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Population demographic survey and ownership of pet dogs and cats from a small city of southern Brazil

Caracterização demográfica de cães e gatos e perfil de seus respectivos guardiões domiciliados numa pequena cidade no sul do Brasil

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Abstract

This study evaluated the population dynamics and ownerships of dogs and cats from the city of Jaguapitã, southern Brazil. The human to dog and cat ratios were 4.6 and 21.5, respectively. Comparatively more dogs (*n*=2,460) than cats (*n*=571) were within the households and there were significantly more male (55.8%; 679/1,217) dogs relative to females (44.2%; 538/1217). Most cats (69.2%; 180/260) did not received any antiparasitic medication, were not immunized against rabies (91.2%; 237/260) or any specific infectious disease (91.5%; 238/260). Less than half (40.8%; 106/260) of these was below one-year-of age, but a significant number of cats was without any definite breed (81.2%; 211/260), and not spayed (93.5%; 243/260). Most dogs were of the mixed breed (69.5%; 846/1217), between one and four-years old (42.6%; 519/1217), and not spayed (96.3%; 1172/1,217). An elevated population of dogs received anthelminthic drugs (71%; 865/1,217), but most of these were not immunized against rabies (63.8% 777/1,217) or other infectious disease (58.6%; 713/1,217). Most (68.7%; 770/1,120) households were owners of a pet dog and/or cat; 54.4% (610/1,120) of these owned only dogs, 4.9% (55/1,120) were the owners of cats only, while 9.4% (105/1,120) owned pet dogs and cats. The results obtained are similar to those described in populated cities of Brazil and other countries. However, the free street access of pets associated with the reduced level of immunization against canine and feline infectious diseases coupled with the responsibility of ownership demonstrated by most residents make these animals highly susceptible to zoonotic and infectious diseases. Additionally, the free street access of unsprayed pets increases the risk of contact with other animals and the transmission of disease.
Key words: Feline and canine population, zoonosis, epidemiology

Resumo

Este estudo avaliou a dinâmica da população de cães e gatos e o perfil de seus respectivos guardiões na cidade de Jaguapitã, sul do Brasil. A razão homem:cão e homem:gato foi de 4,6 e 21,5, respectivamente. Em comparação, mais cães (*n*=2,460) do que gatos (*n*=571) eram domiciliados havendo significativamente

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mais cães machos (55.8%; 679/1,217) em relação as fêmeas (44.2%; 538/1217). A maioria dos gatos (69.2%; 180/260) não recebeu qualquer medicação antiparasitária, não foi vacinada contra raiva (91.2%; 237/260) ou qualquer doença infecciosa específica (91.5%; 238/260). Menos da metade destes (40.8%; 106/260) tinha idade inferior a um ano e, um número significante de gatos não apresentava definição racial (81.2%; 211/260) e não era castrado (93.5%; 243/260). A maior parte dos cães não apresentava raça definida (69.5%; 846/1217), tinha entre um e quatro anos de idade (42.6%; 519/1217) e não era castrada (96.3%; 1172/1,217). Um grande número de cães recebeu medicação antiparasitária (71%; 865/1,217), mas a maioria desses não foi imunizada contra raiva (63.8% 777/1,217) ou outra doença infecciosa (58.6%; 713/1,217). Cães e/ou gatos estavam presentes na maioria dos domicílios visitados (68.7%; 770/1,120), nos quais 54.4% (610/1,120) possuíam somente cães, 4.9% (55/1,120) possuíam somente gatos, enquanto 9.4% (105/1,120) possuíam cães e gatos. Os resultados obtidos são similares aos descritos em outras cidades do Brasil e outros países. O livre acesso à rua associado ao reduzido nível de imunização contra as doenças infecciosas de cães e gatos e à conduta de posse responsável adotada pelos guardiões torna esses animais altamente susceptíveis às doenças infecciosas e zoonóticas.
Palavras-chave: População felina e canina; zoonose; epidemiologia

Introduction

Pet dogs and cat can suffer from problems such as environmental disasters, vehicular accidents, bite-inflicting wounds, and the transmission of infectious and zoonotic diseases. Although there are risks associated with contact with animals, the frequency of most zoonotic and infectious diseases can be reduced or even eliminated, if adequate public policies or administrative practices are implemented. However, adequate veterinary care, movement restrictions of animals, selective reproduction, adequate regulations and education of owners can provide positive experience for pet ownership (CANATTO et al., 2012).

Understanding the dynamics of urban canine and feline populations is fundamental for the implementation of control programs for zoonotic and infectious diseases. In Brazil, anti-rabies vaccination campaigns are implemented, due to municipal or state jurisdiction, based on estimates of the canine population using guidelines outlined by the World Health Organization (DOMINGOS et al., 2007). These campaigns have resulted in the drastic reduction of canine and human rabies since 1980 to current times (SCHNEIDER et al., 1996; WADA et al., 2011; SVS/MS, 2012).

Demographic surveys of pet animals have been realized in different countries including Canada (LESLIE et al., 1994), Ireland (DOWNES et al., 2009), Guatemala (PULCZER et al., 2013), Australia (TORIBIO et al., 2009), Kenya (KITALA et al., 2001), and Zimbabwe (BUTLER; BINGHAM, 2000). These studies have investigated issues including the dog: human ratio (BUTLER; BINGHAM, 2000; PULCZER et al., 2013), canine ecology and demographics (KITALA et al., 2001; TORIBIO et al., 2009; ACOSTA-JAMETT et al., 2010), analyzed factors associated with pet ownership (LESLIE et al., 1994; DOWNES et al., 2009), and the reproductive status of pet cats (TORIBIO et al., 2009).

Data relative to the human: dog ratio in Brazil is conflicting; studies done in different states and cities of Brazil have revealed marked differences in canine populations (DIAS et al., 2004; ALVES et al., 2005; DOMINGOS et al., 2007; MOLENTO et al., 2007; CANATTO et al., 2012), and consequently in the human: dog ratio. Investigations done in Brazil have estimated that the human: dog ratio varies between 3.6:1 to 7.3:1 within the state of São Paulo, and from 2.3:1 to 13.0:1 in the state of Paraná (ROCHA et al., 2011). Alternatively, data of the human to cat ratio was estimated as varying from 16.4:1 (ALVES et al., 2005) to 30.57:1 (DIAS et al., 2004; CANATTO et al., 2012) in the state of São Paulo, and from 5.2:1 (MOLENTO et al., 2007) to 86.38:1 (SERAFINI et al., 2008) in the state of Paraná.

However, pet population studies of some sort have been done primarily within the regions of Curitiba (BRANCO et al., 2007; SERAFINI et al., 2008; MARTINS et al., 2013), and north-western regions (MOLENTO et al., 2007) of the state of Paraná, as well as in southeastern (CANATTO et al., 2012; MARTINEZ et al., 2013), northeastern (ROCHA et al., 2011), and Midwestern (DOMINGOS et al., 2007) regions of Brazil. These studies have investigated the population of pets residing in apartments (SERAFINI et al., 2008), urban (DIAS et al., 2004; DOMINGOS et al., 2007; ROCHA et al., 2011; CANATTO et al., 2012; MARTINS et al., 2013) and rural (MARTINEZ et al., 2013) regions of major cities, and the effects of sterilization (MOLENTO et al., 2007) and ownership (MARTINS et al., 2013) on pets, and estimated the canine and feline populations (BRANCO et al., 2007). However, no investigation relative to the dynamics of pet dogs and cats residing in small cities of Brazil was located in major databases. This study investigated the population demographics and ownership of dogs and cats in a small city from southern Brazil.

Material and Methods

Study location

This investigation was done within the city of Jaguapitã, northern Paraná, located between latitude 23° 06' 46" South and 51° 31' 55" West, and approximately 41 km from Londrina, southern Brazil. The city encompasses an area of 478,452 km^2 (IPARDES, 2009), with an estimated 12,286 habitants in 2009, a demographic density of 25.67 habitants/km^2 (IBGE, 2009), a human devolvement index (HDI) of 0.761, and with agriculture being the principal economic activity (IPARDES, 2009). This city was selected for this survey due to the comparatively elevated HDI, which is similar to other small cities that have less than 50,000 residents within the state of Paraná, and the unique layout, which facilitated a house-to-house survey of all selected households within the city during this investigation.

Estimation of canine and feline populations

To determine the number of households to be visited and included during this study, the dog: cat ratio relative to the number of habitants was observed. Since it is well established that the number of cats is smaller than the canine population, the scaling of the population size was done using the number of cats estimated since this is the greater sample size required between the two populations of animals under investigation. Consequently, considering the previously estimated data of the human: cat ratio of 16.4:1 established within the state of São Paulo (ALVES et al., 2005), the feline population of the study area was estimated at 750 cats. Additionally, at the time of this investigation, there were 2,460 households distributed in 160 blocks within the city of Jaguapitã (IPARDES, 2009), resulting in five residents per household and an approximate frequency of 30% of the households having at least one cat.

Sample design and sampling

The size of the sample was determined by calculating the frequency of 30% of the households where cats were present, using the estimate of five persons per residence and considering the human: cat ratio, with a precision of 7%, and a 5% significance level, resulting in 154 residences with cats to be interviewed. The number of samples was randomly determined, being systematically and proportional to the blocks that were included. From the 160 residential blocks within the city, 1120 households from 84 blocks were visited and responded to the questioner. These 1120 households were evenly distributed throughout the city, represented the differences in economic status of the residents and the geographical distribution of the city.

Epidemiological survey of pet/human demographics

The questioner was done to 30% of the existing households, excluding commercial establishments and empty lots. When the selected household was vacant or the habitants absent at the time of the interview, or if the residents refused to respond the questioner, the closest residence to the left was used to compose the sample unit. The questioner investigated the following issues: biological data of the respondent; composition of the basic household; ownership of cats and dogs within the residence; biological data of pet animal(s); the possibility of pets having free street access or maintained indoors; and the nutritional, hygiene, sanitary, and prophylactic measures used by the respondent for the wellbeing of the pet. This survey was done between January and February 2009.

Statistical analyses

All tabulated data and the analysis of the frequencies of variables of the epidemiological questioner were done by using the program Epi Info 3.5.4 (DEAN et al., 1996). Additionally, the Chi-square Test with equally known adherences and proportions was used to compare all categories of tabulated data (FLEISS et al., 2003); the Yates correction was used when necessary (YATES, 1984). $p \leq 0.05$ was considered as significant.

Results

Human to pet dogs and cats ratios

The sample design resulted in 1,120 households that were interviewed during the house-house survey; 717 of these contained dogs and 160 cats. Within these households, the number of dogs was 4.7 times greater than the feline population with 1,217 dogs and 260 cats being estimated within these households, with an average of 1.32 (917/1,120) animal/household. Consequently, the feline population was estimated at 571 cats, while there were 2,673 dogs (Table 1), representing 45.5% of the feline and canine populations included in this study. The human to dog and cat ratios were 4.61 and 21.5, respectively. Proportionally, the feline and canine population corresponded to 4.65% and 21.8% of the human population, respectively. Further, the ratio of cat/households was 0.23:1, while the dog/household ratio was 1.09:1.

Table 1. Numerical distribution of the sizes of the randomly generated samples and estimated populations of the city of Jaguapitã, southern Brazil.

Variables	Sample size	Estimated populations
Households	1,120	2,460[a]
Residents	5,600	12,286[a]
Dogs	1,217	2,673[b]
Dog: human ratio	1:4.6[b]	-
Cats	260	571[b]
Cat: human ratio	1:21.5[b]	-

[a] IBGE reference data
[b] Estimates derived from this study.

Pet dogs and cat population dynamics

The feline population consisted of 48.1% (125/260) female and 40.8% (106/260) male cats; the gender of 11.2% (29/260) cats was unknown (Table 2). Less than half (40.8%; 106/260) of these were below one-year-of age, but most were of without any definite breed (81.2%; 211/260), of shorthair origin (92.7%; 241/260), and not spayed (93.5%; 243/260). Although commercial ration was the diet of a significantly reduced (21.5%; 56/260) population of cats, most (68.5%; 178/260) cats were maintained on a mixed diet of commercial ration and home-derived leftovers. However, less than half (46.9%; 122/260) of the feline population received uncooked meat as part of their diet. Additionally, significantly more cats had unrestricted street access (80%; 208/260) and mingled (67.3%; 175/260) within the interior of the residences.

Table 2. Biological, nutritional, sanitary, and prophylactic characteristic of cats surveyed from the city of Jaguapitã, southern Brazil.

Variables evaluated	Number	Percentage (%)	p value for the Chi-square test
Gender			<0.0001
Male	106	40.8	
Female	125	48.1	
Undefined	29	11.2	
Age (yrs)			<0.0001
≤ 1	106	40.8	
1 - 4 inclusive	102	39.2	
> 4	28	10.8	
Unknown	24	9.2	
Breed			<0.0001
Mixed	211	81.2	
Pure	49	18.8	
Hair coat			<0.0001
Short-haired	241	92.7	
Long-haired	19	7.3	
Spayed			<0.0001
Yes	17	6.5	
No	243	93.5	
Nutrition			<0.0001
Commercial ration	56	21.5	
Homemade	26	10.0	
Commercial ration and homemade	178	68.5	
Ingestion of crude meat			0.3211
Yes	122	46.9	
No	138	53.1	
Anthelminthic control			<0.0001
Yes	80	30.8	
No	180	69.2	
Antirabies immunization			<0.0001
Yes	23	8.8	
No	237	91.2	
Immunization against infectious feline diseases			<0.0001
Yes	22	8.5	
No	238	91.5	
Regular baths			<0.0001
Yes	85	32.7	
No	175	67.3	
Street access			<0.0001
Yes	208	80	
No	52	20	
Frequent access to interior of residences			<0.0001
Yes	241	92.7	
No	19	7.3	

The canine population was predominantly male (55.8%; 679/1,217) with bitches contributing to 44.2% (538/1217) of the dogs surveyed (Table 3). Most dogs were of the mixed breed (69.5%; 846/1217), between one and four-years old (42.6%; 519/1217), and not spayed (96.3%; 1172/1,217). Additionally, a significant part of these dogs (58.3%; 710/1,217) was maintained on a mixture of commercial ration and homemade diet, while only 23.3% (283/1,217) of these received commercial rations.

Table 3. Biological, nutritional, sanitary, and prophylactic characteristic of dogs surveyed from the city of Jaguapitã, southern Brazil.

Variables evaluated	Number	Percentage (%)	p value for the Chi-square test
Gender			<0.0001
Male	679	55.8	
Female	538	44.1	
Age (yrs)			<0.0001
≤ 1	307	25.2	
1 - 4 inclusive	519	42.6	
>4	391	32.1	
Breeds			<0.0001
Mixed	846	69.5	
Pure	371	30.5	
Spayed			<0.0001
Yes	45	3.7	
No	1172	96.3	
Nutrition			<0.0001
Commercial ration	283	23.3	
Homemade	224	18.4	
Commercial and homemade	710	58.3	
Anthelminthic control			<0.0001
Yes	865	71.0	
No	354	29.0	
Antirabies immunization			<0.0001
Yes	440	36.2	
No	777	63.8	
Immunization against infectious canine diseases			<0.0001
Yes	504	41.4	
No	713	58.6	
Street access			<0.0001
No	695	57.1	
Free	433	35.6	
With owner	89	7.3	
Frequent access to interior of residences			<0.0001
Yes	533	43.8	
No	684	56.2	

Sanitary and immunization demographics of pets

The sanitary and prophylactic survey demonstrated that most cats (69.2%; 180/260) did not received any antiparasitic medication, were not immunized against rabies (91.2%; 237/260) or any specific feline disease (91.5%; 238/260). Although most dogs received anthelminthic drugs (71%; 865/1,217), most of these were not immunized against rabies (63.8% 777/1,217) or other infectious canine disease (58.6%; 713/1,217).

Household demographics and pet ownership

Analysis of the households revealed that females were predominantly interviewed (70.2%; 786/1,120) relative to males, most households 49.9% (559/1,120) consisted of three to four members, 21.3% (238/1,120) of each household consisted of at least three persons, while at least two persons were in 28.9% (323/1120) of the residences (Table 4). Most residents (75.5%; 846/1,120) were more than 30 years of age; children (42.1%; 471/1,120) and elderly persons (35.6%; 398/1,120) were also present within these households.

Additionally, dogs and/or cats were owned by most (68.7%; 770/1,120) of the households visited, 54.4% (610/1,120) of these owned only dogs, relatively few (4.9%; 55/1,120) were the owners of cats, while 9.4% (105/1,120) were the owners of pet dogs and cats. However, 31.1% (450/1,120) of the households were not owners of any pet. When the households that contained only cats were evaluated, it was demonstrated that most (73.8%; 118/160) of these had more than one cat, while 26.2% (42/160) had only one cat. The results were quite different when households with only dogs were analysed. A single pet dog was present in most (55.9%; 401/717) households, and almost a third of these (27.8%; 199/717) had two dogs, while only 5.1% (37/717) were the owners of three dogs.

Table 4. Characteristics of the residents interviewed, the composition of households, and pet ownership from a small city of southern Brazil.

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Variables evaluated	Number	Percentage %	*p* value for the Chi-square test
Gender			<0.0001
Female	786	70.2	
Male	334	29.8	
Age			<0.0001
18 - 30 inclusive	273	24.4	
30 - 50 inclusive	418	37.3	
> 50	429	38.3	
Residents/households			<0.0001
1 - 2	323	28.8	
3 - 4	559	49.9	
> 5	238	21.5	
Presence of children			<0.0001
Yes	471	42.1	
No	649	57.9	
Presence of elderly persons			<0.0001
Yes	398	35.5	
No	722	64.5	

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Pet ownership			<0.0001
No pets	350	31.3	
Dogs only	610	54.4	
Cats only	55	4.9	
Dogs and cats	105	9.4	
Dog frequency/household			<0.0001
One dog	401	55.9	
Two dogs	199	27.8	
Three dogs	80	11.2	
> 3	37	5.1	
Cat frequency/household			<0.0001
One cat	42	26.2	
≥ 2	118	73.8	

Discussion

The result of this study have demonstrated that the number of dogs (2,673) were significantly more elevated when compared to cats (571) within the households evaluated. Although similar results have been described in several Brazilian cities (ALVES et al., 2005; BRANCO et al., 2007; DOMINGOS et al., 2007; SERAFINI et al., 2008; CANATTO et al., 2012; MARTINS et al., 2013), it must be highlighted that all previous studies were done in cities that contained more than 100,000 residents. Nevertheless, similar results were also observed in Ireland (DOWNES et al., 2009), the Teramo Province of Italy (SLATER et al., 2008a), Texas, USA (RAMÓN et al., 2010), and Sydney, Australia (TORIBIO et al., 2009). These results suggest that dogs are currently the preferred household pets over cats within this region, probably because cats are not the predominant breed of domestic animals in Brazil (GENARO, 2010). Alternatively, predominantly more cats than dogs have been identified in Italy (SLATER et al., 2008b); suggesting that the differences in the canine and feline populations might vary based on the geographical location.

The human to dog ratio identified during this investigation was 4.61; these results are similar to those observed in densely populated cities of Brazil, such as São Paulo, 4.34 (CANATTO et al., 2012), Agreste region of Pernambuco, 4.5-12.8 (ROCHA et al., 2011), and Taboão da Serra, and within the state of São Paulo, 5.14 (DIAS et al., 2004), but significantly lower than the ratio of 13.05 described in Curitiba (SERAFINI et al., 2008). Additionally, similar findings were observed in other countries including the 4.7 in Zimbabwe (BUTLER; BINGHAM, 2000), 6.4 of Guatemala (PULCZER et al., 2013), 1.1-6.2 in Chile (ACOSTA-JAMETT et al., 2010), 4.1 in Mexico (FLORES-IBARRA; ESTRELLA-VALENZUELA, 2004), and the 4.5 of Madagascar (RATSITORAHINA et al., 2009), while the human to dog ratio in North America and Europe varies between 6 and 10 (WANDELER et al., 1988). However, these indices are completely different to that of India (SUDARSHAN et al., 2006) and China (KNOBEL et al., 2005), where the human to dog ratio is 36 and 48.3, respectively. These results suggest that the human/dog ratio is relatively similar in cities from underdeveloped and developing countries, but extremely elevated in severely populated nations. Additionally, the marked difference obtained in the city of Curitiba (SERAFINI et al., 2008) relative to that in other cities of developing countries, can be predominantly related to the strategy used, since only pets living in apartments were included in that study. Comparatively, the human: cat ratio (21.5) was significantly more elevated than that observed in dogs: similar findings were described in cats (19.3) from the city of São Paulo (CANATTO et al., 2012),

but lower than the distribution (30.6) identified within the state of São Paulo (DIAS et al., 2004).

During this study, male dogs were predominantly significant (55.8%; 679/1217) within the population evaluated, similar results have been described in other studies from Brazil (MOLENTO et al., 2007; CANATTO et al., 2012; MARTINEZ et al., 2013). Moreover, the predominance of male dogs within canine populations seems to be a worldwide trend, with similar findings occurring in Zimbabwe (BUTLER; BINGHAM, 2000), Chile (ACOSTA-JAMETT et al., 2010), Ireland (DOWNES et al., 2009), Madagascar (RATSITORAHINA et al., 2009), Mexico (FLORES-IBARRA; ESTRELLA-VALENZUELA, 2004), Tanzania (GSELL et al., 2012), Kenya (KITALA et al., 2001), India (SUDARSHAN et al., 2006), and Guatemala (PULCZER et al., 2013). The acquisition of a male or neutered pet has been considered as an efficient form of controlling the growth of urban canine or feline populations (FELDMANN; CARDING, 1973), and might be one of the unintentional reasons for the predominance of male dogs within households worldwide. Additionally, the consequences related with the estrous cycle of bitches has been associated with the comparatively significant number of male dogs in urban (CANATTO et al., 2012) and (MARTINEZ et al., 2013) rural cities. The cost of neutering and the need to reduce unwanted pregnancies also favour the utilization of male dogs as pets (MARTINEZ et al., 2013).

However, there was no significant difference between the populations of male (40.8%; 106/260) and female (48.1%; 125/260) cats during this study; similar results have been described in the city of São Paulo (CANATTO et al., 2012) and in Texas (RAMÓN et al., 2010). Alternatively, female cats were the predominant gender observed in investigations from Australia (TORIBIO et al., 2009) and Ireland (DOWNES et al., 2009), representing 55% (141/260) and 56.3% (108/192), respectively, of these feline populations. Interestingly, 97% and 79% of the female cats from the Australian and Irish studies, respectively, were neutered, with similar (71%) results of neutering described in Canada (LESLIE et al., 1994); while only 6.5% (17/260) of all cats from this study were neutered. The elevated level of neutering of female cats has been associated with an expected reduction in the feline population of Australia (BALDOCK et al., 2003; TORIBIO et al., 2009). While female cat neutering has been primarily aimed at decreasing pregnancy rates, prevention of fighting between roaming cats, and the reduced dissemination of disease between contact cats in Ireland (DOWNES et al., 2009). Consequently, it can be hypothesized that the low neutered rate of female cats identified in this study might result in a proportional increase in this feline population over time. Additionally, since significantly more cats from this study have street access (80%; 208/260), and are not immunized against common feline infectious diseases (91.5%; 238/260), it can be conjectured that these cats have a greater tendency to develop infectious diseases due to contact with other cats of unknown origin. Similar health concerns were expressed due to the tendency of increased feline population in Brazil (GENARO, 2010), considering the predatory and roaming habits of cats. It is worthy to mention that the gender of 11.2% (29/260) of the cats within these households was unknown to the owners, suggesting that these pets do not receive adequate care as comparable to dogs.

Part of the elevated population of cats with street access observed during this study can be associated with the greater difficulty in maintaining cats indoors relative to dogs, since cats are more apt to escape by pulling/scaling enclosed areas thereby increasing the risk of being infected or be involved in fights with neighbouring cats. Moreover, pet dogs and cats with street access can invade homes, suffer vehicular trauma, and might inflict damage to other animals or humans. Nevertheless, the maintenance of cats indoors at nights might reduce vehicular trauma and fighting with unrestrained tomcats

(TORIBIO et al., 2009). The uncontrolled roaming of pet dogs and cats is worrisome particularly for some geographical regions of Brazil where rabies is endemic, since rabies virus type 2 variant, responsible for the transmission of rabies from dogs to humans, has been identified in herbivores (FAVORETTO et al., 2002). Moreover, four definite reservoirs (domestic dog, vampire bat, marmoset, and the crab eating fox) of the rabies virus have been identified in most geographical regions of Brazil, excluding the south (FAVORETTO et al., 2013). Consequently, the confirmation of wild animals serving as reservoirs for the rabies virus in some geographical regions of Brazil, confers the elevated risk of transmission to cats relative to dogs, particularly due to the uncontrolled roaming habits and predatory characteristics of cats, these are more susceptible to enter in contact with bats and wild animals (GENARO, 2010). However, although possible contact between pet dogs and cats with animals might result in infection, the frequency of zoonotic diseases can be reduced or possibly eliminated, if adequate public policies and control strategies are implemented (CANATTO et al., 2012). Consequently, understanding the dynamics of pet dogs and cats within any definite region is of outmost importance for the adequate design and implementation of control and prophylactic measures to prevent the dissemination of zoonotic and infectious diseases.

This investigation has demonstrated that most (58.6%; 713/1217) dogs were not immunized against common canine infectious diseases such as canine distemper virus (CDV) or parvovirus; similar results have been described in another Brazilian city (MARTINEZ et al., 2013). The large population of unvaccinated dogs with street access within this region favours the maintenance and dissemination of these infectious disease agents within the canine population, considering that CDV is one of the principal causes of canine mortality in several Brazilian cities and dogs with street access are constant sources of viral dissemination (HEADLEY et al., 2012). An excellent demonstration of viral maintenance in susceptible canine populations can be obtained from the Coquimbo region of Chile, where CDV is considered endemic, but only 30% of dogs were vaccinated (ACOSTA-JAMETT et al., 2010). Large populations of dogs with street access were also described in the Brazilian cities of São Paulo (CANATTO et al., 2012) and Campo Grande (DOMINGOS et al., 2007), within the Coquimbo region of Chile (ACOSTA-JAMETT et al., 2010), and the Machakos district of Kenya (KITALA et al., 2001); alternatively few dogs had street access in Tanzania (GSELL et al., 2012). The large population of dogs with street access in Latin America might be one of the reasons to explain the endemic state of canine distemper within this region (HEADLEY et al., 2013).

Additionally, a large population of pet dogs (63.8%; 777/1212) and cats (91.2%; 237/260) were not immunized against rabies; these results are similar to those described in Antananarivo, Madagascar (RATSITORAHINA et al., 2009), but opposite to an epidemiological study realized in southeastern Brazil (MARTINEZ et al., 2013) and Ontario, Canada (LESLIE et al., 1994). Although rabies is a serious public health concern worldwide, mass vaccination of dogs and cats in most Brazilian cities (SCHNEIDER et al., 1996), has drastically reduced the number of cases of human, canine, and feline rabies throughout the entire country (CALDAS, 2013; FAVORETTO et al., 2013). Further, recent data released from the Ministry of Health/Brazil has revealed that cases of human rabies have not been diagnosed in southern Brazil effective from 1990, while only 23 cases have occurred within the entire country since 2006; most of these within northeastern Brazil (SVS/MS, 2012). Moreover, southern Brazil was being considered as a urban rabies-free zone where mass vaccination is not indicated; while the state of Paraná, where this investigation was done, has not reported a case of canine rabies since 1997

(CALDAS, 2013). Nevertheless, rabies continues to be a great public health concern in northern and northeastern Brazil (FAVORETTO et al., 2013). Consequently, rabies is neither a major problem nor a cause of canine mortality in southern Brazil; mortality is primarily associated with the direct and indirect effects of infections due to CDV (HEADLEY et al., 2012), and might explain the large percentage of dogs vaccinated against rabies in southeastern Brazil (MARTINEZ et al., 2013), where the disease is still endemic. However, feline rabies is a serious public health issue throughout Brazil that is not easily controlled. The predatory and roaming habits of cats, as demonstrated during this study, make these pets highly susceptible to be in contact with vampire bats and hence be infected with rabies. This difficulty to control feline rabies might explain the two recent deaths of cats due to rabies in the state of Rio Grande do Sul, southern Brazil (PROMED-PORT, 2014).

Only 25.2% (307/1217) of dogs and 40.8% (106/260) of cats were below one year of age. These results are in accord with a study done in the city of São Paulo which demonstrated that the average age of dogs was 4.99 and cats 3.53 years of age (CANATTO et al., 2012) as well as in Kenya (KITALA et al., 2001) and Zimbabwe (BUTLER; BINGHAM, 2000) where more than half of the population of dogs were less than one year of age. The large population of adult dogs and cats associated with the reduced spaying rates (3.7%, dogs; 6.5%, cats) and the larger proportion of intact female dogs (44.1%) and cats (48.1%) identified during this study would definitely result in constant turnover of the canine and feline populations; similar conclusions were drawn for the canine populations of Kenya (KITALA et al., 2001) and Zimbabwe (BUTLER; BINGHAM, 2000). Additionally, most dogs (69.5%; 846/1217) from this study were of the mixed breed, as was demonstrated in southeastern Brazil (MARTINEZ et al., 2013) and in Kenya (KITALA et al., 2001).

More than half (54.4%; 610/1,120) of the households interviewed were owners of a pet dog; similar results (50.8%) were described in Guatemala (PULCZER et al., 2013), but these results were more elevated than the 33.4% of dog ownership described in Australia (TORIBIO et al., 2009). However, the level of pet dog ownership identified during this study was slightly less, but probably not statistically different, than that observed in Chile (ACOSTA-JAMETT et al., 2010), Zimbabwe (BUTLER; BINGHAM, 2000), Pinhais, Brazil (MARTINS et al., 2013), and in Kenya (ACOSTA-JAMETT et al., 2010), where dog ownership was estimated at 61%, 62%, 62.43%, and 63%, respectively. While pet dog ownership in the city of São Paulo varied between 13-63.4%, due to the type of household of the owners (CANATTO et al., 2012). Pet ownership of cats was markedly different when compared to dogs, with only 4.9% (55/1,120) of households being owners of a pet cat; these results are below the 22.5% of pet cat ownership in Australia (TORIBIO et al., 2009), but are similar to the cat ownership obtained in other Brazilian cities, such as the 2.05-6.48% from Pinhais (MARTINS et al., 2013), and the 2.5-16.2% in São Paulo (CANATTO et al., 2012). Data from an investigation done in the city of Pinhais, Paraná state, southern Brazil (MARTINS et al., 2013) with a similar HDI (0.751) but a comparatively greater (117,008) population (IPARDES, 2013) relative to the city of Jaguapitã, has demonstrated that pet ownerships is more related to age rather than the economic status of the owner; these results are in accord with a study done in Texas (RAMÓN et al., 2010). These authors (MARTINS et al., 2013) have shown that owners of elevated social categories are more apt to have pet dogs and not cats relative to owners of the lower income levels, but the age of the household members seem to determine the possibility or not having a pet; individuals between 24-44 years of age are more likely to be owners of pets (RAMÓN et al., 2010). Alternatively, pet dog ownership in

Ireland has been associated with social status, having children as well as the location and type of households, the presence of cats within these households (DOWNES et al., 2009), and household composition (DOWNES et al., 2009, 2011). Pet cat ownership has been associated with the household structure, the gender of ownership (DOWNES et al., 2009), and the presence of dogs (DOWNES et al., 2009; TORIBIO et al., 2009) and/or other pets within these households (TORIBIO et al., 2009).

Surprisingly, significantly less pets were observed in households that contained children (42.1%; 471/1,120) relative to those without (57.9%; 649/1,120); this is contrary to the findings described in Australia (BALDOCK et al., 2003), England (MURRAY et al., 2010; WESTGARTH et al., 2010), Ireland (DOWNES et al., 2009), and the USA (TECLAW et al., 1992). It has been demonstrated that households containing children between 11-15 years of age are more likely to have a pet (MURRAY et al., 2010), probably because children at this age are influential in pet-ownership decisions (DOWNES et al., 2009) and have more time available to assume the responsibility of pet ownership (MURRAY et al., 2010). In the present situation, the reduced number of children pet-owners might be associated with cultural habits and the principal economic activity of the city of Jaguapitã, considering that most residents are engaged in agricultural production or processing, and that the age-range associated with children pet-ownerships only represents 8.9% of the population (IPARDES, 2009). In addition, most of these residents tend to have pet dogs in the rural and urban areas of the city, while pet dogs within this city are mostly acquired for property security; this might have a negative effect on children pet-ownership.

A significant proportion of households during this study were the owners of at least one dog (55.9%), being similar to that described in Chile (ACOSTA-JAMETT et al., 2010), Guatemala (PULCZER et al., 2013), the UK (MURRAY et al., 2010), and Ireland (DOWNES et al., 2009). Alternatively, most households (73.8%) were owners of more than two cats. Most (58.3%) households of the UK had only one cat, while 29.3% were the owners of two cats (MURRAY et al., 2010); similar results have been described in Ireland (DOWNES et al., 2009). The percentage of the canine population (21.8%) relative to the human population from this city is similar to that described in larger cities from different geographical regions of Brazil, such as Campo Grande, MS, Midwest (DOMINGOS et al., 2007) and Lauro de Freitas, BA northeast (MASCARENHASA et al., 2009). The ratio of dogs (1.09) to households observed during this study was similar to that described in the city of São Paulo (CANATTO et al., 2012) and the UK (MURRAY et al., 2010), where the indices are 1.6 and 1.44, respectively. However, the number of cats per household (0.23) was markedly lower than that described within the city of São Paulo (CANATTO et al., 2012) and the UK (MURRAY et al., 2010; WESTGARTH et al., 2010). The elevated number of cats/households observed in large cities seems to be the tendency for cat ownership worldwide and definitely offers a challenge for the control of feline rabies within these urban populations (GENARO, 2010), considering the nocturnal, roaming, and predatory characteristics of cats.

Conclusions

This study probably represents the first demographic investigation of pet dogs and cats from a small city of Brazil, while the results herein obtained have demonstrated that comparatively more pet dogs than cats were present in households during the survey of this investigation. However, the dog and cat demographics identified during this study are comparatively similar to those described in larger cities of Brazil and in other countries. Nevertheless, the responsibility demonstrated by most owners suggest that these pets are highly susceptible to be infected by zoonotic and infectious diseases.

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