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Microorganisms causing of clinical pathologies in canines and domestic felines in Valledupar, Colombia

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ABSTRACT

The pathologies caused by microbial groups generate health risks in domestic dogs and cats; showing a zoonotic potential and producing affections in humans. According to that background, the purpose of this study was to establish the main microorganisms causing clinical pathologies in domestic dogs and cats by reviewing medical records in a veterinary clinic in Valledupar, Colombia. In order to do that, a retrospective study was conducted with clinical histories of dogs and cats admitted during 2017 and 2018 to the veterinary clinic "Mis Mejores Amigos", located in the city of Valledupar, Colombia. Based on the information, a descriptive, explanatory and statistical analysis was applied, the latter by means of a Sperman correlation to evaluate the relationship between race, sex, age, microbial group and pathology-pathogen. From a total of 462 reports of canines and felines admitted to the clinic, a total of 273 diagnoses were obtained. 4% of the felines and 24% of the canines were affected by some microbial group. The most prevalent microorganisms in canines were *Ancylostoma* spp. (9 %) *Entamoeba histolytica* (5%) *Ehrlichia* spp. (5%), and *Isospora* sp. (5%) while in felines were *Haemobartonella felis* (20%) and *Haemobartonella* spp. (17%). It was determined that there is only correlation between the age of felines and the microbial group that affects them, in addition to the pathology presented with the pathogen. It was observed a high percentage of *Ancylostoma* sp. (9%) in canines of mongrel and French Poodle breeds whilst in felines was found the bacterium *Haemobartonella felis* in 20% of the mongrel breeds.

Keywords: pets, diagnostic, bacteria, parasites, zoonoses.

Microorganismos causantes de patologías clínicas en caninos y felinos domésticos en Valledupar, Colombia

RESUMEN

Las patologías causadas por grupos microbianos generan riesgos en la salud de perros y gatos domésticos, lo que tiene un potencial zoonótico y produce afecciones en seres humanos. De acuerdo con lo anterior, el objetivo de este estudio fue establecer los principales microorganismos causantes de patologías clínicas en perros y gatos domésticos

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mediante la revisión de historias clínicas en una clínica veterinaria de Valledupar, Colombia. Se realizó un estudio retrospectivo con historias clínicas de perros y gatos ingresados durante 2017 y 2018 a la clínica veterinaria "Mis mejores amigos", ubicada en la ciudad de Valledupar, Colombia. Con base enla información se aplicó un análisis descriptivo, explicativo y estadístico, este último mediante una correlación de Sperman para evaluar relación entre raza, sexo, edad, grupo microbiano y patología-patógeno. De un total 462 reportes de caninos y felinos ingresados a la clínica, se obtuvieron 273 diagnósticos. El 4% de los felinos y el 24 % de los caninos presentaban afecciones por algún grupo microbiano. Los microorganismos más prevalentes en caninos fueron *Ancylostoma* spp. (9%) *Entamoeba histolytica* (5%) *Ehrlichia* spp. (5%) e *Isospora* sp. (5%), mientras que en felinos fueron *Haemobartonella felis* (20%) y *Haemobartonella* spp. (17%). Se determinó que solo existe correlación entre la edad de felinos y el grupo microbiano que los afecta, además de la patología presentada con el patógeno. Se observó un alto porcentaje de *Ancylostoma* sp. (9%) en caninos de las razas mestiza y French Poodle, y, por otro lado, en felinos se identificó la bacteria *Haemobartonella felis* en 20% de los sujetos de raza mestiza.

Palabras clave: mascotas, diagnóstico, bacterias, parásitos, zoonosis.

INTRODUCTION

According to the Ministry of Health and Social Protection (MINSALUD) (2019), it is estimated that 1 dog for every 14 inhabitants, and 1 cat for every 67 inhabitants have been incorporated into society. Many health professionals recommend having pets as an aid for children with different physical conditions and mental health problems (Hernandorena *et al*. 2013), as guards and guides for people with visual impairment and related problems (Gómez 2019). Therefore, favorable conditions are necessary to avoid the development of pathologies and the deterioration of their state of health (Cabra *et al*. 2011).

Pet owners must be responsible for their animals. Many pets develop pathologies due to the lack of minimum preventive conditions, which end up in diseases (Rendón *et al*. 2018). In some cases, the diseases represent a potential zoonotic risk and directly affect pet owners and veterinary diagnostic professionals who work with these patients on a daily basis.

Pets play an important role in the transmission of diseases with zoonotic potential and generate public health problems caused by bacteria, fungi, parasites and viruses. Among these, *Ehrlichia* sp. is a bacterium that produces serious diseases in canines and felines, with the possibility of transmission to humans (Silva *et al*. 2014). Likewise, *Haemobartonella felis* and *Haemobartonella* spp. are bacteria that cause serious health problems in felines.

Similarly, there are infectious diseases of veterinary importance such as pyometra caused by *Escherichia coli, Staphylococcus aureus*, among others, which affects female dogs between 7 and 9 years old, causing great damage to intrauterine level and also the death of the animal. This disease stimulates the establishment of other pathogenic bacteria that further compromise the health of these animals (Quispe 2019). Problems associated with fungal dermatitis are also presented, a disease that is barely attended but is important in terms of animal welfare and can be caused by

dermatophyte fungi such as *Trichophyton, Microsporum* and *Epidermophyton,* and its occurrence in companion animals predisposes to transmission to humans and animals of productive interest (Peña *et al*. 2020).

On the other hand, pathogenic microorganisms of parasitic origin such as *Toxocara* spp.—which have great importance as the cause of Toxocariasis, a disease with high prevalence worldwide and high morbidity and mortality rates in humans—affects dogs and cats causing considerable symptomatology (Archelli *et al.* 2018). This microorganism is easily found in open spaces, where dogs and cats generally deposit their feces, contaminating the soil and causing transmission through contact between the infected area and humans (Sierra *et al*. 2014). *Ancylostoma* spp., *Entamoeba histolytica* and *Isospora* sp. are parasites that mainly affect children through direct contact with soil contaminated by infected feces (Luzio *et al*. 2015).

Among others, *Dipylidium* spp. is an intestinal parasite, which is transmitted due to contact between a flea and a human being, and its presence and transmission is considered a hygienic-sanitary problem and of insufficient vaccination and deworming control (Reyes 2019). Additionally, *Toxoplasma* spp. cause toxoplasmosis, a disease that is perhaps one of the most studied worldwide due to its infectious conditions which generally affects mammals and more specifically fetuses causing congenital diseases, being cats the main transmitters of this disease (Torres *et al.* 2020).

The authors have described the main pathologies affecting canines treated in veterinarians (Sandoval y Lagos 2015) to demonstrate some pattern of percentage and follow-up to take the necessary measures. However, it is important to provide local data on the pathologies presented. In addition, similar studies have not been reported in the department of Cesar, but they have in departments of Atlántico, Cundinamarca, and others, in which there are studies that reinforce the implementation of measures aimed at achieving animal welfare and minimize zoonoses caused by different infectious microorganisms of human and veterinary importance, so the study foments research in the department of zoonotic diseases in domestic animals and the enhancement of sanitary measures in the veterinary environment.

MATERIALS AND METHODS

The sample corresponds to medical records of canines and felines admitted to the veterinarian during 2017 and 2018. There were 462 reports of which 365 correspond to clinical history of canines, 47 of felines and 26 animal species were not specified in these, likewise 24 of the medical records did not contain a condition by some of the microbial groups, which was discarded to determine the most affected microorganisms.

The database provided included clinical diagnoses of all tests performed. Wright and Hemacolor staining were used in the identification of hemoparasites by peripheral blood smear; methodology similar to that performed by Cabanillas (2019) as amended.

In order to determine parasites, coprology was performed by direct examination using saline solution and parasitological Lugol, and observed under an optical microscope with a 10 and 40x objective. By means of skin scraping with 10% KOH, visualization of fungal structures was also

performed. In addition, automated hemograms were done with Biobase equipment and subsequent verification on peripheral blood smear slides by Wright staining, as well as blood biochemistry by means of a blood chemistry analyzer equipment with respective quality controls. Uroanalysis was executed by means of urine test strips, where physical, chemical and microbiological aspects were evaluated, in the latter a centrifugation was performed taking the binary sediment and observing it under the optical microscope with 10 and 40x objectives. Virus determination was carried out by means of a test with the Anigen Rapid CVD Ag Test Kit (Anigen Rapid CVD Ag Test Kit). Only those containing any of the microbial groups were selected.

Statistical analysis

A descriptive and explanatory analysis of the results obtained at the "Mis mejores amigos" Veterinary Clinic was performed for each of the canines and felines. These diagnoses were grouped by animal species. A Spearman correlation was applied using the statistical program Minitab 18 (with 95% confidence) to determine significant associations between the variables breed, sex, and age of the animals, and microbial group. It was also significant associations between clinical signs and the microbial group with which the felines and canines present the infection.

Result

The database provided by the Veterinary Clinic "Mis mejores amigos" in the City of Valledupar includes a total of 462 records of animal admissions to the clinic in the years 2017 and 2018 as shown below.

In the table 1 the number of felines and canines that visited the veterinary clinic with health problems in each year can be seen. According to these results, the study population is reduced to 412 due to the absence of information in 26 records that do not specify the species of animal that entered the clinic. It was important for the analysis to know the species that presented the symptoms for the reliability and veracity of the results obtained, and 24 of these diagnoses did not record a pathology by some type of microorganism.

The diagnoses obtained belonged to pathologies caused by bacteria, fungi, parasites, and viruses, as well as trauma, cracks, and neoplasms, among others. Only diagnoses caused by 1 microbial group were analyzed. It was determined that 20 felines (4%) and 99 canines (24%) had diagnoses related to a group of microorganisms. Those with less percentage of cases representing a high risk for animal species and public health, containing a vaccination plan, were considered.

Table 2 sets out the list of microorganisms affecting canines and felines admitted to veterinary during 2017 and 2018 and the percentage of cases of each, being C for

TABLE 1. Canines and felines treated at the veterinary clinic during the years 2017 and 2018 in Valledupar, Colombia

Year	Canine	Feline	Unspecified	Non-microbial	Total
2017	88	4			92
2018	277	43	26		346
Total	365	47	50	24	462

canines and F for felines. It was determined that there is a relationship between the age of the felines and the microbial group. The Spearman correlation showed a significant difference ($p < 0,05$). The negative results (–0,572) defines an inverse relationship between age and susceptibility to infection by microorganisms indicating that, as the age of the specimen increases, the probability of infection by bacteria increases. In the case of canines, there were no significant differences ($p > 0,05$) for breed, sex, age, and microbial group affected, likewise it was shown that there is only significant association ($p < 0,05$)

TABLE 2. Microorganisms and pathologies in felines and canines admitted to the veterinary clinic during 2017 and 2018 and the percentage of cases

Bacteria	**% c/f**	**Fungi**	**%**	**Parasites**	**% C/f**	**Virus**	**% c/f**	**Pathologies**	**% C/F**
Anaplasma platys	C 7%	Fungal Dermatitis	C 3%	*Ancylostoma* sp	C11%	Canine distemper	C 1%	Palpebral abscess	C 2%
Anaplasma sp.	C 3%			*Ascaris* sp.	C 1%	Parvovirosis	C 3%	Bronchopneumonia	C 2%
Ehrlichia sp.	C 6%			*Babesia canis*	C 1%	(Feline immunodeficiency virus)	F 9%	Bronchitis	C 5% F 10%
Haemobartonella felis	F 27%			*Babesia* sp.	C 1%			Cystitis	C 1% F 1%
Haemobartonella sp.	F 18%			*Coccidios*	C 1%			Mixed dermatitis	C 17% F 2%
				Entamoeba histolytica	C 7%			Piometra	C 3%
				Entamoeba sp.	C 2%			Gingivitis	C 1% F1%
				Giardia sp.	C 2%			Hemoparasites	C 1%
				Hepatozoon sp.	C 1%			Urinary tract infection	C 1% F 6%
				Isospora sp.	C 6%			Pneumonia	C 1%
				Trichomonas sp.	C 1%			Mixed Otitis	C 1% F 1%
								Dog cough	C 1%
								Tracheobronchitis	C 1% F 3%
								Tracheitis	C 1% F 2%
								Periodontal disease	C 0% F 1%
								Bacterial dermatitis	C 0% F 1%
								Bacterial conjunctivitis	C 1% F 1%
								Bacterial otitis	C 1% F 1%
								Bacterial gastroenteritis	C 1% F 1%
								Parasitic gastroenteritis	C1% F 16%
								Miasis	C 1%

between clinical signs and feline diagnosis, which was high (0,768). Additionally, with cross tabulation it was evident that 100% of specimens that presented vomiting, inappetence or diarrhea were infected by bacteria, and 100% that had alopecia were infected by fungi and bacteria.

The microorganisms with the highest percentage of cases in canines were *Ancylostoma* sp. (9%), *Entamoeba histolytica* (5%), *Ehrlichia* sp. (5%), and *Isospora* sp. (5%) (image 1).

The canine breeds most affected by parasites such as *Ancylostoma* sp. were mongrels and French poodles, with a percentage of 24 and 14%, respectively. *Entamoeba histolytica* (12%) was more prevalent in the mongrel breed, *Isospora* sp. (27%) in the Yorkshire terrier breed, and *Ehrlichia* sp. bacteria (25 %) in mongrels and French poodles.

The most frequent diagnoses in canines were mixed dermatitis and bronchitis, with 12% and 5%, respectively. Among the dog breeds most affected by mixed dermatitis caused by fungi and bacteria 17% were the pug and beagle breeds.

In cats, the microorganisms with the highest percentage of cases were *Haemobartonella felis* with a prevalence of 20%, and *Haemobartonella* spp. with 7%. The most frequent pathology in cats was bronchitis (10%) (image 2). *Haemobartonella felis* affected the mixed breed in 100%. *Haemobartonella* spp. affected the mixed breed and the Russian blue in 80%, and 20%, respectively.

In canines and felines, there were diseases of great importance due to their high mortality and low prevalence. In canines, distemper, parvovirus and pyometra were found. Some of the animal species had more than one diagnosis related to different and intestinal parasites. These are involved in health damage and predispose animals to the development of other pathologies.

DISCUSSION

The parasite *Ancylostoma* sp. had a high prevalence among the diagnosis of canines registered by the veterinary clinic "Mis mejores amigos" in the city of Valledupar. In a study conducted by Sierra *et al.* (2014) a prevalence of 20,6% of *Ancylostoma* sp. was found in canines from two Animal Welfare Centers in the city of Cali, Colombia. This result was higher than that obtained

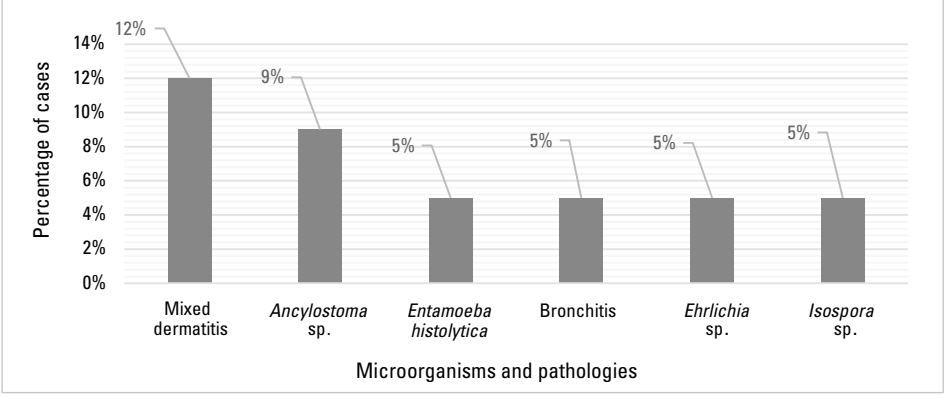

IMAGE 1. Microorganisms and pathologies with the highest percentage of cases in canines seen at the veterinary clinic during 2017 and 2018

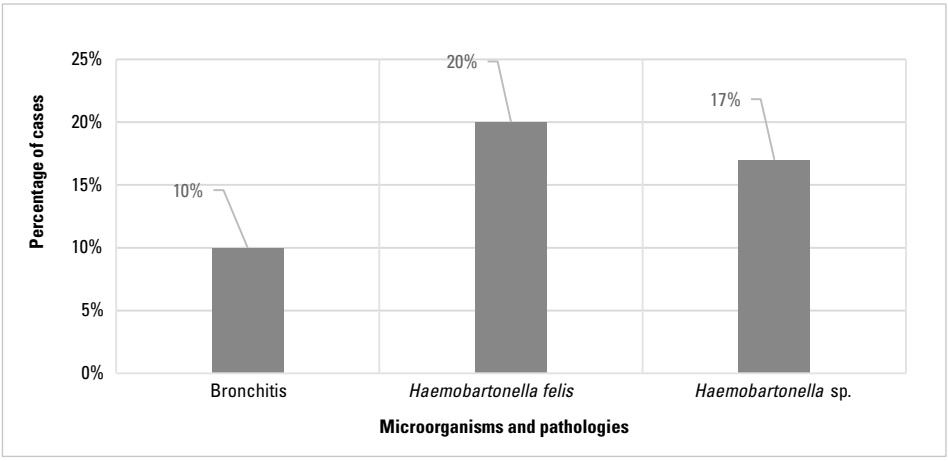

IMAGE 2. Microorganisms and pathologies with the highest percentage of cases in felines seen at the veterinary clinic during 2017 and 2018

in this study, which was 9%, but of great importance due to the damage to animal health. In addition, this parasite is the cause of a type of dermatitis, pneumonia, and other conditions in humans, depending on the location of these larvae (Sarmiento *et al*. 2018).

In reference to *Ehrlichia* sp., a prevalence of 5% was found, with a higher frequency in French poodle breeds, like the percentage obtained in the study conducted by Cartagena *et al*. (2014). According to the author, regardless of the low prevalence, this microorganism is important for the health of domestic animals, mainly because of similar symptoms with other diseases, organ involvement, and the absence of vaccines; in addition to its zoonotic potential.

According to Juárez y Rajal (2013), humans and canines act as a reservoir of *Entamoeba histolytica*. In the investigation, the percentage of *Entamoeba histolytica* cases was 5%; however, it is important to point out that owned canines should be the least affected due to the fact that the owners take care of them, as well as that to find this parasite mainly in humans denotes a public health problem as it causes a anthropozoonosis disease produced in the first instance by the contact of the pets with human feces (Salazar 2018). Similarly, the reports for *Isospora* spp. shown a percentage of 5%, which differs from that reported by Morales (2020), who found a percentage of 9%. This indicates that canines with poor sanitary conditions are the most exposed to these parasites, since not all owners provide their pets with adequate conditions for their development and prevention of health problems. Likewise, environmental conditions interfere in the development of different pathologies (Opazo 2019), which explains the result shown in the Spearman correlation of this research, in which age, sex, and breed are not associated with the microorganism present in the canines, neither with problems in the environment and in the proper care.

Diseases such as mixed dermatitis (which can be caused by bacteria or fungi) and bronchitis had a percentage of 12% and 5%, respectively. The result is lower than the reported by Ceino *et*

al. (2018), who, in their research, found that mixed infectious dermatitis had a higher prevalence of 26,5%, especially in mixed breed canines, unlike the current research, in which the highest percentage was reported in Beagle and Pug breeds. These pathologies cause different critical images in canines. Mixed dermatitis can be caused by dermatophyte fungi such as *Microsporum canis* and *Trichophyton mentagrophytes*, bacteria such as *Staphylococcus pseudointermedius*, and ectoparasites. All these can trigger more serious problems in pet health (Peña *et al*. 2020).

According to the results presented for cats, a bacterial infection percentage of 20% was obtained for *Haemobartonella felis,* and 17% for *Haemobartonella* spp. This result is opposite to what was reported (Onofre 2018). In the investigation he reported a 0% percentage of positive cases using direct examination for detection. Other studies (Tapias 2018; Gonzales 2014) achieved a higher percentage. However, in the first investigation more specific diagnostic tests such as PCR were performed. As for the work done by Gonzales (2014), a high percentage was obtained using Giemsa staining as a diagnostic method. According to research such as the developed by Navas (2018) and Arcila *et al*. (2016), it is shown that in most cases felines affected by bacteria were associated with clinical signs such as vomiting diarrhea and inappetence. In relation to mixed dermatitis, a percentage of 5% was obtained, relatively low in relation to that reported by Vanegas (2018), who in his research presents a percentage of 15,5% of dermatological cases in felines. This supports the Spearman correlation that yielded a relationship between the clinical sign (alopecias) and the resulting pathology (mixed fungal and bacterial dermatitis).

Among the pathologies involving a less frequent microbial group in the study, but not less important, are canine parvovirosis and feline AIDS. The former is a disease caused by a virus that, according to some authors, in recent years, new variants have been reported that may be more pathogenic than the existing ones (Miranda y Thompson 2016). Following the study conducted by Aldaz *et al.* (2015), the risk factors associated with this disease caused by a virus are feeding, age, interaction with other carriers and sick animals, intestinal parasitosis, as well as environmental conditions. It causes the appearance of this disease and lead to fatal consequences. Cahuana (2015) and Calle *et al.* (2013) state in their researches that parvovirosis is a very prevalent disease in Colombia, and that is why programs are established to help prevent this disease such as vaccination.

As for feline AIDS, it has a major impact worldwide due to its easy transmission and the damage it can cause once it enters the host (Calle *et al.* 2013). Research by Collazos (2016) reported a prevalence of 11,4% in felines with a low prevalence of feline AIDS in domestic cats, which differs from the current research with a low prevalence.

Like the pathogens that cause different conditions in domestic canines and felines, vectors play an important role in the transmission of zoonotic bacteria and parasites in humans. In animals, canine vector-borne diseases (CVBD) form a broad group of microorganisms, including *Anaplasma* spp. and *Ehrlichia* spp. In a study conducted in Portugal, *Anaplasma* spp. and *Ehrlichia* spp. were detected in 6,6% of the dogs analyzed, results that are similar to those found in this review of medical records. The identification of any CVBD microorganisms highlights

the importance of alerting the veterinary community, owners, and public health authorities to avoid the risk of transmission of vector-borne pathogens between dogs and other vertebrate hosts, including humans (Maia *et al*. 2015).

According to the review carried out (clinical histories of canines and felines), and to the results obtained in similar investigations, the presence of microorganisms that causes pathologies has become an important public health problem, mainly due to the role that pets play in the community. However, prevention of potential zoonotic risks should focus on the implementation of vaccination-related strategies. In addition to mitigating the transmission of infectious diseases and the deterioration of animal and human health, it involves psychological factors. This improves people's attitude towards animals, which will improve their living conditions. However, to achieve this, it is necessary for public health, veterinary and animal welfare agencies to ensure the control of canine and feline diseases (Cleaveland *et al.* 2006).

CONCLUSIONS

The presence of microorganisms in domestic animals varies according to environmental, hygienic and geographical conditions. Following the data collected in the research, in the veterinary clinic located in the city of Valledupar, canines presented a higher percentage of infection by parasites such as *Ancylostoma* sp., *Entamoeba histolytica* and *Isospora* sp., as well as bacteria such as *Ehrlichia* sp. In felines, there was a higher percentage of bacteria among these *Haemobartonella felis* and *Haemobartonella* spp. and a lower percentage of cases for viruses and fungi, in both cases.

Regardless of the low prevalence compared to other studies, the microorganisms identified in canines and felines are classified as microorganisms that affect animal health with predisposition to other diseases and cause death. Likewise, these microorganisms represent a zoonotic potential.

It is important to contain local data on the most prevalent diseases in domestic canine and feline animals. These animals are the most used for companionship or other activities, which suggests conducting more studies to analyze the behavior of the different diseases, and to create care protocols and alternatives to reduce the impact on animals and public health.

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CONFLICT OF INTEREST

The authors declare that they have no conflict of interest related to the work presented here.

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