Original Article

Evaluation of the Environmental Situation at Public Areas of Tirana by using Stray Dogs as Biomonitor

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ABSTRACT

Fecalization of green space of towns in Albania is the extreme displaying of the dog's pollution, who with faeces in these environments eliminate the causes of parasitic zoonoses they are given the status of contaminated environments. The aim of this study is to evaluate the environmental situation in the public areas of Tirana city by using stray dogs as biomonitor. The prevalene of infestation of stray dogs from intestinal fauna is reflected in the level of contamination of public areas that they frequent. For calculation of the prevalence of the infestation are gathered and analyzed with coproscopi 240 samples of faeces by stray dogs in 3 public areas of Tirana. The average prevalence of stray dog's infestation from parasitic fauna was 77.5%.

So are found: E.granulosus, D. caninum, T. hydatigena, M. lineatus, Ancylostomum spp, Uncinaria spp, T. canis, T. leonina, Trichuris spp, Giardia spp and Coccidia spp. Public areas of the capital city are more polluted by parasitic fauna of dogs because 77.5% of stray dogs that frequent resulted infested by these parasites. The territories that have many trees are more contaminated because the conditions under the shadows of trees are ideal for the longevity of exogenous stages of parasites. Contamination of public places from invasive stages of the dogs intestinal parasites is higher in the spring and autumn (p-value = 0.0001665).

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Introduction:

"The world exists only by the dog's intelligence." These words are written in Vendidad, the oldest and most authentic first texts of humanity (8). The dog is the only animal that has followed the man across all over the Earth since the ancient times. In modern times the relations with this faithful and noble friend are resized, especially in terms of its use in the treatment of stress, neurosis,the eliminaton of loneliness, etc. Resizing of its usages has shortened the distance between him and the man in the family environment, in many cases it considered and treated as a family member. But we should not forget that the dog being the best friend of man, is even more dangerous for our health, if we do not take care for his health (1,6,7,14,21,22).

Likely the man also the dog, is infected by many viral, microbic and parasitic diseases. Due to the numerous morphological and physiological similarities (likely the man and dog are omnivor mammals and live in the same environment) some diseases can be transmitted to the man by many different ways. The main factor for infection the man and pets due to the dogs parasitic zoonoses is the presence of stray dogs in the same environment, who due to ignorance of the danger posed by them (7, 14, 17, 20) and the speed of multiplication are adding more in the streets and other areas of our towns.There is estimated that in Tirana are about 15'000 stray dogs who mostly move or relax in the green areas of the city.

Being numerous stray dogs are the main contributors the fecalization and denatyre of public areas. A ground covered by faeces is a good bed for the development of molds and mushrooms known as the primary cause of allergies in humans (13), but in such environment are created ideal conditions for the development of eggs of parasites zoonotic carried by dewormings dogs. In a study conducted in Tirana by a group of authors (18) is shown that 88.3% of dogs were infected by various representatives of intestinal helminthofauna.

Public areas contaminated by dogs, are transformed from entertainment and recreational facilities in areas where people and animals take different infections, which in some cases may seriously endanger their health and lifes.The aim of this study is to assess the environmental situation in public spaces in Tirana by using stray dogs that frequent these environments as biomonitor, aiming to raise the awareness of the community and local government on the importance of monitoring constantly the environmental sanitation, the planning and implementation measures that will minimize the risks to public health from environment with biological contamination.

Materials and Methods

The evaluation of environmental purity in Tirana, we have conducted by monitoring over a period of two years the level of stray dog's infestation by intestinal fauna that frequented the public areas at three urban zones: Kavaja Street, river Lana and Park Lake. As biomonitor we have used stray dogs because they are really accumulators of intestinal parasitic fauna and as such are the main contaminants of public spaces with these parasites exogenous stages. The level of infestation of stray dogs will be appreciated by two indicators: prevalence of infestation and diversity of invasive species. Through prevalences we will find the quantitative evalutation of infestation, and through the diversity of invasive species we have the opportunity to evaluate the dangerousness of infestation. To calculate the parameters of these indicators there are gathered and analyzed with coproscopi (3, 5, 15, 19) 240 samples of stray dogs faeces that frequented the three urban public areas monitored. In each zone there were set 5 monitoring points, at the distance 200 -300 m from each other (a total of 15). In each monitoring point were collected two samples of faeces from stray dogs once in every season during two years (2013 and 2014). The analyses were conducted at the Institute of Food Safety and Veterinary of Tirana. Types of intestinal fauna were identified by taxonomic keys of eggs, proglotids and oocysts that were discovered during the application of qualitative and quantitative coproscopic techniques (3, 15).

Result

Table 1: The data of parasites species identified in faeces of stray dogs during 2013 and the infestation prevalence in relation with the seasons

Saeson	No. of dogs	The infestation prevalence in %								
		E. granulosus	Cestodë të tjerë	Ancylostomum sp & Uncinaria sp	Toxocara canis	Toxascaris leonina	Trichuris sp	Giardia sp	Coccidia sp	Seasonal prevalence of dogs infestation of all parasites
Spring	30	4(13.3%)	12(40%)	5(16.6%)	7(23.3%)	5(16.6%)	6(20%)	8(26.6%)	13(43.3%)	27(90%)
Summer	30	4(13.3%)	6(20%)	4(13.3%)	3(10%)	3(10%)	3(10%)	4(13.3%)	9(30%)	21(70%)
Autumn	30	3(10%)	9930%)	4(13.3%)	5(16.6%)	5(16.6%)	5(16.6%)	8(26.6%)	10(33.3%)	23(76.6%)
Winter	30	2(6.6%)	8(26.6%)	4(13.3%)	3(10%)	3(10%)	6 (20%)	4(13.3%)	9(30%)	20(66.6%)
Total	120	13(10,8%)	35(29,16%)	17(14,16%)	18(15%)	16(13,33%)	20(16,66%)	24(20%)	41(34,16%)	91(75.8%)

Table 2: The data of parasites species identified in faeces of stray dogs during 2014 and the infestation prevalence in relation with the seasons

Saeson	No. of dogs	The infestation prevalence in %								
		E. granulosus	Cestodë të tjerë	Ancylostomum sp & Uncinaria sp	Toxocara canis	Toxascaris leonina	Trichuris sp	Giardia sp	Coccidia sp	Seasonal prevalence of dogs infestation of all parasites
Spring	30	4(13.3%)	12(40%)	6(20%)	9(30%)	5(16.6%)	10(33.3%	8(26.6%)	16(53.3%	26(86.7%)
Summer	30	0	8(26.6%)	5(16.6%)	6(20%)	1(3.3%)	4(13.3%)	7(23.3%)	10(33.3%	24(80%)
Autumn	30	3(10%)	9	5(16.6%)	6(20%)	3(10%)	8(26.6%)	7(23.3%)	11	23(76.7%)
Winter	30	1(3.3%)	7	4(13.3%)	8(26.6%)	3(10%)	4(13.3%)	5(16.6%)	10(33.3%	22(73.3%)
Total	120	8 (6,66%)	36(30%)	20(16,66%)	29(24,16%)	12(10%)	26(21,66%)	27(22,5%)	47(39,16%)	95(79.2%)

Table 3: Data of parasites species identified in faeces of stray dogs during the two years together and the infestation prevalence in relation with the seasons

Saeson	No. of dogs	The infestation prevalence in %								
		E. granulosus	Cestodë të tjerë	Ancylostomum sp & uncinaria sp	Toxocara canis	Toxascaris leonina	Trichuris sp	Giardia sp	Coccidia sp	Seasonal prevalence of dogs infestation of all parasites
Spring	60	8(13.3%)	24(40%)	11(18.3%)	16(26.6%)	11(18.3%)	17(28.3%)	16(26.6%)	29(48.3%)	53(88.3%)
Summer	60	4(6.6%)	14(23.3%)	9(15%)	9(15%)	4(6.6%)	7(11.6)	11(18.3%)	19(31.6%)	45(75%)
Autumn	60	6(10%)	18(30%)	9(15%)	11(18.3%)	8(13.3%)	13(21.6%)	15(25%)	21(35%)	46(76.6%)
Winter	60	3(5%)	15(25%)	8(13.3%)	11(18.3%)	6(10%)	10(16.6%)	9(15%)	19(31.6%)	42(70%)
Total	240	21(8,75%)	71(29,6%)	37(15,4%)	47(19,5%)	29(12%)	47(19,6%)	51(21,2%)	88(36,6%)	186(77.5%)

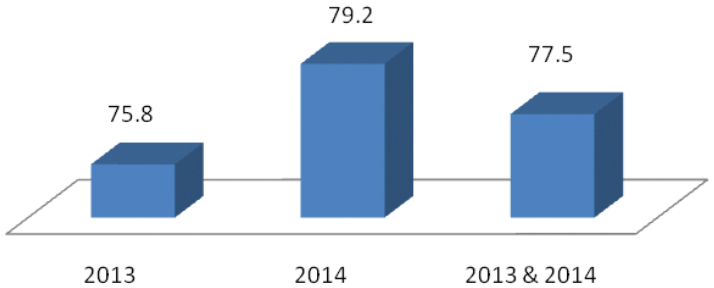

Fig. 1: The infestation prevalence of stray dogs from intestinal fauna by year in %

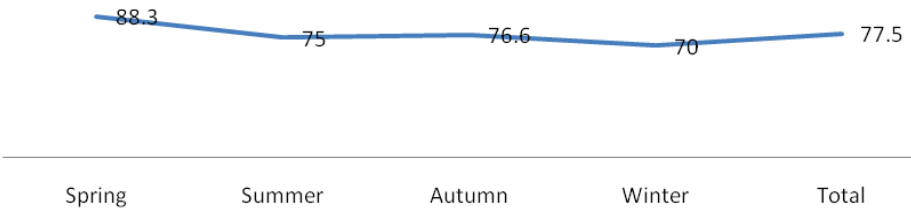

Fig. 2: The prevalence of stray dogs infestation from intestinal parasitic fauna in relation to the season when it is important the monitoring of environmental situation

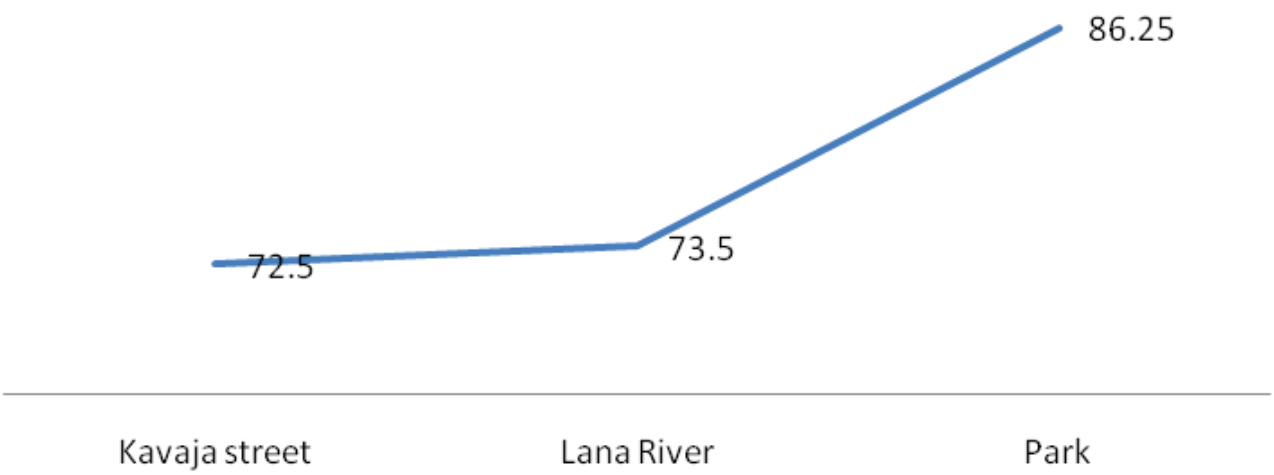

Fig. 3: The prevalence of stray dogs infestation from intestinal parasitic fauna in relation to urban areas where the environmental condition is monitored

Table 4: Intestinal parasitic fauna species identified in faeces of stray dogs in the three urban areas where the environmental condition is monitored

Public areas	The types of intestinal parasites that have been identified in faeces of dogs							
Kavaja Street	E.granulosus	Others cestods	Ancylostoma spp & Uncinaria spp	T.canis	T. leonina	Trichuris spp	Giardia spp	Coccidia spp
Lana River	E.granulosus	Other cestod	Ancylostoma spp & Uncinaria spp	T.canis	T. leonina	Trichuris spp	Giardia spp	Coccidia spp
Park	E.granulosus	Other cestod	Ancylostoma spp & Uncinaria spp	T.canis	T. leonina	Trichuris spp	Giardia spp	Coccidia spp

P.s. Other cestods = Taenia hydatigena, Dipylidium caninum and Mesocestoides lineatus

Discussion

Numerous buildings and disregard of urbanization plans in most of our towns has reduced to extreme the green areas and generally what are called public space. Consequently those few public facilities are most frequented from citizens, accompanying animals and stray dogs. These are the only territories when they can live. Being out any care the stray dogs have a high load of intestinal fauna, exogenous stages of which derive in the external environment with faeces during defecation. For this reason they have become main contaminants of public spaces with faeces and parasitic pathogens, which through the legs of animals and of people, of arthropods and worms, wind, water, and via extensions of molds are distributed and contaminate the entire territory of the public areas.

Table 1 shows the data on the parasites species that are found in faeces of stray dogs in 2013 and the prevalence of infection in relation to the seasons. By cestodes we have identified: Echinococcus granulosus, Dipylidium caninum, Taenia hydatigena, and Mesocestoides lineatus. The last three types for reasons of space are not presented separately in the table but are named "others cestods". By nematodes have identified: Acylostomatides (Ancylostoma spp and Uncinaria spp), Toxocara canis, Toxascaris leonina and Trichuris spp. By zoonotic protozooa have identified Giardia spp and Coccidia spp. Our results do not differ with those of the literature (2, 6, 11, 12, 13, 15). Prevalenvca average of infestation of stray dogs by representatives of the intestinal fauna that we identified through coproscopic analysis during the first year of a monitoring (2013) was 75.8%. The position of each individual parasite prevalence level of infestation would be: E.granulosus (10.83%) <T.leonina (13.3%) <Ancylostomatides (14:16%) <T.canis (15%) <Trichuris spp (16.6%) <Giardia spp (20%) < Other Cestod (29.16% <coccidia spp (34.16%). So, it results that ccocidia spp and group "cestod others" are parasites more frequently in stray dogs. E .granulosus is parasite with a lower frequency (10.83%), but we should not forget that it is the cause of cystic echinococcus, one of the most dangerous zoonoses for humans and animals (1, 16, 22).

During 2014, the average prevalence of dog's infestation (Table 2) was 79.2% or 3.4% higher than in 2013. The order of each individual parasite infestation prevalence was: E.granulosus (6.6%) <T.leonina (10%) <Ancylostomatidet (16.66%) <Trichuris spp (21.6%) <Giardia spp (22.5%)

T.canis (24.16%) < Other Cestod (36.6%) <Coccidia spp (39.16%). Even during this year, the most frequent parasites were the Ccocidia spp and the group "Other cestods".

Table 3 reflectes all the results of coproscopic analysis for the entire period of the experiment (two years). The average prevalence of dog's infestation from intestinal parasites was 77.5%. The ccocidia spp stay in the highest position and lowest position is E.granulosusin in terms of individual infestation prevalence belongs for two years together. The differences between the average prevalence of infestation for the years 2013 and 2014 are random and are not confirmed by statistical analysis. Our results are similar to those reported in the literature. In a study conducted several years ago in the peri-urban area of Tirana resulted infested by intestinal fauna 88.3% of dogs (18), while in a study of this type orientied to family dogs perform in Germany (2) it reported that the prevalence of infestation was 32.2%. Approximate results reported by other researchers (10, 11).

Prevalence of stray dogs infestation from zoonotic parasites that live and move in Tirana's public areas is very high (77.5%). It is the direct result of the lack of care and the way they provide food. They are feed mainly in containers where the waste is collected and when they are hungry predated small rodents, arthropod and different soil worms. It is known that these groups of creatures are the paratenic hosts of dog's intestinal parasites (5, 15, 19). The high prevalence of stray dog's infestation from intestinal parasitic fauna is reflected in the level of contamination of the public areas. The higher is the degree of environmental contamination, the higher will be the pressure of the polluted environment on the health of the community who frequent it.

Fig.2 reflectes the general trend of the level of stray dog infestation prevalence in relation to seasonal (winter 70% <summer 75% <autumn 76.6% <spring 88.3%.). Statistical analyzes have confirmed the seasonal impact on the prevalence of stray dogs infestation from zoonotic intestinal parasites (p-value = 0.0001665). Spring weather conditions favor the development and lifetime of exogenous stages of dogs intestinal fauna in the external environment, so during the spring and fall the infestation level is higher than during in winter and summer (5, 15, 19).

The results of coproscopic analysis in relation to public areas where environmental health monitoring are reflected in the Fig.3. It is presented clearly the histogram of infestation prevalence of stray dogs that changes from Kavaja Street with 72.5% going up to 73.5% to River Lana and ends at Park with 86.25%. Stray dogs that attend territorial of park resulted in the highest level of infestation because due to numerous trees found in Park, exogenous parasites intestinal stages are protected from solar radiation that is lethal for them and at the same time provided normal humidity to develop throughout the year. In addition the park has more than anywhere else rodents, birds, arthropods and annelid worms that serve as a reservoir of dog's intestinal fauna. From this result we come to the conclusion that the environments where there are more trees are more contaminated by exogenous stages of dogs zoonotic intestinal parasites compared to public areas where trees are absent.

Another indicator with which is estimated infestation of stray dogs is the diversity of parasitic fauna, referring to the number of parasites species identified in stool of stray dogs in the three territories and the intervals of time when monitoring is performed. By identifying parasites' types and knowing the pathogenicity of any we evaluate dangerousness of infestation. Regardless of season, year and environment where faeces are collected through coproscpic analysis are identified always the same representatives of the intestinal fauna of dogs. These results are presented in Table 4. So this phenomenon finds explanation to what we mentioned above that, stray dogs live in groups and are always on the move throughout the territory of the towns in search of food (despite the return to rest in preferred territories). In this way they come in contact with contaminated environments by their homologous realizing crossed infestation and the homogenisation of pollution in all urban spaces. Finally are identified all the representatives of intestinal parasitic fauna of dogs that were described at the beginning of the discussion. So, in public areas of our towns can be infected from all species of zoonotic intestinal parasites of dogs, no matter the season and the fact that the frequented areas are at center or peripheral part of the town.

Conclusion

1. Public areas of the capital city are polluted by exogenous stages of dog's parasitic zoonotic fauna, because 77.5% of stray dogs that frequented resulted infested by these zoonotic parasites.
2. Biological pollution of public areas by dog's zoonotic intestinal fauna from the risk posed to public health is uniform throughout the territory of Tirana because the stray dogs that are carriers and spreaders of its move in search of food from one territory to another .
3. Contamination of public places from invasive stages of the dogs intestinal parasites with zoonotic highlighted character is higher in the spring and autumn (p-value = 0.0001665).

4. Public environments where there are many trees are more contaminated because the territories under the shadow of trees create ecological ideal nursery for the development and lifetime of exogenous stages of dogs intestinal parasites
5. To minimize pollution public spaces in the towns for stray dogs we recommend: a) capture, sterilization and their periodic deworming; b) as the many part of stray dogs originate from rural areas, to be stop by the law the omission of dogs in the urban area.

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Competing Interests
None declared

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