigated, this finding may be a reflection of the younger average age of males in a breeding colony. Young males are often removed for research studies and so do not appear in this survey of natural lesions. Additionally, fewer adult males are needed in a breeding colony, so once breeding age is reached, females become a sizable majority of the population. The sex association of pneumonia, airsacculitis, gingivitis, and glossitis in males may also reflect this, because younger animals are a more sizable part of the overall male population. Even if the rates of juvenile disease were equal between males and females, the lack of older males would make juvenile diseases appear more frequent when evaluating the overall male population.

Neoplasms were found in 395 animals at necropsy, and most have been included in a survey of the baboons at this colony [9]. The majority of the neoplasms were lymphosarcomas, followed by pituitary adenomas, uterine leiomyomas, cecal adenocarcinomas, and islet cell adenomas. Lymphosarcoma in baboons is often associated with Simian T-cell leukemia virus type 1 (STLV-1) [23], although an association with STLV was not confirmed in all of the cases in the present study. Pituitary adenomas have also been reported in additional reports from this colony [18], as have cecal adenocarcinomas [48], and islet cell adenomas [18].

Many of the conditions in the current study have been previously described in baboons, including some from our colony (see Table 2), but the relative frequency of these findings is rarely described. Previous studies have presented the frequency of diagnoses in baboons, but represented much smaller population groups [26, 31]. In one study of captive baboons, the most common diagnoses were pneumonia and enteritis/colitis, often diagnosed together [26]. Animals with this pneumonia/enteritis complex had typically been in the colony <6 months, so it was suggested that these may be associated with recent shipping and stress [11, 26]. In our study, however, pneumonia and colitis were typically seen in younger animals (<5 years-old), which were mostly captive-bred, so the frequency of these diagnoses may be more a function of age than stress associated with shipping. In a previous study, as in the current one, hemorrhage related to trauma was also common, as well as stillbirths and neonatal death [26]. Some common lesions that were reported in this study that were not in the previous survey [26] include amyloidosis [43] and spondylosis, both more associated with older animals [56], and myocarditis, which we have demonstrated is often associated with positive *Trypanosoma* serologic titers [2].

We have presented here the largest survey of morphologic diagnoses in a baboon colony to date. In addition to being a measure of the most common diagnoses that may be expected in a baboon colony, the data presented here also can be used by those interested in utilizing the baboon as a model of particular spontaneous diseases [28] and can help guide researchers when determining the causes of disease or risk factors for specific pathologic processes [50, 51].

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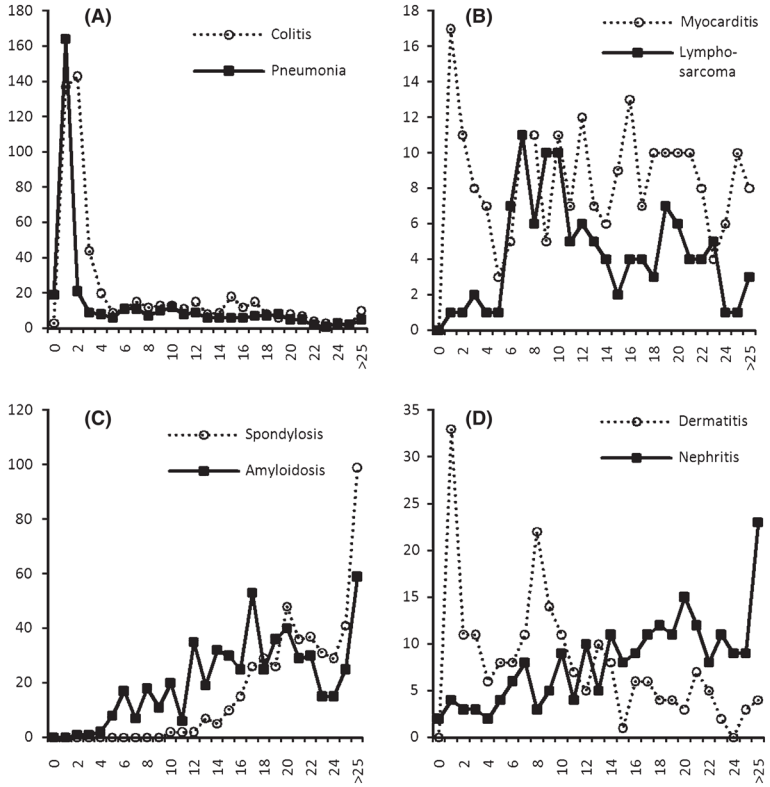

Fig. 1.

Age distribution of selected diagnoses. In all graphs, the *x*-axis is the age and the *y*-axis is the number of animals affected at that age. (A) colitis, pneumonia; (B) myocarditis, lymphosarcoma; (C) spondylosis, amyloidosis; (D) dermatitis, nephritis.

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Table 1

Morphologic diagnoses of all baboons by sex and age

Morphology	Total	Frequency %	Mean Age	Age SD	Male	Female	Unknown	<1 year	1 < 2 years	2 < 6 years	6 < 11 years	11 < 16 years	16 < 21 years	21 < 25 years	≥25 years
Hemorrhage	811	7.45	1.67	4.51	347	360	104	328	343	39	43	25	16	13	4
Stillborn	636	5.84	0.00	0.00	244	240	152	636	0	0	0	0	0	0	0
Amyloidosis	559	5.14	16.93	6.15	148	408	3	0	0	12	73	122	179	114	59
Colitis	558	5.13	5.70	6.75	215	339	4	3	137	216	64	61	49	18	10
Spondylosis	445	4.09	21.44	4.32	143	302	0	0	0	0	2	26	144	174	99
Pneumonia	364	3.34	5.28	6.97	192	152	20	19	164	44	51	35	33	13	5
Congestion	330	3.03	5.23	6.13	143	184	3	25	84	97	58	26	27	11	2
Cyst	295	2.71	19.64	6.33	60	235	0	0	3	6	18	28	87	99	54
Inanition	288	2.65	0.92	2.72	141	126	21	25	210	39	6	5	3	0	0
Hyperplasia	268	2.46	12.61	9.24	88	179	1	0	34	50	40	22	45	54	23
Edema	242	2.22	7.54	7.14	99	142	1	7	43	64	53	27	29	17	2
Myocarditis	226	2.08	12.52	7.60	89	137	0	0	17	29	43	41	50	38	8
Nephritis	217	1.99	16.13	7.25	56	160	1	2	4	12	31	38	58	49	23
Dermatitis	210	1.93	8.90	7.08	55	155	0	0	33	36	66	31	23	17	4
Atrophy	203	1.87	19.62	7.34	81	122	0	2	8	5	9	10	49	78	42
Emaciation	193	1.77	9.30	8.98	58	134	1	1	33	59	19	18	34	18	11
Steatosis	174	1.60	14.52	7.65	33	138	3	2	10	7	31	35	40	34	15
Necrosis	147	1.35	7.06	7.66	61	79	7	12	47	17	22	18	18	10	3
Hepatitis	141	1.30	14.53	7.68	35	104	2	0	11	6	27	25	31	33	8
Ulcer	136	1.25	9.10	7.97	40	96	0	0	30	23	26	22	18	13	4
Gastritis	124	1.14	11.91	7.32	39	85	0	0	7	18	28	29	22	16	4
Trichobezoar	122	1.12	10.04	6.01	32	89	1	0	2	18	58	18	14	8	4
Atelectasis	120	1.10	0.97	4.00	58	48	14	59	51	3	0	2	3	2	0
Degeneration	117	1.08	20.67	4.88	54	63	0	1	0	1	3	5	41	46	20
Lymphosarcoma	114	1.05	12.72	6.28	36	78	0	0	1	5	44	22	24	15	3
Endometriosis	112	1.03	20.20	5.02	0	112	0	0	0	1	0	13	45	32	21
Gingivitis	111	1.02	9.99	9.81	76	35	0	0	27	32	0	5	26	16	5
Arthritis	102	0.94	22.04	6.51	33	68	1	1	2	0	4	5	10	44	36

Morphology	Total	Frequency %	Mean Age	Age SD	Male	Female	Unknown	<1 year	1 < 2 years	2 < 6 years	6 < 11 years	11 < 16 years	16 < 21 years	21 < 25 years	≥25 years
Ascites	101	0.93	7.81	7.46	43	58	0	0	15	33	23	7	13	9	1
Peritonitis	98	0.90	11.95	7.40	29	67	2	0	10	8	26	19	20	10	5
Adenomyosis	94	0.86	0.49	2.49	0	94	0	0	0	0	2	15	20	40	17
In utero death	94	0.86	0.00	0.00	36	43	15	94	0	0	0	0	0	0	0
Nematodiasis	92	0.85	8.62	7.71	46	46	0	0	15	28	15	9	16	7	2
Cannibalism	91	0.84	0.04	0.19	33	31	27	77	10	2	0	0	0	0	2
Endocardiosis	87	0.80	20.64	5.36	26	61	0	0	1	2	7	13	16	32	16
Adenoma	87	0.80	19.27	7.07	26	61	0	0	0	0	3	9	26	29	20
Esophagitis	86	0.79	12.90	8.68	24	61	1	0	8	14	12	11	21	13	7
Dehydration	84	0.77	3.85	6.74	37	42	5	2	44	20	4	4	6	2	2
Fibrosis	81	0.74	16.99	8.01	38	43	0	1	2	6	8	12	15	26	11
Typhlitis	80	0.74	16.50	7.30	18	62	0	0	2	6	7	14	23	21	7
Anthracosis	78	0.72	12.20	7.38	33	45	0	0	2	5	34	10	14	9	4
Hydropericardium	72	0.66	8.45	7.43	29	43	0	0	11	19	18	4	12	7	1
Enteritis	70	0.64	10.96	8.62	30	40	0	0	9	13	13	10	14	7	4
Fracture	67	0.62	2.84	4.77	30	32	5	11	33	8	8	3	4	0	0
Pyelonephritis	64	0.59	14.57	6.21	16	48	0	0	1	2	14	19	15	9	4
Hydrothorax	61	0.56	6.84	6.97	25	35	1	0	14	18	13	6	3	6	1
Cellulitis	58	0.53	10.14	7.79	19	38	1	0	9	8	11	14	7	7	2
Encephalitis	57	0.52	8.22	8.06	30	27	0	0	13	15	9	4	10	4	2
Cystitis	48	0.44	11.79	6.92	21	27	0	0	2	9	8	12	11	4	2
Cholangiohepatitis	47	0.43	14.51	7.81	16	31	0	0	2	4	7	10	10	10	4
Obese	47	0.43	20.83	4.21	9	38	0	0	0	0	0	6	11	22	8
Glossitis	45	0.41	1.31	3.69	30	15	0	0	38	5	0	1	0	1	0
Dilatation	44	0.40	6.17	7.76	14	30	0	0	12	17	6	1	4	2	2
Carcinoma	43	0.40	22.58	6.05	2	41	0	0	1	0	0	3	7	20	12
Mineralization	42	0.39	12.43	8.60	9	30	3	4	2	5	6	6	9	9	1
Adenocarcinoma	40	0.37	21.32	4.48	3	37	0	0	0	0	0	2	14	11	13
Dystocia	39	0.36	3.67	6.42	14	21	4	28	0	0	3	4	4	0	0
Lymphadenitis	37	0.34	5.38	6.84	20	17	0	0	15	10	4	2	5	1	0
Obstruction	37	0.34	13.16	6.55	6	31	0	1	1	3	5	10	12	5	0

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Morphology	Total	Frequency %	Mean Age	Age SD	Male	Female	Unknown	<1 year	1 < 2 years	2 < 6 years	6 < 11 years	11 < 16 years	16 < 21 years	21 < 25 years	≥25 years
Cholecystitis	37	0.34	16.16	7.21	14	23	0	0	1	2	7	4	13	5	5
Hypothermia	35	0.32	6.12	7.32	8	24	3	13	5	0	6	3	6	1	1
Intussusception	30	0.28	7.16	6.13	7	23	0	0	2	12	9	2	3	2	0
Nephrocalcinosis	30	0.28	12.80	8.04	10	19	1	0	2	4	5	7	7	3	2
Hydronephrosis	30	0.28	15.25	7.17	9	21	0	0	1	3	3	5	13	3	2
Glomerulonephritis	30	0.28	15.18	6.73	7	23	0	0	1	1	7	3	10	7	1
Airsacculitis	30	0.28	13.70	5.23	29	1	0	0	0	1	8	9	7	4	1
Protozoiasis	29	0.27	9.81	7.86	11	18	0	0	4	8	2	4	9	2	0
Asphyxiation	28	0.26	2.72	3.70	9	18	1	2	9	13	2	2	0	0	0
Meningitis	27	0.25	10.06	8.96	17	9	1	0	8	1	4	5	4	5	0
Leiomyoma	27	0.25	21.62	6.52	0	27	0	0	1	0	1	2	2	15	6
Laceration	26	0.24	2.55	4.29	10	11	5	5	12	4	3	1	1	0	0
Metritis	25	0.23	15.55	6.29	0	25	0	0	0	1	6	4	8	5	1
Abscess	24	0.22	7.54	7.70	10	12	2	0	8	2	7	2	3	2	0
Infarct	23	0.21	8.77	7.56	13	10	0	3	3	1	7	3	4	2	0
Prolapse	22	0.20	8.27	6.73	6	16	0	0	2	7	5	3	4	1	0
Diverticulosis	21	0.19	5.99	7.52	2	19	0	0	0	1	0	4	6	6	4
Myositis	21	0.19	1.05	3.30	9	12	0	0	5	1	5	3	4	2	1
Hypoplasia	21	0.19	18.56	5.93	7	14	0	4	7	1	2	5	0	2	0
Cholelithiasis	21	0.19	18.19	6.92	6	15	0	0	1	0	1	3	9	4	3
Dysplasia	20	0.18	9.63	7.57	9	5	6	5	13	1	0	1	0	0	0
Vaginitis	19	0.17	17.16	6.17	0	19	0	0	0	0	2	5	7	3	2
Placentitis	19	0.17	2.57	5.43	7	8	4	15	0	0	2	1	1	0	0
Hydroureter	18	0.17	15.27	7.73	5	13	0	0	1	2	2	2	7	3	1
Septicemia	18	0.17	21.09	4.91	10	6	2	1	5	2	4	3	2	0	1
Meningoencephalitis	17	0.16	10.87	7.27	11	6	0	0	3	3	4	0	6	1	0
Alopecia	17	0.16	8.97	7.32	6	11	0	0	0	0	0	1	8	4	4
Prostatitis	17	0.16	15.07	4.96	17	0	0	0	1	0	6	2	5	3	0
Pleuritis	17	0.16	13.15	6.72	4	12	1	0	3	0	6	2	4	2	0
Polyp	16	0.15	10.18	10.25	2	14	0	0	1	0	0	4	2	4	5
Pancreatitis	16	0.15	20.13	8.32	4	12	0	0	0	0	3	4	6	3	0

Morphology	Total	Frequency %	Mean Age	Age SD	Male	Female	Unknown	<1 year	1 < 2 years	2 < 6 years	6 < 11 years	11 < 16 years	16 < 21 years	21 < 25 years	≥25 years
Hydrocephalus	15	0.14	0.00	0.00	7	7	1	4	5	4	2	0	0	0	0
Nephrosis	15	0.14	5.85	6.49	4	11	0	0	0	1	4	3	4	3	0
Hernia	15	0.14	1.82	2.75	7	8	0	0	5	1	2	2	2	2	1
Live birth	15	0.14	0.00	0.00	9	6	0	15	0	0	0	0	0	0	0
Atony	14	0.13	14.37	7.70	1	13	0	0	0	2	2	2	4	4	0
Cardiomyopathy	13	0.12	15.27	6.56	6	7	0	0	0	2	0	3	5	3	0
Splenitis	13	0.12	7.33	7.93	7	6	0	0	4	2	3	1	2	1	0
Stenosis	13	0.12	9.18	6.97	0	13	0	1	1	2	3	3	2	0	1
Lipoma	13	0.12	16.62	5.30	2	11	0	0	0	0	2	3	4	3	1
Arteriosclerosis	12	0.11	21.22	4.01	4	8	0	0	0	0	0	1	1	9	1
Granulosa cell tumor	12	0.11	21.66	7.74	0	12	0	0	0	0	0	4	1	3	4
Diarrhea	11	0.10	2.41	2.60	6	5	0	0	2	8	1	0	0	0	0
Cataract	11	0.10	17.50	10.78	4	7	0	0	0	2	2	0	1	4	2
Myodegeneration	11	0.10	12.96	8.61	5	6	0	1	0	2	1	1	5	0	1
Squamous cell carcinoma	11	0.10	19.71	7.05	0	11	0	0	0	1	0	0	4	4	2
Hemosiderosis	11	0.10	10.03	7.89	1	10	0	1	0	1	4	2	1	2	0
Bronchopneumonia	10	0.09	8.87	10.26	6	4	0	0	1	5	1	0	1	1	1
Granuloma	10	0.09	14.32	8.94	1	9	0	0	1	1	1	1	2	4	0
Endocarditis	10	0.09	16.42	6.55	6	4	0	0	0	1	1	1	4	3	0
Pericarditis	10	0.09	11.29	10.76	1	9	0	0	3	1	1	1	1	1	2
Emphysema	10	0.09	12.69	9.50	4	6	0	0	2	1	1	1	3	0	2
Myxoma	10	0.09	16.64	5.12	0	10	0	0	0	0	2	1	4	3	0
Pediculosis	9	0.08	9.42	9.12	2	7	0	0	1	3	2	0	2	0	1
Steatitis	9	0.08	9.27	8.01	0	8	1	0	3	1	0	1	4	0	0
Lymphadenopathy	8	0.07	3.16	4.94	3	5	0	0	3	4	0	1	0	0	0
Sarcoma	8	0.07	15.26	7.87	3	5	0	0	0	1	1	2	0	4	0
Mastitis	8	0.07	17.92	4.97	1	7	0	0	0	0	1	0	5	2	0
Thrombus	8	0.07	13.82	7.64	4	4	0	0	1	0	2	1	2	2	0
Endometriosis-like	8	0.07	16.14	3.84	0	8	0	0	0	0	1	1	5	1	0
Anomaly	8	0.07	0.24	0.33	4	3	1	2	6	0	0	0	0	0	0
Phytobezoar	7	0.06	10.45	6.81	1	6	0	0	0	2	2	1	2	0	0

Morphology	Total	Frequency %	Mean Age	Age SD	Male	Female	Unknown	<1 year	1 < 2 years	2 < 6 years	6 < 11 years	11 < 16 years	16 < 21 years	21 < 25 years	≥25 years
Cardiomegaly	7	0.06	16.12	10.44	5	2	0	0	1	1	0	0	2	2	1
Lymphangiectasia	7	0.06	14.63	7.17	2	5	0	0	0	1	1	0	4	1	0
Nephropathy	7	0.06	16.91	8.88	3	4	0	0	0	1	0	1	3	0	2
Scoliosis	7	0.06	20.67	10.00	1	6	0	0	0	0	2	0	0	2	3
Rupture	7	0.06	9.66	8.85	3	4	0	1	1	0	2	2	0	0	1
Kyphosis	6	0.06	6.74	7.30	0	6	0	0	1	2	1	0	0	2	0
Congestive heart failure	6	0.06	8.26	6.74	5	1	0	0	0	2	2	1	1	0	0
Proctitis	6	0.06	8.88	10.16	1	5	0	0	0	1	2	1	0	2	0
Rhinitis	6	0.06	11.35	5.39	2	4	0	0	2	1	0	1	1	1	0
Stomatitis	6	0.06	10.88	6.72	2	4	0	0	4	1	0	0	0	1	0
Scar	6	0.06	4.66	9.36	1	5	0	0	0	1	1	2	2	0	0
Osteomyelitis	6	0.06	11.62	8.01	4	2	0	0	2	1	1	1	1	0	0
Impaction	6	0.06	10.57	10.90	1	5	0	0	0	0	0	3	0	0	3
Hypospadia	5	0.05	18.76	7.32	5	0	0	0	0	3	2	0	0	0	0
Hyperkeratosis	5	0.05	3.91	3.51	2	3	0	0	1	3	1	0	0	0	0
Orchitis	5	0.05	6.19	3.24	5	0	0	0	0	2	2	1	0	0	0
Megacolon	5	0.05	11.21	11.27	3	2	0	0	1	1	1	0	0	2	0
Hepatopathy	5	0.05	2.94	3.03	3	2	0	1	0	1	1	0	2	0	0
Myopathy	5	0.05	6.60	6.29	3	2	0	0	1	1	2	0	1	0	0
Hemopericardium	5	0.05	8.73	7.85	3	2	0	1	3	1	0	0	0	0	0
Bronchiectasis	5	0.05	0.69	0.93	0	5	0	0	0	0	0	1	2	1	1
Splenomegaly	5	0.05	15.42	6.68	2	3	0	0	0	0	2	1	1	1	0
Thyroiditis	5	0.05	20.60	9.27	1	4	0	0	0	0	1	0	1	1	2
Pheochromocytoma	5	0.05	25.94	5.99	1	4	0	0	0	0	0	0	1	1	3
Myelitis	5	0.05	17.91	4.31	4	1	0	0	0	0	0	1	3	0	1
Adenitis	5	0.05	0.34	0.11	2	3	0	0	1	0	1	1	2	0	0
Arteritis	5	0.05	19.44	4.82	1	4	0	0	1	0	0	1	2	0	1
Aneurysm	5	0.05	15.43	9.91	2	3	0	0	5	0	0	0	0	0	0
Torsion	4	0.04	5.08	2.63	4	0	0	0	0	3	1	0	0	0	0
Fecolith	4	0.04	16.26	11.27	0	4	0	0	0	1	0	1	0	1	1
Neuritis	4	0.04	12.10	7.19	0	4	0	0	0	1	0	1	2	0	0

Morphology	Total	Frequency %	Mean Age	Age SD	Male	Female	Unknown	<1 year	1 < 2 years	2 < 6 years	6 < 11 years	11 < 16 years	16 < 21 years	21 < 25 years	≥25 years
Adhesions	4	0.04	21.09	1.98	1	3	0	0	0	0	0	0	1	3	0
Cestodiasis	4	0.04	19.97	3.59	1	3	0	0	0	0	0	0	2	2	0
Osteoma	4	0.04	16.97	7.56	3	1	0	0	0	0	1	1	0	2	0
Conjunctivitis	4	0.04	19.44	3.49	1	3	0	0	0	0	0	0	3	1	0
Glioblastoma multiforme	4	0.04	11.86	10.02	2	2	0	0	1	0	0	2	0	1	0
Vulvitis	4	0.04	15.97	2.64	0	4	0	0	0	0	0	1	3	0	0
Atherosclerosis	4	0.04	20.48	6.40	1	3	0	0	0	0	0	0	3	0	1
Otitis	4	0.04	12.16	5.56	3	1	0	0	0	0	2	1	1	0	0
Urethritis	4	0.04	6.01	6.76	4	0	0	0	2	0	1	1	0	0	0
Arthropathy	4	0.04	0.07	0.11	3	1	0	1	3	0	0	0	0	0	0
Encephalomyelitis	3	0.03	7.91	11.37	2	1	0	0	0	2	0	0	0	1	0
Cryptorchid	3	0.03	5.22	3.56	3	0	0	0	0	2	1	0	0	0	0
Histiocytosis	3	0.03	8.49	8.59	1	2	0	0	0	1	1	0	1	0	0
Tonsillitis	3	0.03	7.15	11.07	1	2	0	0	1	1	0	0	1	0	0
Gangrene	3	0.03	2.94	3.80	1	2	0	0	1	1	1	0	0	0	0
Aspiration	3	0.03	1.65	2.86	3	0	0	2	0	1	0	0	0	0	0
Glomerulosclerosis	3	0.03	18.71	2.32	1	2	0	0	0	0	0	0	1	2	0
Hypospermia	3	0.03	19.82	2.51	3	0	0	0	0	0	0	0	1	2	0
Megaesophagus	3	0.03	16.76	9.43	1	2	0	0	0	0	1	0	0	2	0
Hemangioma	3	0.03	21.56	4.18	0	3	0	0	0	0	0	0	1	1	1
Arteriopathy	3	0.03	6.98	11.58	0	3	0	0	2	0	0	0	0	1	0
Myxosarcoma	3	0.03	19.41	4.93	0	3	0	0	0	0	0	0	2	0	1
Oophoritis	3	0.03	20.80	6.97	0	3	0	0	0	0	0	0	2	0	1
Aspermia	3	0.03	12.33	4.85	3	0	0	0	0	0	2	0	1	0	0
Fistula	3	0.03	10.27	5.92	3	0	0	0	0	0	2	0	1	0	0
Pharyngitis	3	0.03	5.56	9.00	2	1	0	0	2	0	0	0	1	0	0
Tracheitis	3	0.03	10.85	2.07	1	2	0	0	0	0	1	2	0	0	0
Vasculitis	3	0.03	8.47	7.40	1	1	1	1	0	0	0	2	0	0	0
Osteosarcoma	3	0.03	10.05	3.56	0	3	0	0	0	0	2	1	0	0	0
Erythrophagocytosis	3	0.03	6.55	0.81	2	1	0	0	0	0	3	0	0	0	0
Pectus excavatum	3	0.03	0.31	0.51	1	0	2	0	3	0	0	0	0	0	0

Morphology	Total	Frequency %	Mean Age	Age SD	Male	Female	Unknown	<1 year	1 < 2 years	2 < 6 years	6 < 11 years	11 < 16 years	16 < 21 years	21 < 25 years	≥25 years
Candidiasis	2	0.02	2.02	0.00	0	2	0	0	0	2	0	0	0	0	0
Granulation	2	0.02	1.14	0.00	0	2	0	0	0	2	0	0	0	0	0
Anemia	2	0.02	3.54	1.67	1	1	0	0	0	2	0	0	0	0	0
Diverticulitis	2	0.02	11.55	12.72	0	2	0	0	0	1	0	0	0	1	0
Hypertrophy	2	0.02	12.26	10.70	1	1	0	0	0	1	0	0	1	0	0
Fibrosarcoma	2	0.02	7.43	6.68	1	1	0	0	0	1	0	1	0	0	0
Porencephaly	2	0.02	0.74	0.84	1	1	0	0	1	1	0	0	0	0	0
Luxation	2	0.02	2.19	2.21	2	0	0	0	1	1	0	0	0	0	0
Bronchiolectasis	2	0.02	22.49	1.92	0	2	0	0	0	0	0	0	0	2	0
Bronchiolitis	2	0.02	18.24	3.16	0	2	0	0	0	0	0	0	1	1	0
Teratoma	2	0.02	20.18	4.69	0	2	0	0	0	0	0	0	1	1	0
Spondylitis	2	0.02	19.14	6.96	1	1	0	0	0	0	0	1	0	1	0
Hematoma	2	0.02	13.52	11.39	1	1	0	0	0	0	1	0	0	1	0
Synechia	2	0.02	27.59	5.02	1	1	0	0	0	0	0	0	0	1	1
Dic	2	0.02	15.80	0.00	0	2	0	0	0	0	0	0	2	0	0
Myosis	2	0.02	16.61	0.83	0	2	0	0	0	0	0	0	2	0	0
Seminal vesiculitis	2	0.02	19.59	0.21	2	0	0	0	0	0	0	0	2	0	0
Brenner tumor	2	0.02	15.67	3.15	0	2	0	0	0	0	0	1	1	0	0
Retention	2	0.02	14.89	5.80	0	2	0	0	0	0	0	1	1	0	0
Constipation	2	0.02	15.60	0.89	1	1	0	0	0	0	0	1	1	0	0
Neuropathy	2	0.02	16.89	2.77	2	0	0	0	0	0	0	1	1	0	0
Microphthalmia	2	0.02	9.54	13.48	2	0	0	0	1	0	0	0	1	0	0
Ophthalmitis	2	0.02	20.41	7.40	0	2	0	0	0	0	0	0	1	0	1
Icterus	2	0.02	0.01	0.00	1	1	0	0	2	0	0	0	0	0	0
Omphalitis	2	0.02	0.00	0.01	1	1	0	1	1	0	0	0	0	0	0
Leydig cell tumor	2	0.02	28.72	4.18	0	2	0	0	0	0	0	0	0	0	2
Electrocution	1	0.01	3.38	N/A	0	1	0	0	0	1	0	0	0	0	0
Melanosis	1	0.01	3.53	N/A	0	1	0	0	0	1	0	0	0	0	0
Seroma	1	0.01	2.77	N/A	0	1	0	0	0	1	0	0	0	0	0
Epidermal inclusion cyst	1	0.01	1.10	N/A	1	0	0	0	0	1	0	0	0	0	0
Penitis	1	0.01	2.89	N/A	1	0	0	0	0	1	0	0	0	0	0

Morphology	Total	Frequency %	Mean Age	Age SD	Male	Female	Unknown	<1 year	1 < 2 years	2 < 6 years	6 < 11 years	11 < 16 years	16 < 21 years	21 < 25 years	≥25 years
Posthitis	1	0.01	2.23	N/A	1	0	0	0	0	1	0	0	0	0	0
Angiomyxoma	1	0.01	22.21	N/A	0	1	0	0	0	0	0	0	0	1	0
Chemodectoma	1	0.01	21.11	N/A	0	1	0	0	0	0	0	0	0	1	0
Dysgerminoma	1	0.01	23.99	N/A	0	1	0	0	0	0	0	0	0	1	0
Fibroadenoma	1	0.01	24.12	N/A	0	1	0	0	0	0	0	0	0	1	0
Hyalinization	1	0.01	20.63	N/A	0	1	0	0	0	0	0	0	0	1	0
Keratitis	1	0.01	24.23	N/A	0	1	0	0	0	0	0	0	0	1	0
Leiomyosarcoma	1	0.01	22.11	N/A	0	1	0	0	0	0	0	0	0	1	0
Lipofuscinosis	1	0.01	21.20	N/A	0	1	0	0	0	0	0	0	0	1	0
Megacecum	1	0.01	22.12	N/A	0	1	0	0	0	0	0	0	0	1	0
Megarectum	1	0.01	22.12	N/A	0	1	0	0	0	0	0	0	0	1	0
Rhabdomyolysis	1	0.01	22.10	N/A	0	1	0	0	0	0	0	0	0	1	0
Sclerosis	1	0.01	21.20	N/A	0	1	0	0	0	0	0	0	0	1	0
Sinusitis	1	0.01	20.35	N/A	0	1	0	0	0	0	0	0	0	1	0
Plaque	1	0.01	20.68	N/A	1	0	0	0	0	0	0	0	0	1	0
Carcinoma islet cell	1	0.01	17.28	N/A	0	1	0	0	0	0	0	0	1	0	0
Pyometria	1	0.01	19.41	N/A	0	1	0	0	0	0	0	0	1	0	0
Stricture	1	0.01	16.81	N/A	0	1	0	0	0	0	0	0	1	0	0
Hydrocele	1	0.01	15.60	N/A	1	0	0	0	0	0	0	0	1	0	0
Seminal fluid reflex	1	0.01	19.44	N/A	1	0	0	0	0	0	0	0	1	0	0
Seminoma	1	0.01	16.92	N/A	1	0	0	0	0	0	0	0	1	0	0
Cervicitis	1	0.01	11.98	N/A	0	1	0	0	0	0	0	1	0	0	0
Subinvolution	1	0.01	13.60	N/A	0	1	0	0	0	0	0	1	0	0	0
Coloboma	1	0.01	13.31	N/A	1	0	0	0	0	0	0	1	0	0	0
Hepatomegaly	1	0.01	14.87	N/A	1	0	0	0	0	0	0	1	0	0	0
Burn	1	0.01	7.98	N/A	0	1	0	0	0	0	1	0	0	0	0
Dystrophy	1	0.01	7.13	N/A	0	1	0	0	0	0	1	0	0	0	0
Meningioma	1	0.01	6.83	N/A	0	1	0	0	0	0	1	0	0	0	0
Pyothorax	1	0.01	5.04	N/A	0	1	0	0	0	0	1	0	0	0	0
Foreign body	1	0.01	6.11	N/A	1	0	0	0	0	0	1	0	0	0	0
Giant cells	1	0.01	5.91	N/A	1	0	0	0	0	0	1	0	0	0	0

Morphology	Total	Frequency %	Mean Age	Age SD	Male	Female	Unknown	<1 year	1 < 2 years	2 < 6 years	6 < 11 years	11 < 16 years	16 < 21 years	21 < 25 years	≥25 years
Myelopathy	1	0.01	8.33	N/A	1	0	0	0	0	0	1	0	0	0	0
Leukodystrophy	1	0.01	0.02	N/A	0	1	0	0	1	0	0	0	0	0	0
Abrasion	1	0.01	0.10	N/A	1	0	0	0	1	0	0	0	0	0	0
Atresia	1	0.01	0.01	N/A	1	0	0	0	1	0	0	0	0	0	0
Cryptosporidiosis	1	0.01	0.02	N/A	1	0	0	0	1	0	0	0	0	0	0
Lymphopenia	1	0.01	0.66	N/A	1	0	0	0	1	0	0	0	0	0	0
Malformation	1	0.01	0.79	N/A	1	0	0	0	1	0	0	0	0	0	0
Nephroma	1	0.01	0.24	N/A	1	0	0	0	1	0	0	0	0	0	0
Persistent ductus arteriosus	1	0.01	0.40	N/A	1	0	0	0	1	0	0	0	0	0	0
Pyodermatitis	1	0.01	0.02	N/A	1	0	0	0	1	0	0	0	0	0	0
Polydactylism	1	0.01	0.01	N/A	0	0	1	0	1	0	0	0	0	0	0
Thymitis	1	0.01	0.02	N/A	1		0	0	1	0	0	0	0	0	0
Ectopic decidua	1	0.01	26.02	N/A	0	1	0	0	0	0	0	0	0	0	1
Osteopathy	1	0.01	0.00	N/A	0	1	0	1	0	0	0	0	0	0	0
Pneumothorax	1	0.01	0.00	N/A	0	1	0	1	0	0	0	0	0	0	0
Lipohyperplasia	1	0.01	30.43	N/A	1	0	0	0	0	0	0	0	0	0	1
Placenta abrupta	1	0.01	0.00	N/A	0	0	1	1	0	0	0	0	0	0	0
All	10,883	100.00			3885	6561	437	1387	1787	3063	1299	1138	1770	1517	708

Table 2

Number of diagnoses by organ system and organ

System	Organ	Total	Percent	
All systems	**All**	**10,883**	**100**	**References**
Digestive	All	3038	27.92	
	Colon	717	6.59	3, 9, 10, 32, 39, 43, 46, 47, 48
	Stomach	623	5.72	32, 41, 42, 49
	Liver	453	4.16	1, 41
	Cecum	214	1.97	9, 32, 46
	Abdominal cavity	156	1.43	3, 9, 10, 24
	Small intestine	146	1.34	9, 32
	Esophagus	142	1.3	14, 32, 40, 44, 45
	Gingiva	111	1.02	
	Gall bladder	98	0.9	55
	Peritoneum	98	0.9	
	Pancreas	94	0.86	9, 17, 18, 25
	Tongue	76	0.7	9, 25, 30
	Oral cavity	40	0.37	30, 32
	Rectum	30	0.28	9, 39
	Salivary gland	25	0.23	9, 25
	Mesentery	11	0.1	9, 10
	Bile duct	3	0.03	
	Anus	1	0.01	
Urogenital	All	2129	19.56	
	Uterus	1072	9.85	4, 6, 9, 10, 16, 51, 52
	Kidney	625	5.74	9, 15, 25, 60
	Ovary	111	1.02	9, 10, 34, 35
	Vagina	65	0.6	9, 30, 54
	Urinary bladder	58	0.53	10, 25, 60
	Placenta	54	0.5	24
	Testicle	34	0.31	9, 60
	Prostate	33	0.3	60
	Ureter	18	0.17	60
	Penis	15	0.14	60
	Seminal vesicle	9	0.08	60
	Oviduct	7	0.06	10
	Umbilical cord	7	0.06	
	Urethra	5	0.05	60
	Cervix	4	0.04	
	Vulva	4	0.04	54
	Scrotum	3	0.03	60
	Epididymis	2	0.02	

System	Organ	Total	Percent	
All systems	**All**	**10,883**	**100**	**References**
	Prepuce	2	0.02	
	Spermatic cord	1	0.01	
Musculoskeletal	All	1330	12.22	
	Bone	648	5.95	9, 20, 33, 36
	Adipose tissue	265	2.43	12, 13
	Skull	129	1.19	
	Joint	108	0.99	
	Teeth	89	0.82	
	Skeletal muscle	80	0.74	9
	Diaphragm	6	0.06	
	Umbilicus	4	0.04	
	Jaw	1	0.01	
Respiratory	All	1235	11.35	
	Lung	1094	10.05	5, 9, 23, 29
	Thoracic cavity	72	0.66	
	Air sac	30	0.28	
	Pleura	23	0.21	23
	Nose	7	0.06	9
Trachea	7	0.06		
Pharynx	1	0.01		
Sinus	1	0.01		
Hemopoietic/Lymphatic	All	722	6.63	
	Lymph node	344	3.16	3, 9, 23, 25, 29
	Spleen	130	1.19	9, 23, 25
	Blood	106	0.97	13
	Thymus	104	0.98	
	Bone marrow	35	0.32	13
	Tonsil	3	0.03	
Endocrine	All	700	6.43	9, 18, 25
	Islets of langerhans	341	3.13	9, 25
	Thyroid	141	1.3	9
	Pituitary	104	0.96	9
	Adrenal	94	0.86	9, 25
	Parathyroid	20	0.18	9
Integument	All	654	6.01	
	Skin	630	5.79	9, 13, 19, 21, 22
	Mammary gland	24	0.22	9, 28
Cardiovascular	All	580	5.33	
	Heart	446	4.1	2, 24, 33, 62
	Pericardial sac	88	0.81	
	Aorta	22	0.2	

System	Organ	Total	Percent	
All systems	**All**	**10,883**	**100**	**References**
	Artery	21	0.19	
	Vessel	2	0.02	
	Vein	1	0.01	
Nervous	All	458	4.21	
	Brain	331	3.04	9, 27, 37
	Meninges	104	0.96	27
	Spinal cord	22	0.2	27
	Nerve	1	0.01	
Special sense	All	37	0.34	
	Eye	33	0.3	
	Ear	4	0.04	

Table 3

Eight most common diagnoses by age-groups

<1 year		**1 < 2 years**		**2 < 6 years**		**6 < 11 years**	
Diagnosis	**No.**	**Diagnosis**	**No.**	**Diagnosis**	**No.**	**Diagnosis**	**No.**
Stillborn	636	Hemorrhage	343	Colitis	216	Amyloidosis	73
Hemorrhage	328	Inanition	210	Congestion	97	Dermatitis	66
In utero death	94	Pneumonia	164	Edema	64	Colitis	64
Cannibalism	77	Colitis	137	Emaciation	59	Congestion	58
Atelectasis	59	Congestion	84	Hyperplasia	50	Trichobezoar	58
Dystocia	28	Atelectasis	51	Pneumonia	44	Edema	53
Inanition	25	Necrosis	47	Hemorrhage	39	Pneumonia	51
Congestion	25	Dehydration	44	Inanition	39	Lymphosarcoma	44
11 < 16 years		16 < 21 years		21 < 25 years		≥ 25 years	
Diagnosis	No.	Diagnosis	No.	Diagnosis	No.	Diagnosis	No.
Amyloidosis	122	Amyloidosis	179	Spondylosis	174	Spondylosis	99
Colitis	61	Spondylosis	144	Amyloidosis	114	Amyloidosis	59
Myocarditis	41	Cyst	87	Cyst	99	Cyst	54
Nephritis	38	Nephritis	58	Atrophy	78	Atrophy	42
Pneumonia	35	Myocarditis	50	Hyperplasia	54	Arthritis	36
Steatosis	35	Colitis	49	Nephritis	49	Nephritis	23
Dermatitis	31	Atrophy	49	Degeneration	46	Hyperplasia	23
Gastritis	29	Hyperplasia	45	Arthritis	44	Endometriosis	21

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Table 4

Total number of animals by age-group and sex

Age	No. animals	M	F	U
<1 year	1818	896	780	142
1 < 2 years	272	124	148	
2 < 6 years	376	168	208	
6 < 11 years	498	151	347	
11 < 16 years	416	111	305	
16 < 21 years	513	168	345	
21 < 25 years	266	42	224	
≥ 25 years	138	10	128	
All	4297	1670	2485	142

M, male; F, Female; U, Undetermined.