RECENT TRENDS IN BIOTECHNOLOGY

MEDDOCS
Open Access Publisher

Parasites in Pets and Humans Cause Cancer by Global Warming

Corresponding Author: Robert Skopec
Dubnik, Free-Lance Science Writer, Slovakia.
Email: zxcbnvm7@gmail.com

Published Online: Oct 18, 2021
eBook: Recent Trends in Biotechnology
Publisher: MedDocs Publishers LLC
Online edition: http://meddocsonline.org/

Keywords: Canine dirofilariosis; Czech republic; Dirofilaria immitis; Dirofilaria repens; Slovakia.

Abstract

Internal parasites are incredibly common in both cats and dogs. Because of their relative ease of transmission and high rate of occurrence, the vast majority of dogs will contract a parasitic infection during their lifetime. Although treatment with parasiticides is reasonably simple and straightforward, many pet owners are unaware of how common these infections are. If left untreated and allowed to progress, these infections can create health issues such as anemia or failure to gain weight, and some pose a risk of zoonosis.

Introduction

Although most owners know that parasitic infections are possible, especially when the animal is relatively young, generally speaking, there seem to be some misconceptions surrounding their prevalence and appropriate testing. The misconceptions originate with owners and are further reinforced by veterinarians, who may be reluctant to suggest testing, which owners might perceive as superfluous [1,2].

Testing for internal parasites is common in both puppies and kittens, largely because they represent the largest category of infected pets. In fact, according to the Companion Animal Parasite Council (CAPC), samples collected from across the United States show that more than 30% of dogs under 6 months of age are shedding *Toxocara canis*, or roundworm, eggs [2]. Most owners are aware that puppies and kittens can contract parasites, particularly roundworms, from the mother, either prenatally or via lactation after birth. Because of this, many new owners accept deworming as a normal part of puppyhood, akin to the first round of vaccinations and sterilization [3].

However, this prevalence presents as somewhat of a double-edged sword. Although most owners of puppies and kittens have their pets dewormed as youngsters because it's common knowledge that many puppies and kittens "have worms," must understand that the danger parasites present dissipates once the dog or cat reaches adulthood than further testing is required.

Immature immune systems are most at risk for parasitic infections

In many ways, they are correct: younger animals with immature immune systems are most at risk for parasitic infections. As veterinarians do not always offer testing for parasites, except at an annual visit (and not all annual visits include a fecal test), many owners believe that it's prudent to test a fecal sample for worms only if the animal is presenting symptoms, such as the presence of worms in stool, or if the dog has knowingly been exposed to an infected dog (eg, at a dog care facility or an animal park).

Citation: Skopec R, (2021). Parasites in Pets and Humans Cause Cancer by Global Warming. Recent Trends in Biotechnology, MedDocs Publishers. Vol. 2, Chapter 2, pp. 9-13.

Contrary to this standard belief system and practice, the CAPC recommends testing at least 4 times in the first year of life, and at least 2 times per year in adults, depending on patient health and lifestyle factors [2].

This frequency of testing is somewhat unusual, as most adult dogs and cats are only brought into the clinic once a year for a wellness visit which is when fecal testing for parasites is most commonly conducted. Furthermore, in low-risk households (ie, a home with strictly indoor cats or dogs that are less likely to contract a parasite), many veterinarians simply would not recommend more frequent testing unless the animal presents with signs of infection.

Owners who are offered this level of testing may protest, particularly if they are aware that the dog has been dewormed, perhaps even multiple times in puppyhood, and is not presenting with any symptoms. In addition, some pet owners are unaware of the symptoms of intestinal parasites save for the presence of worms in the feces and may not know that their pet requires treatment in the early stages of infection.

The notable exception to this trend is *Dirofilaria immitis*, also called heartworm. Dog owners have long been conditioned to regularly test for and guard against heartworm using monthly preventives. It has become standard practice to test for heartworm annually and avoid refilling the monthly parasiticide until the dog has tested negative. Dog owners are quite aware of the dangers of heartworm and are often diligent about preventing it. This is partly because of how expensive and potentially dangerous the treatment for heartworm can be, the informative and sometimes graphic informational leaflets to which the owners are exposed, and partially because it has become standard practice [4,5]

Treatment for intestinal worms is perceived as less serious than that of heartworm. With parasiticides for dogs and cats sold over the counter at pet stores, the consequences of infections are less dire, and owners are less apt even to consider regular testing outside of puppyhood and kittenhood.

Many owners are also under the impression that different geographical areas of the United States present a higher risk for all intestinal parasites. These thoughts are similar to that of tickborne illnesses and heartworm disease, despite data showing that these parasites can be found throughout the country. Often, these associations correlate with warmer weather, and people mistakenly believe that these types of parasitic infections are only a risk in hotter climates [5].

In fact, many owners are not aware of how a pet may become infected with intestinal worms, such as roundworms, *Trichuris trichiura* (whipworms), and *Echinococcus granulosus* (tapeworms). These can be contracted via contaminated soil or contact with the feces of an infected animal, both of which are common in areas where there are multiple animals, such as parks, popular dog-walking trails, etc.

The public may also be unaware that these types of intestinal parasites are zoonotic diseases, and dogs and cats are the definitive hosts for the roundworm species that commonly cause infection in humans. If this information is more widely disseminated, pet owners may feel more compelled to do biannual testing, regardless of the presence or absence of symptoms in their pet, particularly because many owners come into regular contact with dog feces as a result of common etiquette surrounding canine hygiene in public [6].

It may be prudent to engage in more grassroots education, either by making fecal centrifugation part of a biannual or at least, annual examination. In addition, pet owners should be provided with more information about the risks that tapeworms, roundworms, and whipworms pose to their pet, even after the animal reaches adulthood. Owners should also be encouraged to use a broad-spectrum parasiticide, such as milbemycin oxime (Interceptor), which protects against heartworm, as well as roundworms, whipworms, and tapeworms.

Moreover, it should be reiterated that these types of illnesses are zoonotic, can spread to humans relatively easily, and can result in more serious infestations in humans than in their animal counterparts [7].

Different epidemiological pattern of canine dirofilariosis in two neighboring countries in central europe-the czech republic and slovakia

The known data resulting from individual surveys of canine dirofilariosis point to the great differences in the epidemiological situation among countries where Dirofilaria parasites emerged approximately at the same time. In this regard, the Czech Republic and Slovakia, neighboring countries situated in Central Europe, could serve as an illustrative example of such a situation. The present study aimed to assess the prevalence of canine dirofilariosis in both countries and to discuss the reasons for potential differences shown. Between October and December 2019, 429 dogs from the Czech Republic and 644 from Slovakia were examined for canine dirofilariosis using the Knott test for microfilariae detection and conventional PCR for the species determination. The results' analyses showed notable differences. While in the Czech Republic autochthonous Dirofilaria repens cases are reported sporadically and Dirofilaria immitis infections have been confirmed only as imported so far, in Slovakia, both Dirofilaria species seem to have become endemic. Concretely, in the Czech Republic, microfilariae were detected in the peripheral blood of 8 dogs (1.86%): in seven, D. repens was confirmed, and in one dog, mixed infection with D. repens and D. immitis was diagnosed. Seven infected animals came from the eastern part of the country neighboring Slovakia. In Slovakia, microfilariae were detected in 68 (10.56%) dogs examined. DNA analysis confirmed D. repens mono-infection in 38 (5.90%) dogs, single D. immitis infection in 21 (3.26%) animals, and both Dirofilaria species were detected in 9 (1.40%) samples. Although we are unable to determine the cause of the differences, our study confirmed that the long-registered low number of canine dirofilariosis cases in the Czech Republic is not due to insufficient investigation (monitoring), but due to a low prevalence of the parasite in this area [7,8].

Mosquitos and flys make much more infections during last years the people in Central Europe. In my country Slovakia it was discussed in many communities to make for summer extraordinary states caused by too big numbers of mosquitos and flys. There is growing fears from dangerous diseases like Dirofilaria immitis and Dirofilaria repens. Dirofilariosis is studied in Parasitological Institute of the Slovak Academy of Science (PISAS) in Kosice. These two named diseases is from the category of Onchocercidae and are dangerous first of all fot the dogs, cats and animals living free in the nature. Mosquito who has sacked blood from the other animals is able to infect also the humans [7,8].

It's not a long time that source actor of the Heart (Lung) dirofilariousis of dogs was not too frequently met in Central Europe.

There was much more frequent the cases of the Dirofilaria repens in dogs and also in humans. During the first big research of above diseases in Slovakia in the years 2005-2015 with 4 000 dogs from all the regions of Slovakia. Presence of the Dilariousis was find about 2 to 25%. It was depending from the locality. The results were showed the absulute prevalence of Dirofilaria repens. Only in last time we can see big changes South Slovakia with more cases of Dirofilaria immitis and with the combined cases. Inthe years 2016-2020 there were registered more then 80 cases of this disease. Sorry to say, but in the years 2019-2020 were registered also new cases of dog's death. Dirofilaria immitis is causing heart (Lung) infection is much more spread in the USA, Canada, Africa, Asia, Austrelia. Now i tis beginning to be also frequent in Hungary. This disease was first time registered in Slovakia in the districts of Nové Zámky (I am also from this district), Komárno and Bratislava [9,10].

The scientists from the above sayed PISAS in Kosice, were realized a big research of the epidemiological situation in Czech Republic and also in the Slovak Republic with company Bayer, s.r.o. in 2019. Sorry to say, but situation in my country with Dirofilariou immitis was showed much more bad results than in Czechia. It was tragical to see that many dogs may big amount of the worms in their hearth in the region of Kosice-okolie and Zvolen.

There is a big question about risk, danger of Dirofilaria to Humans. Mosquito and fly can infect also people when he was contacting the blood of the infected dog. We know from the year 2007, when was a first man infected with Diroflariou repens in Slovakia. From this time we have every year several similar cases. Special problem may be when parasite is infected the eye of the patient. I tis possible to to cure this problem with antiparasitarian medicine.

Parasitological Institute in Kosice critisise our veterirarien doctors because there are not working enough for the propaganda about dirofilariosis to be preventive against these new diseases in Central Europe. Probably it must also help the Government of our country to make bigger pressure on the veterinarians at this topic [10-12] Figures (1,2,3).

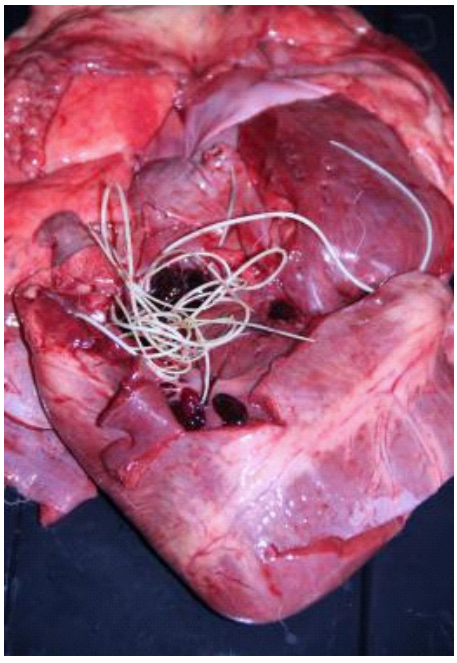

Figure 1: Katarína Čižmáriková.

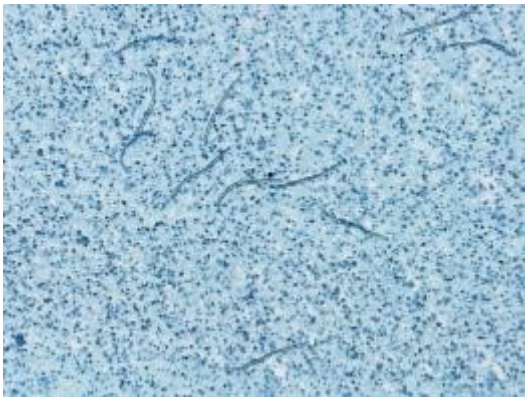

Figure 2: Miloš Halán, UVLF Košice.

Figure 3: Martina Miterpáková.

Climate changes implicated for dirofilaria dissemination in slovakia

Dirofilariosis is a parasitic disease caused by helminths of the genus Dirofilaria. Climatic changes are considered to be main risk factors for dirofilariosis spreading. In the Slovak Republic, canine subcutaneous dirofilariosis was recorded for the first time in 2005. In 2007 the first coordinated research project started to detect possible endemic infections and to determine their magnitude. A total of 984 dogs were examined for the presence of microfilariae within 2007-2008. Modified Knott test and PCR were used for microfilariae detection and for Dirofilaria species identification. Dirofilariosis was diagnosed in 196 dogs which represents an overall prevalence of 19.9%. The majority of infected dogs came from southern regions of Slovakia. In the regions of Trnava and Nitra 45.2% and 31.4% of the dogs surveyed were infected, respectively. The highest prevalence of dirofilariosis was detected in shepherd and watch dogs (45.7%), and hunting dogs (40.5%). In the group of police dogs, 20.5% animals were infected. Dirofilaria repens was detected in all infected dogs. In seven animals co-infection with Dirofilaria immitis was present [12].

The Callisto project

Filaroids are roundworms that belong to the family Onchocercidae. Filaroid species are prevalent in Europe and some of them are of increasing concern due to the significant level of disease they cause in dogs and man [11]. The species *Dirofilaria immitis* and *Dirofilaria repens* (Spirurida, Onchocercidae) are the best known filaroids affecting dogs. They present dif-

ferent pathogenic potentials for man and animals; while *D. immitis* threatens dogs and cats, causing a severe and often fatal cardiocirculatory disease referred to as 'heartworm disease', *D. repens* induces a non-pathogenic subcutaneous infestation in dogs, but is a more prevalent zoonotic pathogen in man. Mosquitoes transmit these *Dirofilaria* species to dogs, cats and other wild carnivores. About 45% of the total human and pet population are exposed to the risk of Vector-Borne Helminths (VBHs) in Europe. Although *Dirofilaria* spp. represent the most prevalent VBHs, other helminths of dogs and cats, such as the *Thelazia callipaeda* eyeworm (Spirurida, Thelaziidae), are emergent zoonotic agents in several European regions. Finally, the recent finding of the zoonotic potential of a little known filaroid of dogs, *Onchocerca lupi* (Spirurida, Onchocercidae), rendered the puzzle of human VBH infections in Europe even more complicated [13,14].

The prevalence of dirofilaria immits and D. repens in the old world

Europe and russia

Dirofilaria immitis (canine and feline heartworm disease) and *D. repens* (subcutaneous infections) (Spirurida, Onchocercidae) are endemic throughout European countries and in the southern eastern regions of Asia, and reported with increasing frequency in Africa. Nonetheless, the increased awareness of veterinary practitioners and owners, even in countries where the infection prevalence is low or the heartworm (HW) cases are sporadic (such as Germany, Netherlands, France; Genchi), has decreased *D. immitis* prevalence mostly in the past endemic, hyper-endemic areas. For instance, in Northern Italy the prevalence decreased in three decades from >40% in dogs living in lower Po River course to about 8% in owned dogs not treated with preventive drug, and most veterinary practitioners currently surveyed have reported diagnosing no more than 5-20 yearly clinical cases of canine HW and *D. repens* infections in previous hyperendemic areas. In the Canary Islands (Spain) the decrease was from 30% to 19% and Japan from 46% in 1999-2001 to 23% in 2009-2011 [13,15].

In France, data from a nationwide serological survey of *D. immitis* and tick borne infections carried out in 2009 showed a prevalence of 0.22% in healthy dogs and 6.87% in dogs with suspected infection. The global annual prevalence (including Corsica Island) of *D. repens* is 0.02-0.12% [14]. In Spain (Madrid area), the prevalence of canine and feline HW infection is 3% and 0.2%, respectively. In western regions the mean prevalence is 5.8%, and 2.8% in the southeast of the country (Catalonia and Barcelona area). In continental Portugal, canine HW infection is endemic and ranges between 4% in apparently healthy dogs and 9% in clinically suspected dogs [14,16]. Furthermore, wild carnivores have been identified as a possible reservoir (prevalence 3-12% in foxes by necropsy). The highest prevalence of canine HW has been observed on Madeira Island (40%).

Data from a large serological survey (>80,000 serum samples) carried out in Germany has shown 1.4% of positive results for *D. immitis*, but all the dogs were from endemic countries such as Spain, Portugal and Greece [13]. *D. immitis* appears not to be endemic in Austria, probably because most dogs are kept indoors, but with regard to the data from neighboring countries (particularly Hungary, where the prevalence increase from 0.7% in the years 2006-2010, to 11.3% in 2015; Bacsadi et al., 2016), it will probably become established in the near future (Fuehrer et al., 2016). Low prevalence has been found by serology in Croatia in apparently healthy dogs (0.4%) [16]. In Greece, the prevalence of canine HW infection ranges between 0.7% and 25%, with the higher values in northern areas, where high prevalence was recently found also in cats (9.4%) [15,16].

In Romania, prevalences of 3.6%-14%, depending from the surveyed area, were found in dogs and 18.5% in golden jackals, although prevalence as high as 42% was found in stray dogs in Southeast part of the country. In Poland, *D. immitis* prevalence is very low (< 1%) while *D. repens* prevalence is 12%. In Turkey, overall *D. immitis* prevalence rages 0-18% [10].

Regarding those countries where the parasite has more recently been observed, such as some Central and Eastern European countries, in some cases the prevalence has increased apparently in a short time. It is difficult to clarify if the parasite was present previously in the dog population but not properly diagnosed or if the prevalence has actually increased. In fact, it is also possible that the increasingly frequent cases of human infections (see as an example, 20, 13, 18) have prompted practitioners to carry out several surveys in dogs. However, in Central Europe (Slovakia), *D. immitis* prevalence has increased up to 64% [16] in some South Western areas, and in some regions of Bulgaria from 15% in 2013-2014 [13] to 34% [14]. In Russia, HW prevalence ranges 3.6% (Moscow region) to 36%-55% in the southern (Rostov region 15%) and central areas of the country (near the course of large rivers such as the Volga and Amur) and 43.6% in far eastern regions, not far from Vladivostok [13,17]. Furthermore, the prevalence of HW infection in wild carnivores from the Southwestern areas of the country, examined by necropsy was 20% for *D. immitis* in foxes; jackals were found infected both by *D. immitis* and *D. repens* (31% and 10%, respectively), 10% of badgers were found infected by *D. repens* only and 31% of raccoon dogs by *D. immitis* only [13]. Autochthonous cases of canine *D. immitis* and D. *repens* infections have been observed in Siberia (Yakutsk, 62°02'N 129°44'E). In spite of extremely cold winters (until −36 °C), the parasite has homoeothermic conditions within the host. During the summers, when transmission potentially occurs, the mean temperature in Yakutsk is 18.7 °C (July 1961-1990). Therefore, the 130 *Dirofilaria* Development Units degree-days above 14 °C proposed to be required for the extrinsic development into the infective stage in mosquitoes, can likely be reached within the mosquitos' lifespan. In Ukraine, although data from dogs are scanty, an isolate of *D. immitis* from human ocular cases has shown molecular characteristic different from *D. immitis* reference stains, including those from dogs in the same area [12].

One of the main factors that has influenced the spreading of *Dirofilaria* infection is the changing climate that has caused an increase in abundance of mosquito and flys populations, has shortened the extrinsic development of infective stages and has lengthened the transmission season. Other critical factors are the introduction of the Pet Travel Scheme in 2000, which has allowed easier movement of companion animals throughout the European Union [16], the introduction of new, invasive, competent mosquitoes species such as *Aedes albopictus* and *Ae. koreicus* [12], the presence of stray dogs with high prevalence of HW infection (e.g. 40% prevalence in Sofia, Bulgaria [14]; 53.8% in Iran [11], and an insufficient prevention in dogs, manly in the new areas of colonization.

It should be mentioned that there is no nationwide survey activity in Europe able to give a complete picture of HW prevalence, such as for North America (AHS, 2019;CAPC), although forecasting maps have been published for *Dirofilaria* infections

[5,8]. So, the above data are from surveys carried out with different scopes (e.g. assessing prevalence in different age groups, sex or breed), in different areas of a country and with different diagnostic methods (antigen serology, blood examination or molecular methods) [8-16].

Conclusions

Example: Fecal bone's rump destruction in older german shepherds

It is wellknown, that the big dogs have more problems with parasite such a dirofilaria. We are now proposing a thesis that i tis a one new type of the cancer when the rump of the big dogs is ahead of time destructed with Dirofilaria's worms as the consequence of the absence of the Fecal Centrifugation. Asi t was happened with my dog Maxi Skopec. It must be done several times annually. Today when we see the presence of the Warmer Weather i tis leading many times to the Fecal Bone's Rump Destruction such one Civilizational Disease. Hotter Climate of the last two years 2020, 2021 are showed very dangerous new diseases sucha s Dirofilaria infections. They are caused by thenew, hotter level of the Global Warming. But i tis not only new changes with Dirofilaria. There are also changes with diagnoses of above changes. I am proposing to begin new research of the parasites and worms under as prasites as new types of CANCER caused by Climatic Changes, especially as a consequence of the GLOBAL WARMING. Parasites as a new type of Cancer.

References

1. Council CA. Coccidia https://capcvet. org/guidelines/coccidia.
2. Ascarid. Companion Animal Parasite Council. https://capcvet. org/guidelines/ascarid
3. CDC. Transition of parasitic diseases. Cdc.gov. https://www.cdc. gov/parasites/transmission/index.html. 2021.
4. Dogs, ticks and tick-borne parasites. Pet Health Network. https://www.pethealthnetwork.com/dog-health/dog-diseases-conditions-a-z/dogs-ticks-and-tick-borne-parasites.
5. Incidence maps- American Heartworm Society. Heartwormsociety.org. https://www.heartwormsociety.org/veterinary-resources/incidence-maps.
6. Who is uniquely susceptible to parasites transmitted by dogs and cats? Companion Animal Parasite Council. https://capcvet. org/articles/who-is-uniquely-susceptible-to-parasites-transmitted-by-dogs-and-cats. 2021.
7. Lisa Lippman, DVM, dvm360, dvm360. 2021; 56.
8. Farkas R, Mag V, Gyurkovszky M, Takács N, Vörös K, et al. The current situation of canine dirofilariosis in Hungary. Parasitology research. 2020; 119: 129-135.
9. Climate changes implicated for Dirofilaria dissemination in Slovakia. Miterpákovzá M, Hurníková Z, Antolová D, Dubinskỳ P. Wiad Parazytol. 2009; 55: 429-431.
10. Mircean M, Ionică AM, Mircean V, Györke A, Codea AR, et al. Clinical and pathological effects of Dirofilaria repens and Dirofilaria immitis in a dog with a natural co-infection. Parasitology international. 2017; 66: 331-334.
11. Genchi C, Kramer LH. The prevalence of Dirofilaria immitis and D. repens in the Old World. Veterinary parasitology. 2020; 280: 108995.
12. Fuehrer HP, Auer H, Leschnik M, Silbermayr K, Duscher G, et al. Dirofilaria in humans, dogs, and vectors in Austria (1978–2014)-From imported pathogens to the endemicity of Dirofilaria repens. PLoS neglected tropical diseases. 2016; 10: e0004547.
13. Bajer A, Rodo A, Mierzejewska EJ, Tołkacz K, Welc-Falęciak R. The prevalence of Dirofilaria repens in cats, healthy dogs and dogs with concurrent babesiosis in an expansion zone in Central Europe. BMC Vet Res. 2016; 12: 183.
14. Bocková E, Iglódyová A, Kočišová A. Potential mosquito (Diptera:Culicidae) vector of Dirofilaria repens and Dirofilaria immitis in urban areas of eastern Slovakia. Parasitol Res. 2015; 114: 4487-4492.
15. Capelli G, Genchi C, Baneth G, Bourdeau PJ, Brianti E, et al. Recent advances on Dirofilaria repens in dogs and humans in Europe. Parasit Vectors. 2018; 11: 663.
16. Čabanová V, Miterpáková M, Valentová D, Blažejová H, Rudolf I, et al. Urbanization impact on mosquito community and the transmission potential of filarial infection in central Europe. Parasites & vectors. 2018; 11: 261
17. Demiaszkiewicz AW, Polanczyk G, Osinska B, Pyziel AM, Kuligowska I, et al. Prevalence and distribution of Dirofilaria repens Railliet et Henry, 1911 in dogs in Poland. Polish journal of veterinary sciences. 2014; 17: 515-517.