TOXOCARA CANIS – BIOINDICATOR OF PARASITIC SOIL CONTAMINATION OF TECHNOGENICALLY TRANSFORMED TERRITORIES

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Abstract: The results of experimental studies of parasitic contamination degree using bioindicators *T.canis* for monitoring areas of technologically transformed territories are given. The reliability of using the methods of bioindication of ecological and parasitological state of technologically transformed territories (for example, m. Kyiv) is confirmed. The results were obtained by using exponent of domination of toxocara invasive stages in selected soil samples with a help of flotation methods with ammonium nitrate.
Keywords: bioindicator, domestic carnivores, helminthes, soil, *T.canis*, parasitic contamination, technologically transformed territories, bioindication mapping, playgrounds, invasive.

Introduction

The balance of parasitic system in terms of the significant environment transformation that is influenced by anthropogenic factors is impaired dramatically. It is manifested especially in the technologically transformed territories, in cities, as well as in emergency situations caused by social factors (Cure, 2005). The main impact of such situations is increasing the number of parasites carriers and hosts of all categories and changing structural and functional organization in the "parasite-host" system. We observe a violation of parasitic mechanisms of self-regulation and increasing the periods, necessary for their stabilization to a new level (Adekeye, 2016).

Dogs helminthes are very common and potentially dangerous for the people mass infection, even in developed countries. In particular, many carnivorous agents of parasitic diseases cause significant pathological changes in the human body. One of the most dangerous zooanthropohelminthes is toxocarosis (Baer, 2007).

The study is testing a method of obtaining information about soil parasitic contamination on technologically transformed territories using bioindication properties of parasitic nematodes *T. canis* for sanitary-helminthological assessment of playgrounds, school and recreation areas, beaches etc.

Materials and methods.

The investigation was performed at a specified pattern study (Fig.1), include three main blocks: the study of environmental issue, determine of research direction conducting experimental research, development and testing the methods of executing etc.

To accomplish this goal we used a number of methods: field (route-search, detail - trip), desk (identification of species, formation of table data), general (synthesis, analysis, monitoring, system approach), special methods of biological (ecological) laboratory (helminthological) and statistic − mathematical analysis.

58 monitoring sites were set, 1160 samples of soil were taken and analyzed, and generalized descriptions that correspond to the number of monitoring sites were made.

Our monitoring sites were set on the territories' of schools, playgrounds, small in size. The size of these test area should not be more than 5x5 m, in other cases on each 0.5 - 20.0 ha of the territory we site at least 1 test area 10x10 m. From the monitoring site, a sample weighing 200 g (consisting of 10 spot samples weighing 20 grams each) was selected.

Spot samples on the monitoring site were selected by the envelope methods with a shovel, trowel etc. from the soil surface and from the depth of 10-20 cm. If necessary, the selection of samples was carried out from the deeper layers (40-60 cm).

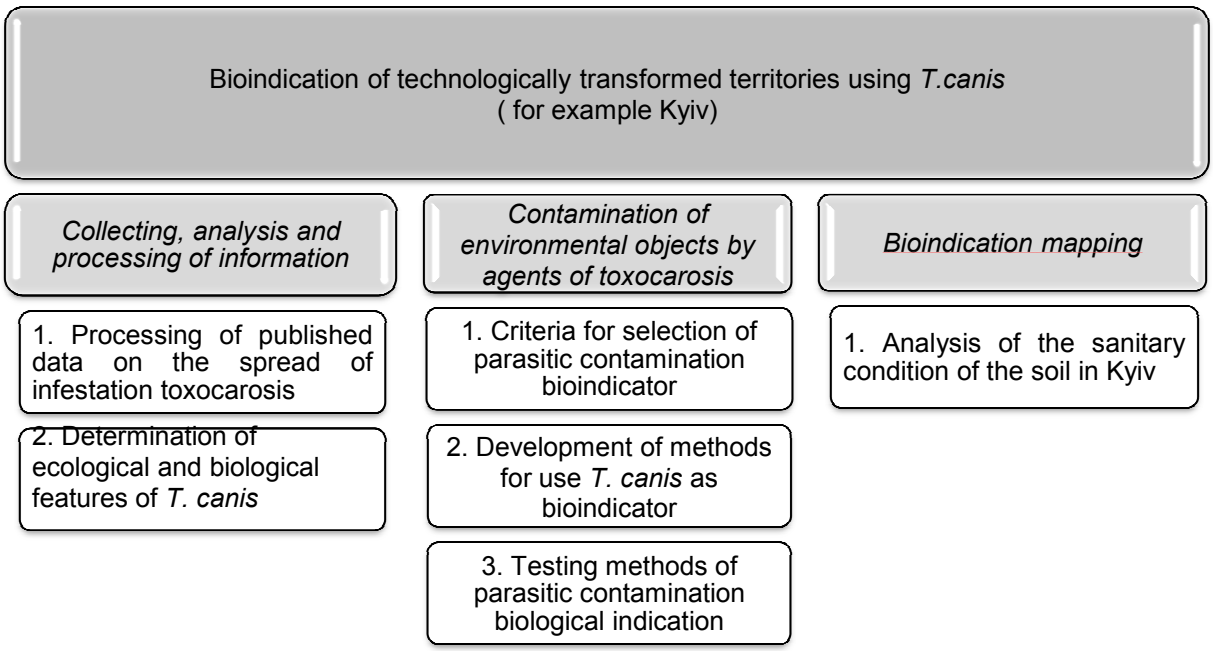

Fig 1. Pattern study

From the combined sample, for 4 portions of 25 grams of soil, were taken and placed in a centrifuge 250 ml tubes and poured by 3% solution of ammonium nitrate (in the ratio 1: 2). The soil was thoroughly mixed, the mixture was centrifuged for 3 minutes. The tubes were installed in the stand, brine is poured to level 2-3 mm below the edges of the tubes and covered by substantive lenses. The eggs of helminthes were drawn up and concentrated in the surface film of brine. For assess the results, of the number of eggs detected in 4 portions of the sample is multiplied by 10, and we getting the number of eggs in1 kg of soil.

Results

Kyiv city is characterized by peculiar climatic, ecologico-geographical and socio-economic conditions that are critical to the activity of toxocarosis sources. The peculiarity and diversity of the natural conditions of Kyiv are related to its location on the edge of physico-geographic zones: steppe and mixed forests. Overall, the city has a moderate continental climate - warm summers and mild winters, optimum humidity. All these contribute to the development and dissemination of toxocarosis invasion that depends directly on abiotic environmental factors and are important components in the development cycle of helminthes.

Nowadays, a significant number of stray dogs (about 500 thousand) contributes to the spread of parasitic infestation. Due to their high amount throughout the city, we have covered the entire territory of the city and obtained the information on parasitic contamination of administrative-territorial system.

To check the reliability of the results, and thus of the method, the statistical analysis of the experimental data for different periods was performed (Tab. 1, 2). Assessing the quality of the obtained results of the soil samples it was recorded that about 95% of samples were infested by helminthes *T. canis*, other 5% - by *Uncinaria stenocephala, Echinococcus granulosus*and al. The amount of latter was not significant and did not affect the overall result.

The difference between the highest and lowest value of the number of eggs, that describe the extent to which its value changes,is defined as the range of variation. The highest magnitude is recorded in Darnytskiy district - 111, and the lowest - in the Pecherskiy district - 73. As for the mean number of eggs in the soil samples, the highest value has Darnytskiy district - 29.86; and the lowest - Dniprovskiy - 18.55.

The results of autumn observations and experiments were as follows: the highest degree of scope of variation was is recorded in Svyatoshinskiy district - 105, the lowest - in Shevchenkivskiy district - 73.The highest number of eggs in 1 kg of soil was recorded in Darnytskiy district - 27.54, the lowest number – in Desnianskiy district - 21.36.

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Table 1

The level of contamination of soil by the administrative districts (summer, 2015)

Administrative ares in Kyiv	The average number of eggs toxocara in 1 kg soil (M±m, %)	Min number of eggs in soil samples	Max number of eggs in soil samples	The scope of variation
Holosiivskiy	25,1±0,77	4	89	85
Darnytskiy	29,86±0,6	9	110	111
Desnianskiy	24,05±0,58	6	87	81
Dniprovskiy	18,55±0,56	5	75	70
Obolonskiy	28,76±0,46	3	98	95
Pecherskiy	24,16±0,49	10	83	73
Podilskiy	21,51±0,84	2	83	81
Svyatoshinskiy	28,2±0,5	5	113	108
Solomianskiy	22,89±0,71	2	81	79
Shevchenkivskiy	20,79±0,61	8	79	71

Table 2

The level of contamination of soil by the administrative districts (autumn, 2015)

Administrative ares in Kyiv	The average number of eggs toxocara in 1 kg soil (M±m, %)	Min number of eggs in soil samples	Max number of eggs in soil samples	The scope of variation
Holosiivskiy	29,11±0,68	7	93	86
Darnytskiy	27,54±0,58	4	102	98
Desnianskiy	21,36±0,59	5	93	88
Dniprovskiy	23,09±059	5	89	84
Obolonskiy	25,41±0,46	5	93	88
Pecherskiy	26,1±0,59	5	96	91
Podilskiy	24,47±0,61	8	83	75
Svyatoshinskiy	26,92±0,48	5	110	105
Solomianskiy	23,34±0,74	7	89	82
Shevchenkivskiy	22,05±0,57	8	81	73

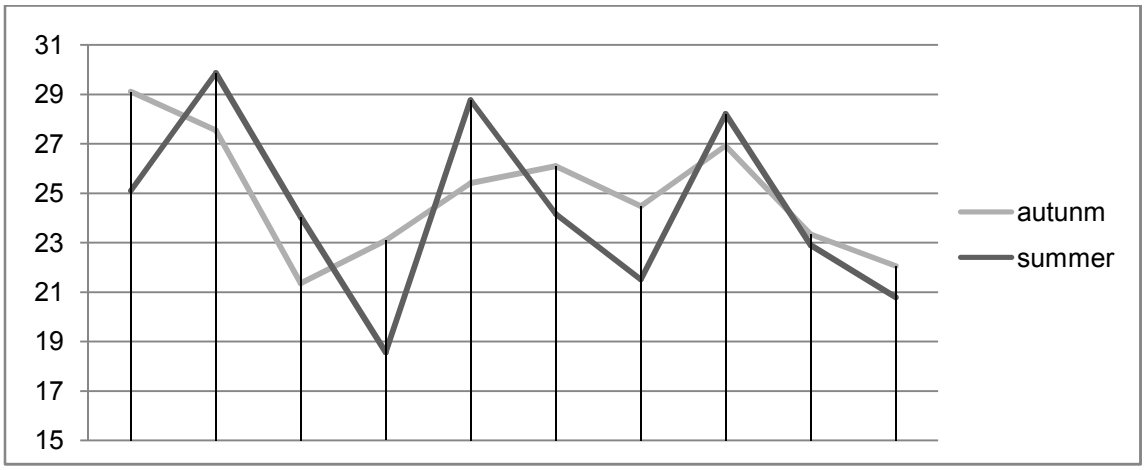

Fig. 2. Comparative dynamics of average number of toxocara eggs (summer - autumn 2015)

Discussion

When comparing the results for establishing the dynamics of contamination in certain areas, it was found out that the summer contamination rates were higher than in the autumn, but the percentage of positive samples recorded in both seasons of a was defined as high with a significant

degree of danger of infection (Fig. 2). The obtained results are similar to those in the literature review of Ukrainian and foreign authors, which indicate a significant level of soil contamination with the toxocara eggs in countries with different levels of sanitary standards and support the hypothesis about on using *T. canis* bioindication properties. The using of informative by bioindicator chosen allows to realize complex preventive measures in the monitoring areas according for the specified addresses, which simplifies significantly the implementation system.

Among the monitoring areas is set with the highest degree of contamination is not significant deviations in three out of ten (namely Darnytskiy, Obolonskiy and Svyatoshinskiy districts) was set. But to define the reasons related with this phenomenon is difficult as the districts as not separated.

Conclusions

The contamination of the environment objects with the parasites has a significant impact on the health of urban residents because of the infections risk. In sandy clay soil the highest level of toxocara eggs domination was registered, and the lowest level - in loamy soils, but it does not change the overall picture since the recorded differences were not significant. A significant degree of soil contamination and a significant amount of specific and non-specific hosts promotes the parasitic diseases development among both among domestic carnivores and human population. Health education policy is essential for reducing the number of patients and avoiding epidemics.

The experimental studies have confirmed the use of *T. canis* helminthes of domestic carnivorous as bioindicators of parasitic contamination in conditions of technologically transformed territories.

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