



2<sup>nd</sup> European  
*Dirofilaria* Days

**PROGRAMME  
AND ABSTRACTS**

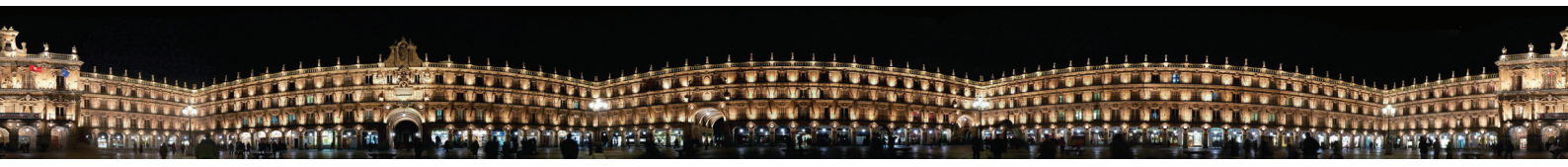
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***Dirofilaria immitis* in Gran Canaria (Canary Islands, Spain): an example of the epidemic evolution in last 15 years.**

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Heartworm infection is a parasitic disease of worldwide distribution. The most endemic areas are those with temperate, tropical and subtropical climates in the planet, where the mosquito populations are high and stable. Other regions with cold weather, hot summers and rivers, lakes and wide irrigation lands are also suitable for the development of the disease.

The prevalence of Heartworm Disease (HWD) disease has been drastically increased in the last years in spite of the chemoprophylaxis widely employed in some regions. HWD has been spread from tropical and subtropical regions to more temperate climate regions. Prevalence broadened could be explained by the increase of animal movements, the increase of the average daily temperature due to the climate change and the human colonization of new habitats where climate provide adequate temperature and humidity to support a viable mosquito population. Probably the parasite cycle is in a process of adaptation to continental climate, where the transmission is seasonable, mostly in the temperate latitudes. Transmission is critically dependent on the accumulation of sufficient heat to incubate the larvae to the infective stage in the mosquito. Otherwise, expanding of the animal reservoir of *Dirofilaria* and the increasing of human dirofilariosis are parallel.

Numerous epidemiological surveys have been completed during the last years showing the higher prevalence in America, Africa, Polynesia, Australia and Japan. Specifically, HWD is endemic in USA, Japan, Australia, Southern Canada, Mexico, Caribbean, Continental Asia, South-

America, Pacific, Western and Northern Africa. In Europe, the higher prevalence (average 10%) of the disease is in Mediterranean countries; however several regions have highest prevalence (over 20%) like Centre and North of Greece, North of Italy, South of France and South of Spain. Therefore, Spain is considered an endemic region of HWD. The most prevalence areas in Spain are the Mediterranean coast, South Atlantic coast, and Canary Islands.

Canary Islands are considered a HWD hyper-endemic area. The highest prevalence of HWD in Spain (over 58%) has been reported in Gran Canaria Island (Montoya *et al.*, 1998). During the last 15 years a complete investigation of the disease in Gran Canaria has been carry out. Specifically, the epidemiological survey has included the disease in dogs, cats and humans, related to the different geo-climatic regions of the island.

Canary Islands are an Atlantic archipelago formed by seven habited islands: El Hierro, La Gomera, La Palma and Tenerife (Province of Santa Cruz de Tenerife) and Lanzarote, Fuerteventura and Gran Canaria (Province of Las Palmas). Canary Islands are one of the "most remote regions" of the European Union. The archipelago is located closely to the North-Western Coast of Africa (95 km) between latitude of 27° 37' and 29° 25' N and between a longitude of 13° 20' and 18° 10' W. Therefore the climate is oceanic-subtropical, with a similar temperature all year round due to the effect of the sea and the trade winds. The rains are variable during the year and, even about the geography of the island. Different microclimate is distributed around the islands, from humid forest in the northern face of some islands to dry dessert in the southern face of others.

Gran Canaria island is the eastern province of the canaries. The island (1560 km<sup>2</sup>) has a truncated cone shape and has been eroded for centuries by water flow from the highest centred top of the island (2000 m. high). A significant change in climate, vegetation and orography is observed by travelling a few kilometres. Due to these specific geographic

and climatic characteristics Gran Canaria is named a "*continent in miniature*".

Four different isoclimate zones are found in Gran Canaria (Fig 1):

A) Dry and Desert Climate Zone (DD). Between 0 – 200 m. Sea winds influenced the Northern face of the island with very dry summers. Average temperature oscillations are reduced (19-23 °C). Average rainfall is below 200 mm/year. Intensive agriculture is located in this zone, mainly bananas and tropical fruits. However the Southern face of the island is more arid and average temperature oscillations are higher, most of the agriculture is centred in the tomato and similar vegetables.

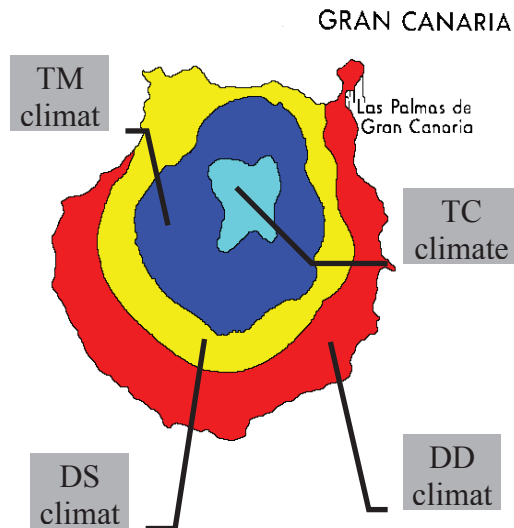
B) Dry and Steppe Climate Zone (DS). Between 200 – 600 m. A higher average temperature oscillation occurs (16-21 °C). The atmosphere is cool and pleasant which is the cultivation of vines, cereals and fruits. On the south side, the land is dry and temperatures vary more, similar to DD.

C) Temperate climate with Warm summers and Dry Winter (TM). Between 600 - 1500 m. Average temperature ranges from 12-16 °C, and dry summers. In winter the weather is cold and wet, with the formation of clouds that benefit the soil with the dew and fog. The rainfall reaches 500 to 1000 mm/year. This is the greenery zone of the island, where cereals and potatoes are grown.

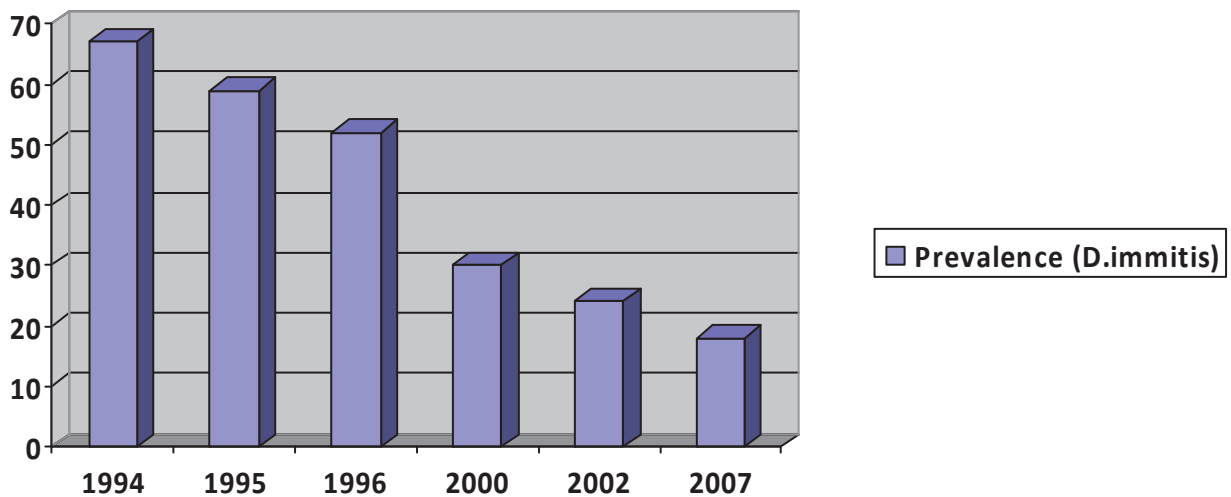
D) Temperate Climate with Cold Winters and summers with Temperatures below 22 ° C Zone (TC). Between 1500 - 2700 m. Summers with hot days and winters with cold nights. Typically have a dry air, comprising the upper component of the trade winds, except during the maritime polar air invasions. Falling snow some years and rainfall is 400 mm. There is a great temperature variation between day and night. Often occur temperatures below 0 ° C. The annual average is 9 ° C. Area is pine, and the highest they disappear into scrub land or broom.

3500 dogs and cats have been investigated since 1994. It is necessary to emphasize that we have found a steady decline in the incidence of *D. immitis* in the island of Gran Canaria. At present the

prevalence is below 19% with the lowest value reached for over 20 years. (Fig. 2).



**FIG 1: Isoclimate zones in Gran Canaria**



**FIG 2: Variations of the incidence of *D. immitis* in Gran Canaria island (1994-2007)**

During these years of study, the most affected breed of dog is the podenco canario. The prevalence in this breed is almost twice that the rest of the dogs of the island.

In Gran Canaria, the podenco canario breed is used especially for hunting. These dogs usually do not receive prophylaxis, mainly about the conditions under which they are held (number of animals in cramped conditions and poor food and sanitary). They also tend to live outdoors without protection from mosquitoes, primarily in rural communities. In these areas, the ignorance of the disease and the particular beliefs of many hunters, these animals are not treated with any preventative and behave on the island as a natural reservoir of the disease.

Furthermore, we have found that most affected dogs have an age range between 3 to 7 years, decreasing the incidence from 10 years. While in endemic areas infected dogs are one years old; we have found the less affected in animals with an age less than 1 years old.

One of the most important factors that affect the prevalence of the disease in Gran Canaria is the climate. We have found a higher prevalence in the dry steppe climate (DS) and warm temperate climates (TM) zones. In these areas, there are suitable conditions of humidity and temperature for the development of the intermediate host. Agriculture and livestock are very common activities in these areas, with average temperatures around 18 ° C and with many ponds and reservoirs of water ideal for mosquito development. Also many villages with large gardens or areas of crops, which kept many dogs without protection against the vectors and without prophylactic treatment, are present.

Moreover, in order to check the prevalence of HWD in cats, we have carry out a sero-epidemiological study in cats. Over 18% of cats tested exceeded the limit of positivity established for the ELISA with peptides *D. immitis*.

In humans, and according to our data, the presence of antigen *D. immitis* is above 16% of the population studied.

We are satisfied with the decline of the disease in dogs, mainly about the emergence of new chemoprophylactics and highly effective work of veterinarians, which promote awareness that people have about the seriousness of the heartworm disease. Chemoprophylaxis is performed effectively, mainly in urban areas. This practice is also increasingly spreading into rural areas where the dog does not receive much care. Although, as we have noted, large populations of hunting dogs with a high prevalence of HWD are not in a prophylactic regime.

It is very important to note that, although the incidence of parasitic infections in cats is important, chemoprophylaxis in cats on the island is very low and there is little awareness of this health problem.

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