



*The EFSA Journal (2007) 469, 1-102, “Assessment of the risk of tick introduction into the UK, Ireland, and Malta as a consequence of abandoning the national rules”*

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**Scientific Opinion on an assessment of the risk of tick introduction into UK, Republic of Ireland, and Malta as a consequence of abandoning National rules<sup>1</sup>**

**Opinion of the Scientific Panel on AHAW  
Adopted on 8<sup>th</sup> March 2007**

**Question No EFSA-Q-2006-326**

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<sup>1</sup> For citation purposes: Opinion of the Scientific Panel on AHAW on a request from the European Commission on the risk of tick introduction into the UK, Ireland, and Malta as a consequence of abandoning the national rule, *The EFSA Journal* (2007) 469, 1-102.

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## **SUMMARY:**

Regulation (EC) No 998/2003<sup>2</sup> lays down the rules for the non-commercial movement of pet animals both within the community as well as from third countries into the EU. The Regulation provides that Member States may maintain their national provisions until July 2008. The United Kingdom (UK), Republic of Ireland and Malta have maintained their national rules in regard to prevention of the introduction of ticks into their own countries. The Commission requested EFSA to assess to what extent abandoning such safeguards could be envisaged, taking into account the different epidemiological situations. This Opinion addresses the justification for the current rules to prevent the introduction of ticks into the three Member States, by pet movement, taking into consideration the epidemiological situation in these countries concerning ticks and tick-borne diseases.

Ticks are known to transmit serious zoonotic diseases. Ticks are also considered a major burden in livestock production due to their ability to transmit several diseases as well as causing significant irritation to animals that can influence their productivity. Out of the 866 tick species identified, approximately 54 affect pets, and pets also suffer from tick-borne diseases. In addition pets can be a vehicle to transmit ticks to humans and to new environments and countries.

This Opinion has summarized the available information on the presence or absence of the identified tick species and their related diseases.

There are limited survey data on the geographical tick distribution among Member States including the UK, Ireland and Malta, and the listed countries<sup>3</sup>. Some of the available information is either anecdotal or outdated. The existing reports and literature indicate the presence of selected tick species in UK and Ireland. No information on ticks is available from Malta.

Several Tick-Borne Diseases (TBD) have been reported in Member States including the UK, Malta and Republic of Ireland and listed countries. However the frequency of reporting varies between countries both in time period and geographical location. Well-designed targeted surveys are needed in order to determine the absence or presence of ticks, and to increase the epidemiological knowledge for most of the tick-transmitted diseases in the MS.

The risk assessment for tick introduction cannot be conducted due to a lack of sufficient data and systematic survey information. It was, therefore, concluded that further assessment of the situation in terms of the value of treatment for the prevention of tick infestation could not be performed. Evaluation of the effectiveness of treatment to prevent infestation by ticks requires prior knowledge about the distribution of ticks in these countries and at a subsequent timepoint. As indicated above, this type of prior knowledge has wide range of uncertainty due to a lack or limited data and records. The issue of the effectiveness of treatment, therefore, was not addressed in this Opinion.

The Opinion has clearly indicated a lack of sufficient evidence over the epidemiological situation in the UK Ireland and Malta to refute or accept the justification for the additional measures currently applied by these countries.

## **KEY WORDS**

Ticks, geographical distribution of ticks, Tick-borne diseases, geographical distribution of tick borne diseases, pet animal movement, risk assessment

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<sup>2</sup> OJ L 146/1, 13.06.2003, p. 1-9.

<sup>3</sup> Listed Countries are the the countries and territories listed in <http://www.defra.gov.uk/animalh/quarantine/pets/procedures/support-info/other.htm>. (Accessed 14/2/07).

## **BACKGROUND**

Regulation (EC) No 998/2003<sup>4</sup> lays down the rules for the non-commercial movement of pet animals (dog, cat, ferrets) both within the community as well as from third countries into the EU.

Article 16 of the above Regulation provides that Member States may maintain their national provisions for a transitional period of 5 years from the entry into force of this Regulation, i.e. until July 2008. This derogation provides for additional measures to prevent the risk of introduction of echinococcosis and ticks before entry of pet animals into their territory.

The United Kingdom, Ireland and Malta have maintained their national rules as regards the control of echinococcosis and ticks, while Sweden and Finland have maintained their national rules as regards the control of echinococcosis. The Regulation further states that the above derogations will be reviewed at the end of this transitional period of 5 years.

To this end, the Commission has to submit to the European Parliament and to the Council, before the 1 February 2007, a report on the need to maintain such additional requirements, and with appropriate proposals for determining the regime to be applied after this period. This report shall be based on the experience gained so far and on a risk evaluation, following receipt of a scientific opinion of the European Food Safety Authority (Article 23).

As a consequence, the Commission requests EFSA to issue a scientific opinion in order to assist the Commission in proposing appropriate amendments to the above Regulation that are scientifically justified.

## **TERMS OF REFERENCE**

The Commission requests EFSA, in accordance with Article 29 (1) (a) of Regulation (EC) No 178/2002<sup>5</sup>, to issue a scientific opinion on an assessment of the risk of tick introduction into the UK, Ireland and Malta and as a consequence of abandoning the national rules.

In particular, the scientific opinion should address the following questions.

- To what extent the abandoning of such additional guarantees (treatments prior to movement) could be envisaged, taking into account the different epidemiological situations with regard to these diseases prevailing in third countries and the Member States other than the UK, Ireland, and Malta, without increasing the risk of introducing those diseases into these latter countries from the remainder of the EU territory and third countries.
- If the assessment reveals that in certain circumstances the need to maintain such treatments prior to movement is scientifically justified (in other words, if the consequential risk is higher than negligible), what would be the appropriate protocol (treatments / movement) to be considered as giving equivalent assurances for the protection of these Member States. To this end, the different national rules that are currently in force could be re-considered.

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<sup>4</sup> OJ L 146/1, 13.06.2003, p. 1-9.

<sup>5</sup> OJ L 31, 1.2.2002, p. 1.

## 1. INTRODUCTION

### *1.1. SCOPE AND OBJECTIVES OF THE REPORT*

Regulation (EC) No 998/2003 lays down the rules for the non-commercial movements of pet animals both within the community as well as from third countries into the EU. The Regulation provides that Member States may maintain their national provisions for a transitional period of 5 years from the entry into force of this Regulation, i.e. until July 2008. The United Kingdom, Ireland and Malta have maintained their national rules in regard to prevention of the introduction of ticks into their own countries.

Ticks are known to transmit viral, bacterial, rickettsial, and protozoal diseases which can be also zoonotic, i.e. spread to humans. Ticks are considered a major burden in livestock production particularly in tropical environments due to their ability to transmit several diseases, as well as causing significant irritation to the animals that can influence their productivity. Pets also can be infected from selected diseases transmitting through ticks. In addition, pets can be a vehicle to transmit these ticks to new environments and countries. The focus of this task is on those ticks that can be harboured by pet animals and the potential for diseases transmission through these parasites.

The risks associated with pets harbouring ticks that can enter one of these three countries can be dealt with and will depend on the following factors.

- 1) The level of infestation with specific tick species in the originating country in pets and other susceptible host species.
- 2) The number of movements of pet animals between Member States, other listed countries, and the UK, Ireland and Malta.
- 3) The prevalence of specific tick-borne diseases in the originating country of the pets in comparison with the Tick-Borne Diseases (TBD) in the three countries.
- 4) The survival of the tick species in the environment and their host range, and the potential effect of environmental changes (both climatic and ecological).

Following initial discussions with the Commission it was agreed that the assessment should focus on the following aspects.

- a. To consider ticks that can be hosted by pet animals. Thus, the geographical distribution of these ticks and their role as vectors of disease agents are reviewed.
- b. To conduct a thorough evaluation of the current situation in the UK, Ireland and Malta and to review the scientific evidence for the presence or absence of these ticks in order to justify or reject the reason for the existing control measures for ticks on pet animals.
- c. To consider disease agents that can be transmitted by ticks hosted by pet animals. The focus will be on important exotic pathogens to the three countries of concern including those with potential zoonotic impact.
- d. Ticks and tick-borne diseases specific to livestock/agriculture animals will not be included in this report.

The Opinion summarises the available information on the presence or absence and geographical distribution of the identified tick species and their related diseases by providing supportive scientific evidence.

## 1.2. *ABREVIATIONS and DEFINITIONS*

|               |                                       |
|---------------|---------------------------------------|
| <b>ELISA:</b> | Enzyme-Linked Immuno-Sorbent Assay;   |
| <b>EU:</b>    | European Union;                       |
| <b>IFAT:</b>  | Immuno-Fluorescent Antibody Test;     |
| <b>LI:</b>    | Louping Ill;                          |
| <b>MS:</b>    | Member States;                        |
| <b>OIE:</b>   | World Organisation for Animal Health; |
| <b>PCR:</b>   | Polymerase Chain Reaction;            |
| <b>PETS:</b>  | UK Pet Travel Scheme;                 |
| <b>RA:</b>    | Risk Assessment;                      |
| <b>TBE:</b>   | Tick-Borne Encephalitis;              |
| <b>TDB;</b>   | Tick-Borne Disease;                   |
| <b>UK:</b>    | United Kingdom;                       |
| <b>WB:</b>    | Western Blot test;                    |
| <b>WHO:</b>   | World Health Organisation.            |

**Ditropic:** ticks that feed on two host species.

**Ecological requirements:** The broad environmental and epidemiological factors which are essential or sufficient for maintaining the survival and completion of the life cycle of tick species. This definition may be broader than the niche for the tick species.

**Listed countries:** These are the countries and territories listed in <http://www.defra.gov.uk/animalh/quarantine/pets/procedures/support-info/other.htm>. (Accessed 14/02/07).

**Locally Endemic:** The presence of tick species, as a vector for disease, in specific local region of a country but with limited evidence on the spread of the species to the entire country.

**Monotropic:** ticks that feed on one host species.

**Pet animals** – These are dogs, cats and ferrets as specified by the concerned countries: UK, Republic of Ireland, and Malta.

**Sporadic:** The occasional reporting or presence of tick species, as a vector for disease in the country.

**Susceptible host species:** Mammalian species that can serve as host to a particular tick species including non-natural hosts.

**Telotropic:** ticks that feed on three host species.

**Tick-Borne disease:** Disease in which their agents are transmitted by ticks. Ticks can act as either mechanical or biological carriers for these agents. The disease agents can be viral, bacterial, protozoal, and others.

**Trans-ovarical:** all tick developmental stages are infective.

**Trans-stadial:** only nymphs and adults are infective.

**Vector competency:** The ability of different species of ticks to transmit one or more pathogens to their hosts.

## 2. HAZARD IDENTIFICATION AND CHARACTERISATION

### 2.1. TICKS

#### 2.1.1. Review of tick species harboured by pets

Throughout the world ticks, together with fleas, are the most widespread ectoparasites affecting pets. Up to now there are 866 described species of ticks worldwide. Ticks are classified, on the basis of sequence of feeding and moulting during their life cycle, into: Three Host ticks (i.e. larvae, nymphs and adults feeding on three different hosts); Two Host ticks (i.e. nymphs and adults feed on the same host); and One Host ticks (i.e. all stages feed on the same host). Ticks may also be classified on the basis of the number of animal species they infest as monotropic, ditropic or telotropic (when immature stages can feed on both different types and the same types of hosts as the adults). At each stage of their life cycle ticks are blood feeders, thus acting as parasites that cause disease in their hosts because of this activity (i.e. transferring saliva, paralysis and removal of blood) or transmitting bacterial, viral, protozoal and helminth pathogens (Section 2.2.) to animals (livestock, pets, wildlife and humans). Detection of ticks is usually performed by clinical examination of specific parts of an animal's body. Detection of earlier life stages is usually overlooked due to their small size at these stages.

Many species of ticks affect dogs and cats worldwide. In this report we concentrate on those species most commonly retrieved, such as *Ixodes ricinus* (known as the “sheep tick”), a three-host tick (telotropic). Several animals have been recognised as hosts for this particular species of tick, especially small mammals, birds and lizards for the immature stages of these ticks, with large ruminants, dogs and wild carnivores for the adults. This tick species is involved in the transmission of several bacterial and viral pathogens of animals and humans. The host-seeking activity of *Ixodes ricinus* is generally recognised as seasonal, varying between countries and according to the climate. Ticks are more frequently found at higher altitudes and in high rainfall areas. *Ixodes hexagonus* and *I. canisuga* are three host ticks that use domestic dogs and other medium-sized wild carnivores as potential hosts. These species are commonly retrieved in urban areas and are frequently involved in cases of heavy home infestations. The role of *I. hexagonus* and *I. canisuga* as vectors of pathogens is poorly known, although the *I. hexagonus* has been found to be infected with Tick-borne Encephalitis (TBE) virus. *Ixodes dammini* (syn. *I. scapularis*) is a telotropic tick species infesting pets, with the nymphal and adult stages being the most common vectors of canine Borreliosis caused by *Borrelia burgdorferi*. In regions characterised by temperate climate, adult activity begins in October and ends by about mid-December.

*Dermacentor reticulatus* (also known as the “ornate dog tick”) is a three-host tick feeding mainly on dogs and other medium-sized carnivores, but it has been also recorded on sheep, cattle and horses. This species is a recognised vector of *Babesia canis* in dogs and of Omsk Haemorrhagic Fever (TBE group) and *Rickettsia conorii* in humans. The occurrence of this tick species is restricted to areas with high humidity and mild winters. *Dermacentor variabilis* and *D. andersoni* (known as the “Rocky Mountain Wood tick”) are three-host ticks causing paralysis in dogs. They can also act as vectors of the agents of the Rocky Mountain Spotted Fever, Tularaemia and Colorado Tick Fever in infected dogs. These species are commonly retrieved in areas of scrubby vegetation which support small and large mammal hosts. In particular, adult *D. variabilis* ticks are abundant along the edge of roads and trails in forested habitats and around man-made habitations.

*Amblyomma americanum* (known as the “Lone Star tick”) occurs on wild and domestic animals and birds. This species acts as vector of diseases of animal and human concern such as Rocky Mountain Spotted Fever by *Rickettsia rickettsi*, Tularaemia by *Francisella tularensis*, Lyme disease by *Borrelia burgorferi*, Q fever by *Coxiella burnetii*, Canine Ehrlichiosis and Human Monocytic Ehrlichiosis. This species of tick is especially well-adapted to forest communities.

*Rhipicephalus sanguineus*, commonly known as “kennel tick” or “brown dog tick”, is a telotrophic tick species most commonly found in regions with warm climates, feeding on dogs both in urban and rural habitats. *Rhipicephalus* groups include a number of species that act as vectors of a wide range of pathogens such as *Rickettsia conorii*, *Ehrlichia canis*, *Hepatozoon canis*, *Babesia canis* and *Babesia gibsoni*. Although *R. sanguineus* is able to survive in open environments, it is highly adapted to living in dog kennels and in homes of humans. Because of the large distribution in areas with warm climates, active *R. sanguineus* adults can be found feeding on hosts throughout the whole year. *Rhipicephalus turanicus* is a three-host tick feeding mainly on cattle, sheep and dogs. The adults generally are most numerous from the early spring to the late autumn. Although its role as a vector of pathogens is still uncertain, it is suspected to be implicated in the transmission of bacteria within the group of Boutonneuse Fever (Mediterranean Spotted **F**ever) (*Rickettsia conorii* group).

### 2.1.2. Distribution of tick species

Tick geographical distribution and their potential niches (the overall potential of a species to live somewhere) have not been clearly defined. Their distribution will mainly depend on the specific species biology and ecology, as well as on the abiotic and environmental factors associated with the availability of an appropriate host. Many species of ticks are adapted to climate, i.e. the seasonal variations within that geographical area. Nevertheless, the habitat in which the tick species is reported is likely to be much more widely distributed than the acknowledged geographical range. The distribution of some species of ticks is, therefore, probably underestimated due to the lack of comprehensive surveillance and collection of specimens, and a further complication is the difficulty in identifying the species. In summary, the absence of comprehensive surveillance, difficulties in identifying species and the wide variety of niches lead to the conclusion that the absence of reported cases is not necessarily an indication for the absence of ticks in that area.

A list of tick species harboured by pets and their distribution through Europe, the listed countries, and in the UK and the Republic of Ireland is provided in Annex I in Table 1. No reports were found for tick species (presence and distribution) in Malta. The list is not intended to be exhaustive and does not consider the species seldom reported or single cases.

In summary, *Ixodes ricinus* occurs mainly in the Palearctic region and it is typically found in cool humid environments in Europe. The distribution ranges from Ireland, Britain and southern Scandinavia, eastwards across Europe to northern Iran, and in the south to the Mediterranean littoral. *Ixodes ricinus* is also the tick species most commonly found on dogs and cats in the UK, Sweden and Germany. *Ixodes hexagonus* and *I. canisuga* are sparse in the Mediterranean region because they are found mainly in the northern Palearctic, while the distribution of *Ixodes gibbosus* is limited to a few areas in the Eastern Mediterranean countries. The distribution of *Ixodes dammini* was originally limited to confined areas in Northern America but their range appears to have expanded.

*Dermacentor reticulatus* is commonly found in Europe, where there are adequate habitat conditions, and there are also localised reports in Britain. *Dermacentor variabilis* is abundant in the eastern US, from Florida to Southern New England, and from the Atlantic seaboard to

the Mississippi basin; discreet populations also occur in Canada. *Dermacentor andersoni* is widely distributed throughout the western and central states of North America.

*Amblyomma americanum* is widely spread from central Texas, eastern Oklahoma, and north to Missouri and eastwards across the southeastern United States. Along the Atlantic coast, its distribution is extended north to the coastal areas of New Jersey and New York.

*Rhipicephalus sanguineus* has become the most widespread tick species throughout the tropics and sub-tropics extending into temperate areas because of its specialised feeding on domestic dogs, while *Rhipicephalus turanicus* is common in southern Europe and northern Africa.

### 2.1.3. Conclusions

There are limited data on the tick distribution among MS and the listed countries. Some of the available information is either anecdotal or outdated. Nevertheless there are reported cases and surveys on the presence of selected tick species in the UK and the Republic of Ireland. No such information is available from Malta. The absence of reports, however, does not indicate the absence of specific tick species and a comprehensive survey of existing tick species in MS, as well as the three countries, is needed.

Some surveys deal with the distribution, either local or sporadic, of selected tick species into an area. However there is a lack of continuous surveillance to provide sufficient information to confirm or refute whether these species are endemic or not.

Evidence exists to indicate that some species, such as *R. sanguineus*, are moving from sub-tropical southern countries to more temperate regions. This fact may lead to a modification of the biological and ecological habits of some tick species which may result in a change of tick distribution and, sometimes, of their involvement as vectors.

## 2.2. TICK-BORNE DISEASES (TBD)

Ticks, as blood feeder parasites, are able to transmit to their hosts a wide variety of pathogens which may cause TBDs affecting wild and domestic animals, including pets. The transmission of pathogens occurs both trans-ovarical (i.e. all tick developmental stages are infective) and trans-stadial (i.e. only nymphs and adults). The vector competence of different species of ticks implies that they are able to transmit pathogens to a range of receptive vertebrate hosts which results in the distribution of different tick species being strictly related to the occurrence of TBDs or to the risk of TBD introduction into a given area. TBDs can cause clinical signs from severe (in the acute phase) to asymptomatic forms (mainly in endemic areas). Furthermore, co-infection with different pathogens occurring in the same animal are caused by the fact that they may be transmitted by the same tick species (e.g. *Hepathozoon canis*, *Ehrlichia canis* and *Anaplasma platys* by *R. sanguineus*). TBD co-infections are frequent in pets living in TBD endemic areas and may often impair a correct etiological diagnosis. An overview of published data regarding tick-transmitted diseases is given in Annex I in Table 2.

### 2.2.1. Distribution of tick-borne diseases

The following diseases were considered based on one or more of the following criteria:

- The disease is tick-transmitted and the tick vector is found on dogs or cats;
- The disease affects pets (dog/cat/ferret);
- The disease is zoonotic;
- Potential arthropod vectors are present in a country;
- There is a perceived risk of vector transmission;
- There is a disease risk to livestock (either the disease itself or is carried by ticks on pets);
- There is a disease risk to other pets and horses;
- There is a disease risk to wildlife;
- The disease has been reported in travelling pets.

Using these criteria some diseases are excluded from Annex I, Table 2 such as Heartwater (*E. ruminantium*) and Powasan as these diseases are tick-transmitted but infect mainly ruminants. In addition, pathogens causing diseases like equine and bovine piroplasmiasis are excluded, as although they are also tick-borne by species that can infest dogs and cats, they don't cause infection in pets.

### **Tick-Borne Encephalitis (TBE)**

TBE occurs in Central Europe, and the list of countries with reported cases comprises Austria, Germany, Switzerland, Italy, Croatia, Slovenia, Hungary, Czech Republic, Slovakia, Poland, Lithuania, Latvia, Estonia, Norway, Denmark, Finland and Sweden (Kunze *et al.*, 2006). For all these countries, with the exception of Austria, an increasing incidence is reported. Due to increased travelling of people, it is becoming an international public health problem (Kunze *et al.*, 2006), however, no reports of TBE from the UK, Ireland and Malta have been reported (as of February 2007). Louping Ill (LI) virus is a member of the TBE virus serocomplex but molecular analyses indicate that it is distinct from other members of the group (McGuire *et al.*, 1998). LI virus causes encephalomyelitis in sheep, but rarely affects humans. It has been recorded in the UK, principally Scotland, Ireland, N. Spain and Norway.

### **Bartonellosis**

Bartonellosis, caused by *Bartonella henselae*, is worldwide and may cause severe disease in humans. The transmission from cat to human may occur *via* a cat scratch but also *via* flea and tick bites. Pets may be carriers without any clinical signs; rarely cats may show uveitis, kidney and urinary tract diseases and fever, while dogs may show endocarditis and anorexia. *Bartonella vinsonii* subsp. *berkhoffii* has been recently described as a pathogen infecting dogs in the USA and Caribbean. The role of ticks as vectors of this pathogen has only been recently suggested (Chomel *et al.* 2006).

### **Borreliosis (*Borrelia spp.*)**

Data from the following countries were found in a literature search: Belgium, Croatia, Czech Republic, Denmark, Finland, France, Germany, Italy, Norway, Poland, Russia, Slovakia and Slovenia, Spain, Sweden, Switzerland, The Netherlands and UK (studies ranged between 1983 in France to 2005 in the UK and Poland) (references in Annex II table 4).

The diagnostic methods were different and in most cases were based on either serology or on clinical signs. In these studies, prevalence estimates ranged between 2.8% to >50% but some of

these reports were individual cases. For most of these no travel history was documented or known, and isolated cases were assumed but not always proven. Examinations of ticks in Germany revealed approximately 20% positive infected ticks by either dark field microscopy or PCR. The overall seroprevalence, as published from numerous European studies in dogs, ranges from 10.1% to 50% (mean 22.11%), and for cats was 8.9%. Beside classical serodiagnostic tests (IFAT, ELISA, WB) and direct microscopic detection, in recent years PCR is being used which allows species differentiation.

*Borrelia* of the *B. burgdorferi* s.l. complex is detected in the UK and has been numerously reported in dogs and ticks (Annex I, Table 2), but a clear differentiation of the exact subspecies was not described in all cases. Therefore, it still remains unclear whether all species described for the European continent also occur in the UK, Ireland and Malta.

*Borrelia* spp. have been reported from various parts of the world particularly *B. burgdorferi*. The geographical distribution of the various species is not complete due to an on-going classification of this parasite, except perhaps in North America.

### **Babesiosis (*Babesia canis*)**

A literature search identified seven studies that estimated the prevalence of this parasite based on 21 case reports and one tick investigation. *Babesia*-positive animals were reported for the following European countries: France, Germany, Hungary, Italy, Slovakia, Slovenia, Spain, Switzerland, The Netherlands, Turkey and UK (Annex II). A Polish study reported negative results in 192 dogs using PCR. For the majority of the reported cases, however, the travel history is not known. It was also noted that the diagnostic methods were either not described or the description was unsatisfactory. For the German data, one reported case gave a travel history to Spain but all the other cases did not mention travel history. For animals specified in the UK prevalence study, travel history was reported. However, in a report from The Netherlands as well as from Switzerland, isolated individual cases were assumed to have arisen due to earlier travelling in other European countries.

### **Canine Monocytic Ehrlichiosis (*Ehrlichia canis*)**

Eleven prevalence studies and 16 case reports were evaluated from the following countries: Denmark, Germany, France, Greece, UK, Italy, Croatia, The Netherlands, Poland, and Sweden, Slovakia, Slovenia and Spain (Annex II). For Switzerland, only an ongoing discussion about the role and distribution of *Ehrlichia* infections (Pusterla *et al.*, 2000; Rambprabhu *et al.*, 2001) was found (Annex II). Most publications are single case reports, but the Dutch and UK studies indicated definitive travel histories to the Mediterranean basin, The Antilles or Sardinia. Estimates of prevalence from these studies ranged between 0.96% and 55.2% depending on country and method. For cats, the data ranged between 12.5% and 17.9% with serological detection methods (Annex II).

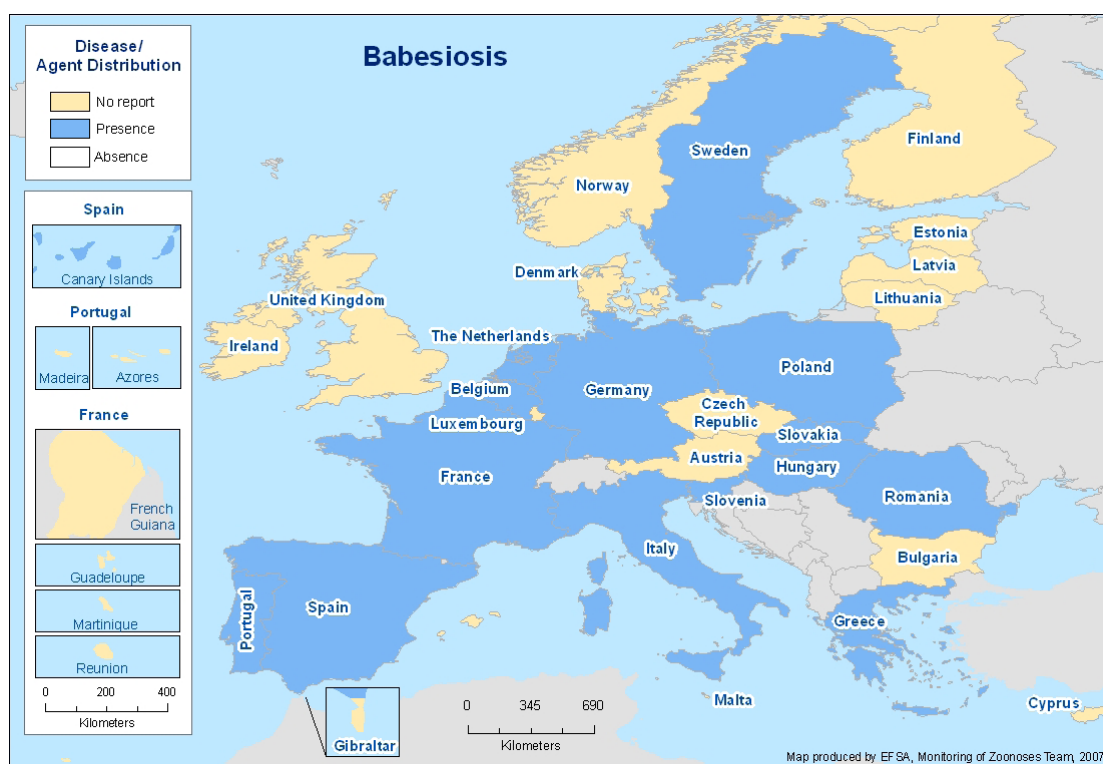
### **Canine Granulocytic Ehrlichiosis (*A. phagocytophilum*, others)**

Reports are scant across Europe. Mostly, they are only case reports with some kind of confirmative laboratory diagnosis and if seroprevalence data are published, they describe a focal/regional situation (Annex II). The only possible exception is a publication in Germany (Barutzki *et al.*, 2006) that describes a 50.1% seroprevalence in 1124 samples. Therefore, a clear epidemiological picture of *A. phagocytophilum* in Europe cannot be given. To date (February 2007), it cannot even be decided whether there is an increase in infection since no comparable data from the past are available for most of Europe.

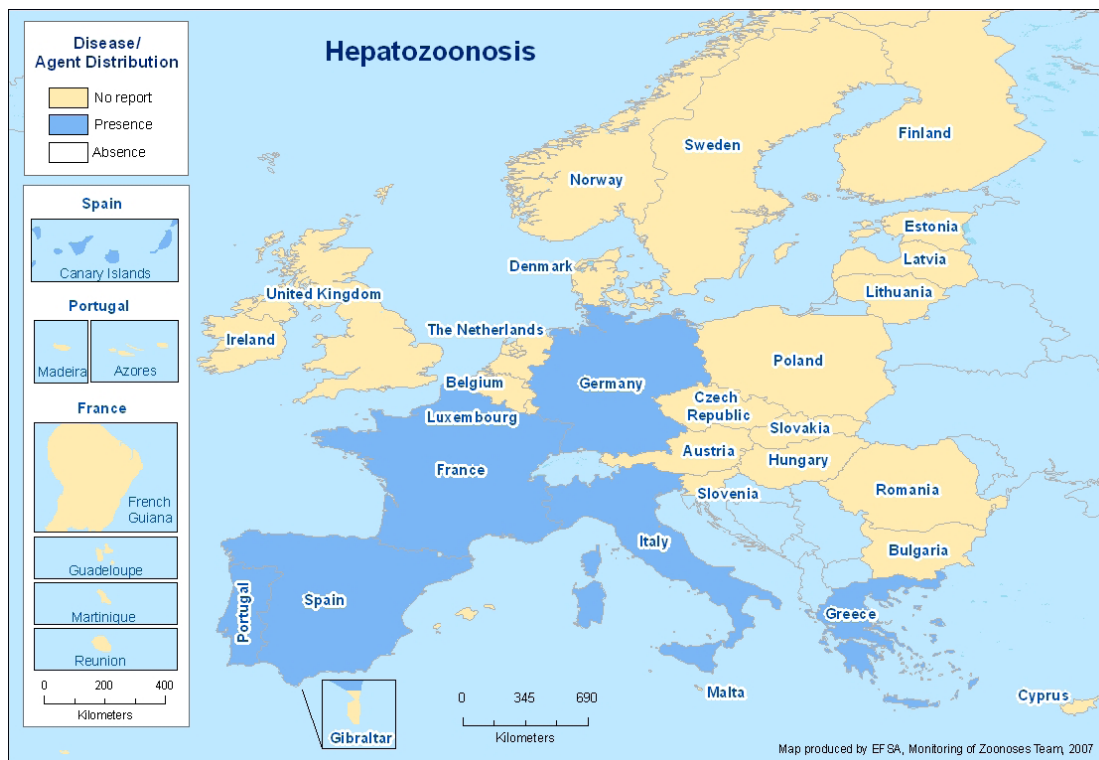
## Hepatozoonosis

Reports are scant and, so far, are only from the Mediterranean basin (Annex II) therefore, a clear epidemiological picture of *Hepatozoon canis* in Europe cannot be given.

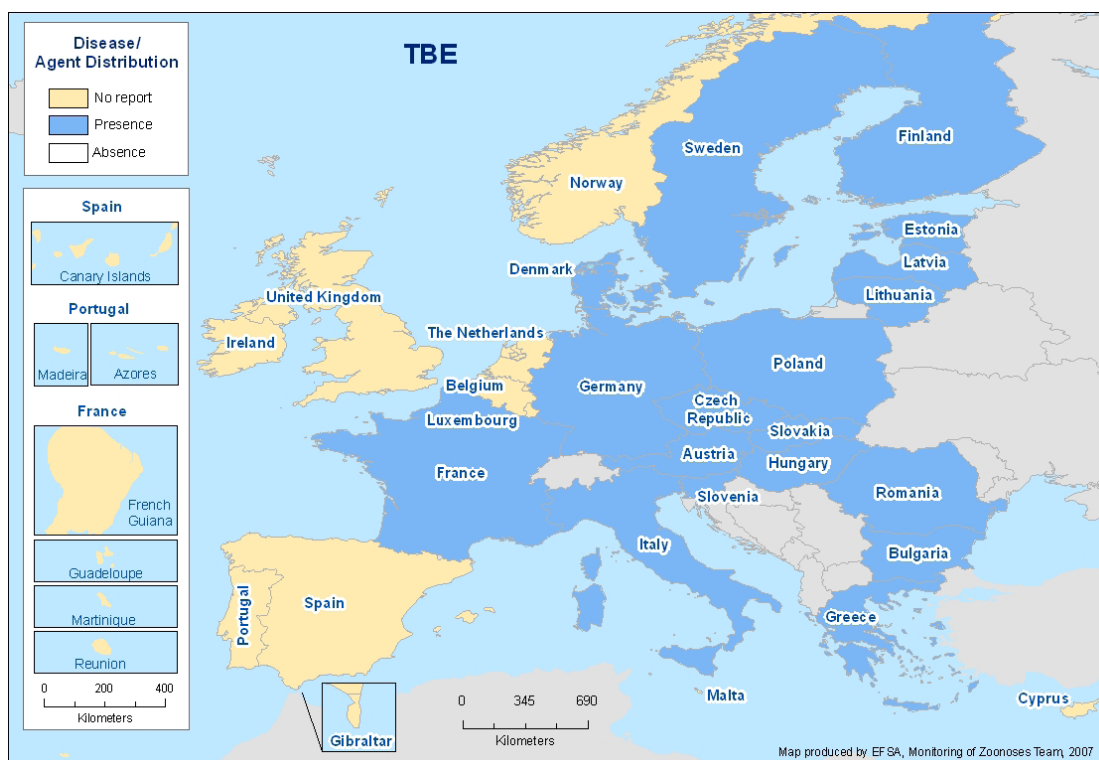
Detailed disease distribution by country is presented in Annex II. The following figures represent the geographic distribution of these diseases in Europe taking into consideration the published literature on the presence, absence or no reporting regardless of the number of reports and number of cases involved. Not reporting these diseases does not indicate their absence.



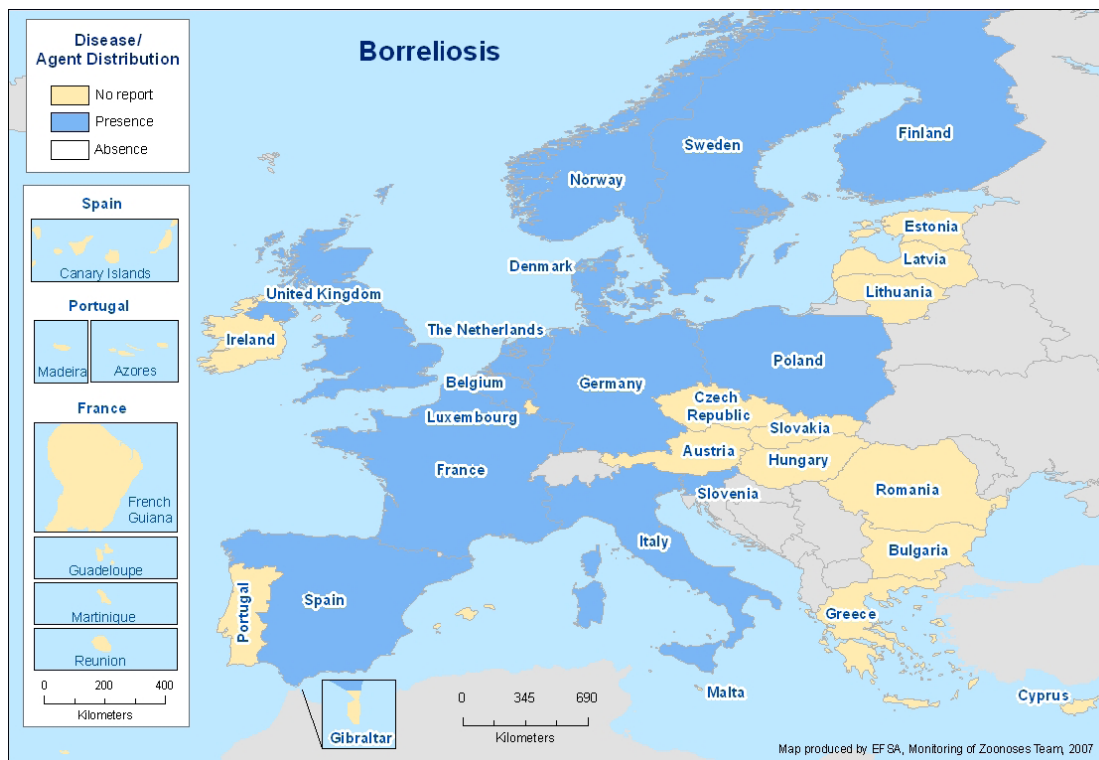
**Fig 1:** Disease geographic distribution of Babesiosis in Europe compiled from literature on the presence, absence or no reporting regardless of the number of reports and number of cases involved. No reporting of the disease does not indicate their absence.



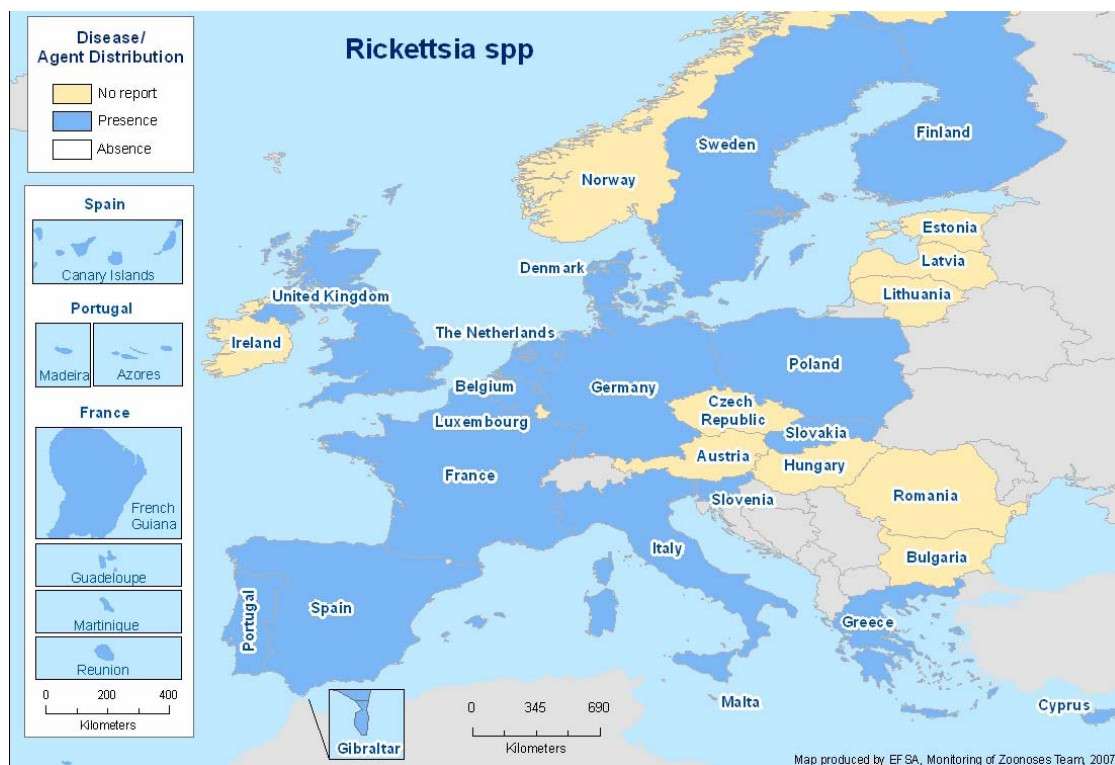
**Fig 2:** Disease geographic distribution of Hepatozoonosis in Europe compiled from literature on the presence, absence or no reporting regardless of the number of reports and number of cases involved. No reporting of the disease does not indicate their absence.



**Fig 3:** Disease geographic distribution of Tick-borne Encephalitis in Europe compiled from published literature on the presence, absence or no reporting regardless of the number of reports and number of cases involved. No reporting of the disease does not indicate their absence.



**Fig 4:** Disease geographic distribution of Borreliosis in Europe compiled from literature on the presence, absence or no reporting regardless of the number of reports and number of cases involved. No reporting of the disease does not indicate their absence.



**Fig 5:** *Rickettsia* complex species geographic distribution in Europe compiled from literature on the presence, absence or no reporting regardless of the number of reports and number of cases involved. No reporting of the disease does not indicate their absence. The following agents were considered: *E. canis*, *A. platys*, *A. phagocytophilum*, *R. conorii* and *R. rickettsii*.

### 2.2.2. Conclusions

*Borrelia burgdorferi s.l.* and other *Borrelia* spp are widely distributed in most of Europe as well as worldwide. Some species are already present in the British Isles, e.g. *Borrelia burgdorferi s.l.* is present in the UK at low levels (Pers. Comm. Dr. Susan O'Connor).

Rickettsial diseases caused by some species of the *Ehrlichia/Anaplasma* complex are present across Europe, including the UK and the Republic of Ireland. However, epidemiological data and systematic evaluation for the source of infection and the *Rickettsia* species are lacking.

TBE is spreading beyond its classical endemic areas and is frequently found in Switzerland, Austria, Southern Germany, Scandinavia and Eastern Europe including some of the new MS. This spread may be due to increasing travel activities of people and is seen as a public health concern in Europe.

*Bartonella* spp, particularly cat scratch disease, is present in Europe. However, there are limited data on the different species that occur in the UK and the Republic of Ireland.

For most zoonotic infections, human cases do not reflect the epidemiological situation in particular countries as it may be due to an increase in travel activity of both humans and pets.

### 3. RISK ASSESSMENT OUTLINE AND GAP ANALYSIS

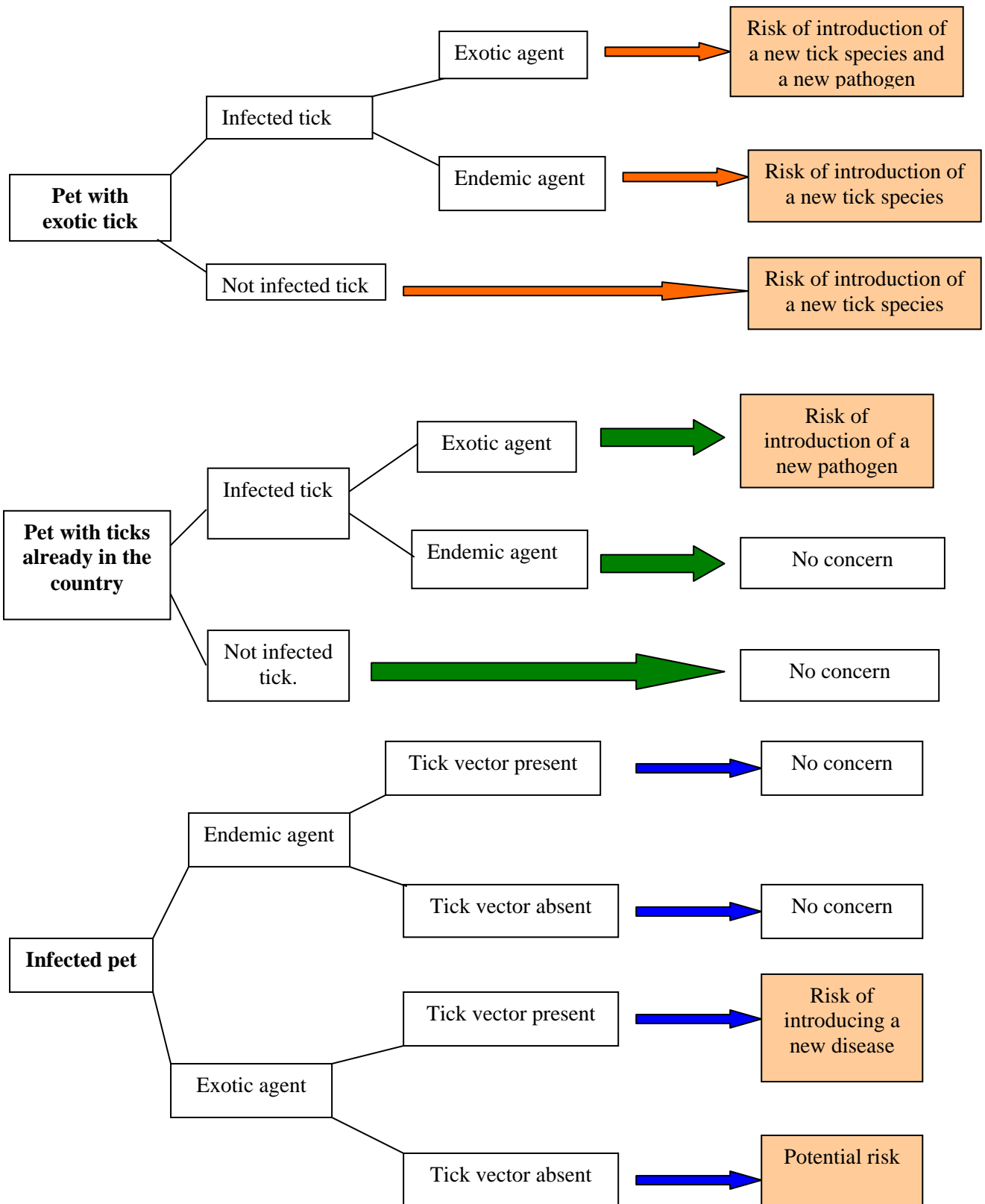


Figure 6: Pathways for potential risk of introduction of ticks and TBDs.

Assessment of the justification for the current rules to prevent the introduction of ticks into these three concerned countries would require two different sets of risk assessment:

- assessing the likelihood and consequences from the introduction of specific species of tick; and
- assessing the likelihood and consequences from the introduction of tick-borne disease agents. The latter will be dependent upon the introduction of the ticks to the concerned countries (see Figure 6).

The first step in this process is to determine the absence of these ticks from these countries. The evidence indicates that some of these tick species already exist in these countries, but it is not clear whether most of these tick species are present due to an incidental introduction or are permanently resident in these countries. Therefore, the existing scientific data are not sufficient to support or refute the permanent presence of most species of ticks. Pursuing a risk assessment approach with such gaps of knowledge would lead to unreliable and conclusions that are not based on sound science.

The risk of further introduction and expansion of the area infested by a tick species in a country, however, can be addressed by just focussing on the risk of introduction. This type of evaluation requires a thorough assessment of the existing quantitative data from the concerned countries and the countries from where the pets are moved. This RA would be required for each tick species, by each disease agent, and in relation to each originating country. Such data are lacking or are too scattered to make this assessment. Epidemiological analytical techniques could be used to determine the magnitude of the risk of tick expansion in a specific geographical area if such data were available. A further step would be to determine if the ticks were harbouring the infective agent(s) of concern. This may vary not only by country but also by limited geographical sub-regions. This information is largely lacking and, therefore, was not considered.

In order to evaluate the risk of introduction of ticks and their diseases to the concerned countries, the number of movements of pet animals between Member States, other listed countries, and the UK, Ireland and Malta is required. Although animal identification is required for pet movements into the UK, Ireland and Malta, the records for the origin of the imported pets are lacking. Therefore a quantitative risk assessment cannot be performed.

Data generated from the proposed survey study for the MS, including the concerned countries, will be the best option for conducting epidemiological risk analyses. The collected data should include the following.

- A time frame for the collection of samples and seasons;
- Incidence data on the various tick species with the identification method used;
- Serological and potential disease agent identification on pets as hosts for these ticks;
- Records of TBD in humans and animals;
- Location of the collected samples so that a definitive geographical distribution can be determined;
- Historical records of host movement so that a better understanding about the potential exposure;
- Control measures used for eliminating the tick as a vector of the disease.

#### 4. CONCLUSIONS

- Out of the 866 tick species identified, approximately 54 infest pets. The available information, particularly from the scientific literature, is limited in giving reliable estimates of the geographical distribution of tick species of pets.
- Surveys for tick species and their associated diseases are either limited or not comprehensive. The current available data lack systematic collection of specimens, epidemiological background, and reliable control measures.
- The existing reports and literature indicate the presence of selected tick species in the UK and the Republic of Ireland. No information on ticks is available from Malta.
- A risk assessment of tick introduction cannot be made due to a lack of sufficient data and systematic survey information. It was, therefore, concluded that further assessment of the value of treatment for the prevention of tick infestation could not be performed.
- Tick-borne diseases are numerous and are hazards for human and animal health. Most of these diseases are under-reported, often due to misdiagnosis and co-infections. Furthermore, some of these tick-borne diseases are not notifiable or reportable in several countries, hence data are lacking.
- For several diseases uniform validated reporting systems, including diagnostic tools, are lacking.

#### 5. RECOMMENDATIONS

- Well-designed targeted surveys should be carried out to determine the absence or presence of ticks and their related diseases.
- Surveys should be carried out to increase epidemiological knowledge for most of the tick-borne diseases in the MS, with particular attention to *Ehrlichia/Anaplasma*, *Bartonella*, *Rickettsia*, and *Babesia canis* spp. Risk analyses could then be used to evaluate the potential importation risk for the introduction and the spread of ticks and tick-borne diseases. The surveys should include strategies for controlling the spread of these diseases.
- In addition to having unique animal identification, proper registration and recording of both the number and origin of imported pets should be put in place.
- Reporting of animal infection should include diagnostic methods used as well as sampling methods
- Collection of reliable data for the proposed survey should require validated and standardized diagnostic assays and well as trained systematians to identify the species of tick.
- Epidemiological risk analyses should be done to determine the potential risk factors associated with the transmission of these diseases between animal hosts, and between animal hosts and humans.

## **6. ANSWERS TO THE QUESTIONS POSED BY THE COMMISSION**

The Commission has requested EFSA to provide a scientific opinion on the following.

- To what extent the abandoning of such additional guarantees (treatments prior to movement) could be envisaged, taking into account the different epidemiological situations with regard to these diseases prevailing in third countries and the Member States other than UK, Ireland, and Malta, without increasing the risk of introducing those diseases into these latter countries from the remainder of the EU territory and third countries.

This Opinion has clearly indicated a lack of sufficient evidence concerning the epidemiological situation in the UK, the Republic of Ireland and Malta to refute or accept the justifications for the additional measures currently applied by these countries.

- If the assessment reveals that in certain circumstances the need to maintain such treatments prior to movement is scientifically justified (in other words, if the consequential risk is higher than negligible), what would be the appropriate protocol (treatments / movement) to be considered as giving equivalent assurances for the protection of these Member States. To this end, the different national rules that are currently in force could be considered.

The risk of tick introduction could not be assessed due to insufficient data and a lack of validated systematic surveys. It was, therefore, concluded that further assessment of the situation in terms of the value of treatment for the prevention of tick infestation could not be performed.

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#### WEBSITES:

<http://www.defra.gov.uk/animalh/quarantine/pets/procedures/support-info/other.htm>  
(Accessed 14/2/07).

<http://www.searchnbn.net/interactive/info.jsp> (Accessed 26/01/2007).

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## **ANNEX I**

### **List of Tables**

Table 1: Distribution of tick species (harboured by pets);

Table 2: Review of tick-borne diseases that can be transmitted by ticks hosted by pets.

**Table 1:** Distribution of tick species (harboured by pets)<sup>6</sup>.

| <b>TICK SPECIES</b>     | <b>GEOGRAPHIC DISTRIBUTION</b>                                                                                                      | <b>REFERENCES <sup>7</sup></b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>FAMILIA IXODIDAE</b> |                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Genus Ixodes</b>     |                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <i>Ixodes ricinus</i>   | From Ireland, Britain and southern Scandinavia eastwards across Europe to northern Iran and southward to the Mediterranean litoral. | Glatz <i>et al.</i> , 2005 (Austria). Angelov <i>et al.</i> , 1996; Atova <i>et al.</i> , 1993 (Bulgaria). Stenzenberger and Gothe, 1999 (Canary Islands). Rudolf <i>et al.</i> , 2005; Janouskovcova <i>et al.</i> , 2004; Hulinska <i>et al.</i> , 2002 (Czech Republic). Jensen and Frandsen, 2000 (Denmark). Makinen <i>et al.</i> , 2003 (Estonia, Finland). Junttila <i>et al.</i> , 1999; Han <i>et al.</i> , 2001 (Finland). Ferquel <i>et al.</i> , 2006; Halos <i>et al.</i> , 2005 (France). Hildebrandt <i>et al.</i> , 2003; Simser <i>et al.</i> , 2002; Maetzel, 2005; Liebisch G. and Liebisch A., 1999 (Germany). Papadopoulos <i>et al.</i> , 1996; Papazahariadou <i>et al.</i> , 2003 (Greece). Földvari and Farkas, 2001; 2005a; 2005b (Hungary). Piccolin <i>et al.</i> , 2006; Tarello, 2005; Manna <i>et al.</i> , 2004 (Italy). Bormane <i>et al.</i> , 2004 (Latvia). Juceviciene <i>et al.</i> , 2005 (Lithuania). Hovius <i>et al.</i> , 2000 (Netherlands). Grzeszczuk <i>et al.</i> , 2004; Pieniazek <i>et al.</i> , 2006; Wodecka |

<sup>6</sup> There are no reports of the presence or the absence of tick species in Malta.

<sup>7</sup> The listed references include case reports and survey data.

|                             |                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-----------------------------|-----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                             |                                               | and Skotarczak, 2005; Skotarczak <i>et al.</i> , 2004; Skotarczak, 2004b (Poland). De Michelis <i>et al.</i> , 2000; Baptista <i>et al.</i> , 2004; Estrada-Pena and Santos-Silva, 2005 (Portugal). Estrada-Peña <i>et al.</i> , 2004a; 2004b; Marquez-Jimenez <i>et al.</i> , 2005; Dongus <i>et al.</i> , 1996; Beati <i>et al.</i> , 1996; Merino <i>et al.</i> , 2005 (Spain). Stjernberg and Berglund, 2005; Jaeson <i>et al.</i> , 1994; Nilsson <i>et al.</i> , 1999 (Sweden). Berberovic <i>et al.</i> , 1991 (Bosnia-Herzegovina). Alekseev <i>et al.</i> , 2001; 2003; Hayasaka <i>et al.</i> , 2001 (Russian Federation). Baumann <i>et al.</i> , 2003 (Switzerland). Satoh <i>et al.</i> , 2002 (Japan). Fisher and McGarry, 2006 (UK, Sweden, Switzerland). |
|                             | <b>UK: <u>Endemic.</u></b>                    | Hillyard, 1996; Fisher and McGarry, 2006.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                             | <b>IRELAND: <u>Endemic.</u></b>               | Hillyard, 1996.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <i>Ixodes persulcatus</i>   | North-east Europe and North-east Asia, Japan. | Bormane <i>et al.</i> , 2004 (Latvia); Alekseev <i>et al.</i> , 2001; 2003; Hayasaka <i>et al.</i> , 2001 (Russian Federation). Ishiguro <i>et al.</i> , 2000; Shimada <i>et al.</i> , 2003 (Japan).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                             | <b>UK, IRELAND. No reports found.</b>         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <i>Ixodes hexagonus</i>     | Throughout Europe and Northwest Africa.       | Cerny, 1972 (Czech Republic). Liebisch G. and Liebisch A., 1999 (Germany). Földvari and Farkas, 2001; 2005a; 2005b (Hungary). Torina <i>et al.</i> , 2006 (Italy). Camacho <i>et al.</i> , 2003a, 2003b (Spain). Jaenson <i>et al.</i> , 1994 (Sweden). Mehl, 1983 (Norway). Estrada Peña <i>et al.</i> , 2004b; 2004b (Northern Palearctic).                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                             | <b>UK: <u>Endemic.</u></b>                    | Hillyard, 1996; Estrada Peña <i>et al.</i> , 2004a; 2004b.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                             | <b>IRELAND: <u>Endemic.</u></b>               | Hillyard, 1996.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <i>Ixodes canisuga</i>      | Throughout Europe                             | *; Estrada Pena <i>et al.</i> , 2004a; 2004b (Northern Palearctic).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|                             | <b>UK: <u>Endemic.</u></b>                    | Hillyard, 1996; Estrada Pena <i>et al.</i> , 2004a; 2004b.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                             | <b>IRELAND: <u>Endemic.</u></b>               | Hillyard, 1996.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <i>Ixodes trianguliceps</i> | Found in most European countries              | *                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                             | <b>UK: <u>Endemic</u></b>                     | Hillyard, 1996; Brown <i>et al.</i> , 2006.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                             | <b>IRELAND: <u>Endemic</u></b>                | Hillyard, 1996.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

|                               |                                                                                                                    |                                                                                |
|-------------------------------|--------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|
| <i>Ixodes rubicundus</i>      | South Africa.                                                                                                      | *                                                                              |
|                               | <b>UK, IRELAND. <u>No reports found.</u></b>                                                                       |                                                                                |
| <i>Ixodes holocyclus</i>      | Australia, Tasmania, New Zealand.                                                                                  | Atwell, 2001 (Australia). Health <i>et al.</i> , 1980 (New Zealand).           |
|                               | <b>UK, IRELAND. <u>No reports found.</u></b>                                                                       |                                                                                |
| <i>Ixodes dammini</i>         | USA through southern and coastal New England, southward into the mid- Atlantic states and westward into Minnesota. | Sonenshine, 1993.                                                              |
|                               | <b>UK, IRELAND: <u>Imported</u></b>                                                                                | Adamantos <i>et al.</i> , 2005.                                                |
| <i>Ixodes scapularis</i>      | Eastern USA. Canada.                                                                                               | Morshed <i>et al.</i> , 2003 (Canada). Hoskins and Cupp, 1988 (USA, mainland). |
|                               | <b>UK, IRELAND. <u>No reports found.</u></b>                                                                       |                                                                                |
| <i>Ixodes pacificus</i>       | Western USA. Canada.                                                                                               | Hoskins and Cupp, 1988 (Canada). Holden <i>et al.</i> , 2006 (USA, mainland).  |
| <i>Ixodes pilosus</i>         | South Africa.                                                                                                      | *                                                                              |
|                               | <b>UK, IRELAND. <u>No reports found.</u></b>                                                                       |                                                                                |
| <i>Ixodes texanus</i>         | Northern USA, Canada                                                                                               | *                                                                              |
|                               | <b>UK, IRELAND. <u>No reports found.</u></b>                                                                       |                                                                                |
| <i>Ixodes gibbosus</i>        | Few areas of the Eastern Mediterranean countries.                                                                  | Estrada Pena <i>et al.</i> , 2004a; 2004b.                                     |
|                               | <b>UK, IRELAND. <u>No reports found.</u></b>                                                                       |                                                                                |
| <b>Genus <i>Boophilus</i></b> |                                                                                                                    |                                                                                |
| <i>Boophilus decoloratus</i>  | Africa.                                                                                                            | *                                                                              |
|                               | <b>UK, IRELAND. <u>No reports found.</u></b>                                                                       |                                                                                |
| <i>Boophilus annulatus</i>    | Africa, central and South America, the Middle East, the Near East, parts of the Mediterranean Basin.               | *                                                                              |

|                                 |                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|---------------------------------|----------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                 | <b>UK, IRELAND. No reports found.</b>                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Genus <i>Dermacentor</i></b> |                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <i>Dermacentor marginatus</i>   | Morocco, Spain, Italy, Southern France, Switzerland, Western Germany, Poland, Eastwards to central Asia. | Angelov <i>et al.</i> , 1996; Atova <i>et al.</i> , 1993 (Bulgaria). Liebisch G. and Liebisch A., 1999 (Germany). Papadopoulos <i>et al.</i> , 1996; Papazahariadou <i>et al.</i> , 2003 (Greece). Földvari and Farkas, 2001, 2005a, 2005b (Hungary). Torina <i>et al.</i> , 2006 (Italy). Cerny, 1972 (Slovakia). Marquez-Jimenez <i>et al.</i> , 2005; Dongus <i>et al.</i> , 1996; Beati <i>et al.</i> , 1996; Merino <i>et al.</i> , 2005 (Spain). Punda-Polic <i>et al.</i> , 1995; Tovornik and Jelka, 1988 (Croatia). |
|                                 | <b>UK, IRELAND. No reports found.</b>                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <i>Dermacentor reticulatus</i>  | Europe (from the Atlantic coast to Kazakhstan) and central Africa.                                       | Cerny, 1972 (Czech Republic; Slovakia). Gilot and Perez-Eid, 1998; Chauvet and L'Hostis, 2005; Dongus <i>et al.</i> , 1996 (France). Liebisch G. and Liebisch A., 1999 (Germany). Földvari and Farkas, 2001, 2005a, 2005b (Hungary). Estrada Pena <i>et al.</i> , 2004a, 2004b (Mediterranean areas).                                                                                                                                                                                                                        |
|                                 | <b>UK: Locally endemic.</b>                                                                              | Hillyard, 1996; Ogden <i>et al.</i> , 2000.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                                 | <b>IRELAND. No reports found.</b>                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <i>Dermacentor albipictus</i>   | North America and Canada.                                                                                | *                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                                 | <b>UK, IRELAND. No reports found.</b>                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <i>Dermacentor andersoni</i>    | Western, North and Central America.                                                                      | Hoskins and Cupp, 1988 (Canada; USA). Fisher and McGarry, 2006 (Western and Central states of North America)                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                                 | <b>UK, IRELAND. No reports found.</b>                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <i>Dermacentor nitens</i>       | Southern USA, Central and South America and the Caribbean.                                               | *                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                                 | <b>UK, IRELAND. No reports found.</b>                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <i>Dermacentor occidentalis</i> | Western USA (Sierra Nevada mountains and the Pacific Ocean from Oregon to Southern California).          | *                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

|                               |                                                                                                                                                                         |                                                                                                                                                                                                           |
|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                               | <b>UK, IRELAND. No reports found.</b>                                                                                                                                   |                                                                                                                                                                                                           |
| <i>Dermacentor silvarum</i>   | Asia (Central Siberia and north-eastern China to Japan).                                                                                                                | *                                                                                                                                                                                                         |
|                               | <b>UK, IRELAND. No reports found.</b>                                                                                                                                   |                                                                                                                                                                                                           |
| <i>Dermacentor variabilis</i> | Europe; eastern US, from Florida to Southern New England and from the Atlantic seaboard to the Mississippi basin; disjoint populations also occur in Canada; Australia. | Halliday and Sutherst, 1990 (Australia). Hoskins and Cupp, 1988 (Mexico; Canada; USA). Jaeson <i>et al.</i> , 1994 (Sweden). Sonenshine, 1993 (Florida, Southern New England, Mississippi basin, Canada). |
|                               | <b>UK, IRELAND. No reports found.</b>                                                                                                                                   |                                                                                                                                                                                                           |
| <i>Dermacentor</i> spp        | Switzerland, Morocco                                                                                                                                                    |                                                                                                                                                                                                           |
|                               | <b>UK, IRELAND. No reports found.</b>                                                                                                                                   |                                                                                                                                                                                                           |
| <b>Genus <i>Hyalomma</i></b>  |                                                                                                                                                                         |                                                                                                                                                                                                           |
| <i>Hyalomma anatolicum</i>    | Central Asia to Bangladesh, the Middle and Near East, Arabia, South-eastern Europe, and Africa north of the equator.*                                                   | Papadopoulos <i>et al.</i> , 1996; Papazahariadou <i>et al.</i> , 2003; Psaroulaki <i>et al.</i> , 2005 (Greece).                                                                                         |
|                               | <b>UK, IRELAND. No reports found.</b>                                                                                                                                   |                                                                                                                                                                                                           |
| <i>Hyalomma lusitanicum</i>   | Central Italy to Portugal, Morocco and the Canary Islands.*                                                                                                             | Castella <i>et al.</i> , 2001 (Balearic Islands). Torina <i>et al.</i> , 2006 (Italy). Calvete <i>et al.</i> , 2003 (Spain).                                                                              |
|                               | <b>UK, IRELAND. No reports found.</b>                                                                                                                                   |                                                                                                                                                                                                           |

|                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><i>Hyalomma marginatum</i>;<br/>subspecies:<br/><i>H. marginatum marginatum</i><br/><i>H. marginatum rufipes</i><br/><i>H. marginatum turanicum</i><br/><i>H. marginatum isaaci</i></p> | <p><i>H. marginatum marginatum</i>: Africa, Asia Minor and southern Europe (Caspian area of Iran and CIS to Portugal and north-western Africa).</p> <p><i>H. marginatum rufipes</i>: South of the Sahara to South Africa, also Nile Valley and southern Arabia.</p> <p><i>H. marginatum turanicum</i>: Pakistan, Iran, southern CIS, Arabia, parts of northeastern Africa.</p> <p><i>H. marginatum isaaci</i>: Sri Lanka to southern Nepal, Pakistan, northern Afghanistan.</p> | <p>Castella <i>et al.</i>, 2001 (Balearic Islands). Cerny, 1972 (Czech Republic; Slovakia). Papadopoulos <i>et al.</i>, 1996; Papazahariadou <i>et al.</i>, 2003 (Greece). Torina <i>et al.</i>, 2006 (Italy). De Michelis <i>et al.</i>, 2000; Baptista <i>et al.</i>, 2004; Estrada-Pena and Santos-Silva, 2005 (Portugal). Marquez-Jimenez <i>et al.</i>, 2005; Dongus <i>et al.</i>, 1996; Beati <i>et al.</i>, 1996; Merino <i>et al.</i>, 2005 (Spain). Angelov <i>et al.</i>, 1996; Atova <i>et al.</i>, 1993 (Bulgaria). Punda-Polic <i>et al.</i>, 1995; Tovornik and Jelka, 1988 (Croatia). Mehl, 1983 (Norway).. Meissner <i>et al.</i>, 2006 (Russian Federation).</p> |
|                                                                                                                                                                                            | <p><b>UK, IRELAND. <u>No reports found.</u></b></p>                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <p><i>Hyalomma detritum</i>;<br/>two subspecies:<br/><i>H. d. scupense</i><br/><i>H. d. mauretanicum</i><br/>Synonym: <i>Hyalomma volgense</i>, <i>Hyalomma uralense</i></p>               | <p>Africa.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <p>*</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                                                                                                                                                                                            | <p><b>UK, IRELAND. <u>No reports found.</u></b></p>                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <p><i>Hyalomma truncatum</i></p>                                                                                                                                                           | <p>Africa.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <p>*</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                                                                                                                                                                                            | <p><b>UK, IRELAND. <u>No reports found.</u></b></p>                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <p><i>Hyalomma spp.</i></p>                                                                                                                                                                | <p>Cyprus</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <p>Spyridaki <i>et al.</i>, 2002.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                                                                                                                                                                                            | <p><b>UK, IRELAND. <u>No reports found.</u></b></p>                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <p><b>Genus <i>Rhipicephalus</i></b></p>                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <p><i>Rhipicephalus bursa</i></p>                                                                                                                                                          | <p>Southern Europe, Africa.*</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                | <p>Castella <i>et al.</i>, 2001 (Balearic Islands). Papadopoulos <i>et al.</i>, 1996; Papazahariadou <i>et al.</i>, 2003 (Greece). Torina <i>et al.</i>, 2006 (Italy). De Michelis <i>et al.</i>, 2000; Baptista <i>et al.</i>, 2004; Estrada-Pena and Santos-Silva, 2005 (Portugal). Marquez-Jimenez <i>et al.</i>, 2005; Dongus <i>et al.</i>, 1996; Beati <i>et al.</i>, 1996; Merino <i>et al.</i>, 2005 (Spain). Angelov <i>et al.</i>,</p>                                                                                                                                                                                                                                   |

|                                     |                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-------------------------------------|----------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                     |                                                                                                                            | 1996; Atova <i>et al.</i> , 1993 (Bulgaria). Punda-Polic <i>et al.</i> , 1995; Tovornik and Jelka, 1988 (Croatia).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                                     | <b>UK, IRELAND. No reports found.</b>                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <i>Rhipicephalus sanguineus</i>     | Almost worldwide, mainly between 50°N and 35°S, but extends to foci beyond that - e.g. in Germany. Sporadic reports in UK. | Fain, 1989; Sibomana <i>et al.</i> , 1986 (Belgium). Stenzenberger and Gothe, 1999 (Canary Islands). Spyridaki <i>et al.</i> , 2002 (Cyprus). Gilot and Perez-Eid, 1998; Chauvet and L'Hostis, 2005; Dongus <i>et al.</i> , 1996 (France). Gothe, 1999 (Germany). Dongus <i>et al.</i> , 1996; Papadopoulos <i>et al.</i> , 1996; Papazahariadou <i>et al.</i> , 2003 (Greece). Sandor and Robert, 2005 (Hungary). Torina <i>et al.</i> , 2006; Maroli <i>et al.</i> , 1996; Dongus <i>et al.</i> , 1996 (Italy). Hillyard, 1996 (Netherlands). Siuda, 1995 (Poland). Marquez-Jimenez <i>et al.</i> , 2005; Dongus <i>et al.</i> , 1996; Beati <i>et al.</i> , 1996; Merino <i>et al.</i> , 2005 (Spain). Jaeson <i>et al.</i> , 1994 (Sweden). Angelov <i>et al.</i> , 1996; Atova <i>et al.</i> , 1993 (Bulgaria). Punda-Polic <i>et al.</i> , 1995; Tovornik and Jelka, 1988 (Croatia). Mehl, 1983 (Norway). Aeschlimann <i>et al.</i> , 1982 (Switzerland). Hoskins and Cupp, 1988; Hibler <i>et al.</i> , 1985 (USA). Szabo <i>et al.</i> , 2005; Gonzalez <i>et al.</i> , 2004 (Argentina). Gonzalez-Acuna and Guglielmone, 2005; Munoz and Casanueva, 2002; Lopez <i>et al.</i> , 1999 (Chile). Hibler <i>et al.</i> , 1985; Cruz-Vazquez and Garcia-Vazquez, 1999 (Mexico). Haas, 1972 (Australia). Heath <i>et al.</i> , 1980 (New Zealand). Wassef <i>et al.</i> , 1997 (Bahrain). Yeung <i>et al.</i> , 2005 (Hong Kong). Inokuma <i>et al.</i> , 1998, 2000, 2001; Shimada <i>et al.</i> , 2003 (Japan). Robbins <i>et al.</i> , 2005 (Taiwan). Estrada Peña <i>et al.</i> , 2004a, 2004b (Mediterranean areas). |
|                                     | <b>UK: Sporadic.</b>                                                                                                       | Documented cases from UK quarantine are in Annex I.<br>Fox and Sykes, 1985; Hillyard, 1996.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                                     | <b>UK, IRELAND. No reports found.</b>                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <i>Rhipicephalus Appendiculatus</i> | East, Central and South Africa                                                                                             | *                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                                     | <b>UK, IRELAND. No reports found.</b>                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <i>Rhipicephalus capensis</i>       | Africa.                                                                                                                    | *                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

|                                   |                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-----------------------------------|----------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                   | <b>UK, IRELAND. No reports found.</b>              |                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <i>Rhipicephalus evertsi</i>      | Africa south of the equator                        | *                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                   | <b>UK, IRELAND. No reports found.</b>              |                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <i>Rhipicephalus turanicus</i>    | Southern Europe and northern Africa                | Estrada Peña <i>et al.</i> , 2004a, 2004b (Mediterranean areas).                                                                                                                                                                                                                                                                                                                                                                 |
|                                   | <b>UK, IRELAND. No reports found.</b>              |                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <i>Rhipicephalus</i> spp          | Switzerland, France, United Arab Emirates, Morocco | *                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                   | <b>UK, IRELAND. No reports found.</b>              |                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Genus <i>Haemaphysalis</i></b> |                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <i>Haemaphysalis punctata</i>     | Europe, Japan, North Africa.                       | Nosek, 1971 (Cyprus; Denmark; France; Germany; Hungary; Netherlands; Poland; Slovakia; Spain; Sweden; Romania; Russian Federation; Switzerland; Japan). Liebisch G. and Liebisch A., 1999 (Germany). Papadopoulos <i>et al.</i> , 1996; Papazahariadou <i>et al.</i> , 2003 (Greece). Angelov <i>et al.</i> , 1996; Atova <i>et al.</i> , 1993 (Bulgaria). Punda-Polic <i>et al.</i> , 1995; Tovornik and Jelka, 1988 (Croatia). |
|                                   | <b>UK: Locally endemic.</b>                        | Hillyard, 1996; Ogden <i>et al.</i> , 2000.                                                                                                                                                                                                                                                                                                                                                                                      |
|                                   | <b>IRELAND. No reports found.</b>                  |                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <i>Haemaphysalis bispinosa</i>    | Australia, New Zealand, Asia, Middle East, Africa  | *                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                   | <b>UK, IRELAND. No reports found.</b>              |                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <i>Haemaphysalis leachi</i>       | Africa, Asia, Australia                            | *                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                   | <b>UK, IRELAND. No reports found.</b>              |                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <i>Haemaphysalis longicornis</i>  | Middle East, Africa, Asia, Australasia             | *                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                   | <b>UK, IRELAND. No reports found.</b>              |                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <i>Haemaphysalis</i> spp          | Switzerland, Morocco                               | *                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                   | <b>UK, IRELAND. No reports found.</b>              |                                                                                                                                                                                                                                                                                                                                                                                                                                  |

| <b>Genus <i>Amyblomma</i></b>                 |                                                                                                      |                                                                                                                                                                                                                                                                                                              |
|-----------------------------------------------|------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Amblyomma americanum</i>                   | USA (mainland). Mexico. Texas, eastern Oklahoma, Missouri. Coastal areas of New Jersey and New York. | Dryden, 2006 (USA mainland). Kahn, 2005 (Mexico). Sonenshine, 1993 (Texas, Oklahoma, Missouri. New Jersey, New York).                                                                                                                                                                                        |
|                                               | <b>UK, IRELAND. <u>No reports found.</u></b>                                                         |                                                                                                                                                                                                                                                                                                              |
| <i>Amblyomma cajennense</i>                   | USA, Caribbean, central and south America.                                                           | *                                                                                                                                                                                                                                                                                                            |
|                                               | <b>UK, IRELAND. <u>No reports found.</u></b>                                                         |                                                                                                                                                                                                                                                                                                              |
| <i>Amblyomma hebraeum</i> and <i>A. gemma</i> | South and Central Africa.                                                                            |                                                                                                                                                                                                                                                                                                              |
|                                               | <b>UK, IRELAND. <u>No reports found.</u></b>                                                         |                                                                                                                                                                                                                                                                                                              |
| <i>Amblyomma maculatum</i>                    | USA and central America. (Greenland, Denmark).                                                       | <a href="http://www.merckvetmanual.com/mvm/index.jsp?cfile=htm/bc/72107.htm">http://www.merckvetmanual.com/mvm/index.jsp?cfile=htm/bc/72107.htm</a> . Accessed 19/05/06; Wiedl, 1981; Snoddy and Cooney, 1984 (USA, mainland). Kahn, 2005 (Mexico). Estrada-Peña <i>et al.</i> , 2005a (Greenland, Denmark). |
|                                               | <b>UK, IRELAND. <u>No reports found.</u></b>                                                         |                                                                                                                                                                                                                                                                                                              |
| <i>Amblyomma variegatum</i>                   | South and Central Africa.                                                                            | *                                                                                                                                                                                                                                                                                                            |
|                                               | <b>UK, IRELAND. <u>No reports found.</u></b>                                                         |                                                                                                                                                                                                                                                                                                              |
| <b>FAMILIA</b>                                |                                                                                                      |                                                                                                                                                                                                                                                                                                              |
| <b>ARGASIDAE</b>                              |                                                                                                      |                                                                                                                                                                                                                                                                                                              |
| <b>Genus <i>Otobius</i></b>                   |                                                                                                      |                                                                                                                                                                                                                                                                                                              |
| <i>Otobius spp</i>                            | Italy (in 1 dog imported from South Africa), France (native).                                        | *                                                                                                                                                                                                                                                                                                            |
|                                               | <b>UK, IRELAND. <u>No reports found.</u></b>                                                         |                                                                                                                                                                                                                                                                                                              |
| <i>Otobius megnini</i>                        | North and South America, India and Southern Africa.                                                  | *                                                                                                                                                                                                                                                                                                            |
|                                               | <b>UK, IRELAND. <u>No reports found.</u></b>                                                         |                                                                                                                                                                                                                                                                                                              |

\*Taylor, Jackson, Zimmer, Huntley, Tomlinson, Grant (2006). Qualitative Veterinary Risk Assessment: introduction of exotic diseases (other than Rabies) in the UK.

**Table 2:** Review of tick-borne diseases that can be transmitted by ticks hosted by pets

| Agent                                                           | Distribution                                                                                         |          | zoonosis | Pet species affected (Dog, Cat, Ferret) | Comments                                                                                                                                                                                                                                                                                            |
|-----------------------------------------------------------------|------------------------------------------------------------------------------------------------------|----------|----------|-----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Flavivirus</i><br><b>Tick-borne encephalitis</b>             | Widespread in Europe and Russia                                                                      |          | Y        | D                                       | Eastern and Western subtypes, transmitted by <i>Ixodes persulcatus</i> and <i>I. ricinus</i> , respectively widespread through Europe.                                                                                                                                                              |
|                                                                 | <b>UK</b>                                                                                            | <b>U</b> |          |                                         | <b><i>Ixodes ricinus</i> endemic</b><br><b><i>I. persulcatus</i> absent</b>                                                                                                                                                                                                                         |
|                                                                 | <b>Ireland</b>                                                                                       | <b>U</b> |          |                                         | <b><i>Ixodes ricinus</i> endemic</b>                                                                                                                                                                                                                                                                |
| <b><i>Bartonella henselae</i></b><br><b>(Cat Scratch Fever)</b> | Worldwide distribution of <i>B. henselae</i> infections in cats                                      |          | Y        | C                                       | Transmission cat to human via cat scratch possum, flea or tick bite (involvement of flea feces). Humans: bacillary angiomatosis (immuno compromised individuals), endocarditis.                                                                                                                     |
|                                                                 | <b>UK</b>                                                                                            | <b>Y</b> |          |                                         | * (also BSAVA, UK questionnaire)                                                                                                                                                                                                                                                                    |
|                                                                 | <b>Ireland</b>                                                                                       | <b>U</b> |          |                                         |                                                                                                                                                                                                                                                                                                     |
| <b><i>Bartonella vinsonii</i> subsp. <i>Berkhoffii</i></b>      | USA and Carribean. In the western USA, coyotes ( <i>Canis latran</i> ) constitute a major reservior. |          | Y        | D                                       | <i>B. vinsonii</i> subsp. <i>berkhoffii</i> was identified in one human case of endocarditis (Roux <i>et al.</i> , 2000). Canine <i>Bartonella</i> infections are also likely to be vector-borne and ticks have been suggested as possible vectors of <i>B. vinsonii</i> subsp. <i>Berkhoffii</i> . |
|                                                                 | <b>UK</b>                                                                                            | <b>N</b> |          |                                         | <b>Specific tick vectors unknown</b>                                                                                                                                                                                                                                                                |
|                                                                 | <b>Ireland</b>                                                                                       | <b>U</b> |          |                                         |                                                                                                                                                                                                                                                                                                     |
| <b><i>Ehrlichia canis</i></b>                                   | The agent distribution is                                                                            |          | N        | D                                       | Also infects wild canids, including foxes, and may be transmissible by other                                                                                                                                                                                                                        |

|                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                |   |   |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| (canine monocytic ehrlichiosis)                                                                                                                                                                                           | likely to be that of the vector:<br>Africa and Mediterranean / Middle East, East and South East Asia, including Japan, South ,Central and North America. Also Caribbean, Hawaii, some South Pacific, including Fiji. Suspected but not confirmed in Australia. |   |   |   | tick spp. Most cases in Germany and Switzerland are in dogs originally imported from S Europe but locally endemic now as coinfection with <i>Mycoplasma canis</i> and <i>Babesia canis</i> . Serological evidence of feline infection in North America and Europe but significance of these findings as yet unknown.                                                                                                                                                                                                                                                       |
|                                                                                                                                                                                                                           | UK                                                                                                                                                                                                                                                             | Y |   |   | The agent was reported in imported dogs only<br><b><i>Rhipicephalus sanguineus</i> sporadic</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                                                                                                                                                                                                                           | Ireland                                                                                                                                                                                                                                                        | U |   |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                                                                                                                                                                                                                           | Malta                                                                                                                                                                                                                                                          | U |   |   | <b><i>E. canis A. platys</i> likely*</b><br><b><i>Rhipicephalus sanguineus</i> sporadic</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b><i>Ehrlichia chaffeensis</i></b><br>(human monocytic ehrlichiosis)                                                                                                                                                     | America                                                                                                                                                                                                                                                        |   | Y | D | <i>E chaffeensis</i> is present in the southern US states and is zoonotic although the role of dogs as reservoir is unclear. The White-tailed deer ( <i>Odocoileus virginianus</i> ) is thought to be wildlife reservoir.                                                                                                                                                                                                                                                                                                                                                  |
|                                                                                                                                                                                                                           | UK                                                                                                                                                                                                                                                             | U |   |   | <b>Tick vectors <i>Amblyomma americanum</i> and <i>D. variabilis</i> exotic</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                                                                                                                                                                                                                           | Ireland                                                                                                                                                                                                                                                        | U |   |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b><i>Anaplasma phagocytophilum</i> combo nov.; (syn <i>E. phagocytophila</i>.)</b><br>(Tick borne Fever, Pasture Fever) <b>includes :</b><br><br><b><i>Anaplasma. Platy</i></b><br>(canine Infectious thrombocytopaenia) | All are associated mainly with the Americas, but <i>A. platys</i> also exists in Southern Europe, Asia and Australia.<br><br><i>A. phagocytophilum</i> has a more worldwide distribution                                                                       |   | Y | D | Mostly established in dogs, with <i>Rhipicephalus</i> , <i>Amblyomma</i> or <i>Dermacentor</i> tick vectors. <i>E. equi</i> and Human Granulocytic Ehrlichiosis (HGE) agent have been reclassified as <i>A. phagocytophilum</i> , which is endemic in Great Britain. Principal Tick vector is <i>Ixodes ricinus</i> and wildlife and ruminants may act as reservoir hosts. <i>A platy</i> is transmitted by <i>Rhipicephalus sanguineus</i> and was not considered to be zoonotic but is now classified as part of the <i>A. phagocytophilum</i> combo, which is zoonotic. |

|                                                                |                                                                                                                                                                      |          |            |  |                                                                                                                                                                                                                                                                                                                                                                                                         |
|----------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>E. equi</i> (Equine granulocytic ehrlichiosis)              |                                                                                                                                                                      |          |            |  |                                                                                                                                                                                                                                                                                                                                                                                                         |
| <i>Ehrlichia ewingii</i><br>(canine granulocytic ehrlichiosis) |                                                                                                                                                                      |          |            |  |                                                                                                                                                                                                                                                                                                                                                                                                         |
|                                                                | <b>UK</b>                                                                                                                                                            | <b>Y</b> |            |  | Gould <i>et al.</i> , 2000 (also BSAVA, UK questionnaire). <b>Tick vector <i>Ixodes ricinus</i> endemic</b><br><i>A. phagocytophilum</i> exists in the UK causing tick-borne fever in humans and there are increasing reports in dogs.                                                                                                                                                                  |
|                                                                | <b>Ireland</b>                                                                                                                                                       | <b>U</b> |            |  | <b>Tick vector <i>Ixodes ricinus</i> endemic</b>                                                                                                                                                                                                                                                                                                                                                        |
| <i>Francisella tularensis</i><br>(Tularaemia)                  | Northern Hemisphere, only:<br>20°- 70°N, includes Japan.<br>Specifically (within N Hemisphere) not Bahrain, Cape Verde, Malta, and probably not Taiwan and Caribbean | <b>Y</b> | <b>D,C</b> |  | Several biotypes and serovars with differing geographical distribution and pathogenicity. In North America the agent has a tick-rabbit cycle. Other biotypes have a more complex cycle– rodents, ticks, mosquitoes and water. Ticks are not essential for the agent transmission.<br><br>Cats can be sub clinically infected and are sources of human infection. Dogs usually have some clinical signs. |
|                                                                | <b>UK</b>                                                                                                                                                            | <b>U</b> |            |  | <b><i>D. reticulatus</i> locally endemic</b>                                                                                                                                                                                                                                                                                                                                                            |
|                                                                | <b>Ireland</b>                                                                                                                                                       | <b>U</b> |            |  |                                                                                                                                                                                                                                                                                                                                                                                                         |
| <i>Mycoplasma haemocanis</i><br>(Haemobartonella)              | Reported in N America and Japan. Probably follows distribution of <i>R. .sanguineus</i> vector                                                                       | <b>N</b> | <b>D</b>   |  | <b><i>Rhipicephalus sanguineus</i> sporadic.</b><br><br>Rarely causes disease in dogs for that reason it may simply have been missed diagnosed.                                                                                                                                                                                                                                                         |
|                                                                | <b>UK</b>                                                                                                                                                            | <b>U</b> |            |  |                                                                                                                                                                                                                                                                                                                                                                                                         |

|                                                                                                                                           |                                                                                                                                                     |          |   |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|----------|---|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                           | <b>Ireland</b>                                                                                                                                      | <b>U</b> |   |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <i>Mycoplasma haemofelis</i><br>( <b>Haemobartonella</b> )                                                                                | Europe(North and South).                                                                                                                            |          | N | C | Causes anaemia, acute or chronic disease and recovered cats may act as carriers. Blood-borne infection, thought to be vector transmission although exact species unknown, postulated to be fleas, ticks, lice and biting flies. At least one report exists from fighting (post ingestion of infected blood). Vertical transmission has been implicated.                                                                                                                                                                                                                                            |
|                                                                                                                                           | <b>UK</b>                                                                                                                                           | <b>Y</b> |   |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                                                                                                                           | <b>Ireland</b>                                                                                                                                      | <b>U</b> |   |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <i>Rickettsia rickettsii, R. montana, R. belli etc</i><br>( <b>Spotted Fevers</b> )                                                       | Mainly Americas                                                                                                                                     |          | Y | D | Rocky Mountain Spotted Fever. Vectors are ticks <i>Dermacentor andersoni</i> and <i>D. variabilis</i> , <i>Amblyomma cajennense</i> , <i>A. americanum</i> and <i>Rhipicephalus sanguineus</i> for <i>R. rickettsii</i> , depending on geography. Main hosts for immature stages of life cycle are rodents. Antigenically related <i>rickettsias</i> have been detected in other ticks throughout Western Hemisphere. Dog-to-human transmission may occur via tick or tick products. RMSF is zoonotic, with mortality rate of 20% in humans. High prevalence of infected ticks in endemic regions. |
|                                                                                                                                           | <b>UK</b>                                                                                                                                           | <b>U</b> |   |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                                                                                                                           | <b>Ireland</b>                                                                                                                                      | <b>U</b> |   |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <i>Rickettsia spp</i><br><i>R. conorii, R. australis, R. sibirica, R. akari, R. japonica, R. honei etc...</i><br>( <b>Spotted Fever</b> ) | Many areas of world, including Australia, Asia – China and Japan, Mediterranean (e.g. Malta) Cape Verde, Middle East (e.g. Bahrain) Africa and Asia |          | Y | D | Life cycles involve a variety of ticks ( <i>Rhipicephalus spp, Amblyomma spp. Dermacentor spp, and Ixodes spp.</i> ) and wildlife. Dog-to-human transmission may occur via tick or tick products. Dog likely to be end hosts.                                                                                                                                                                                                                                                                                                                                                                      |
|                                                                                                                                           | <b>UK</b>                                                                                                                                           | <b>U</b> |   |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                                                                                                                           | <b>Ireland</b>                                                                                                                                      | <b>U</b> |   |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

|                                                                                                      |                                                                                                                                                                                                                                                                 |   |   |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><i>Babesia canis</i>, <i>B. gibsonii</i><br/><i>B. felis</i>, <i>B. cati</i><br/>(Babesiosis)</p> | <p><i>B. canis</i>: South and East Europe, Africa, Asia including Japan and Taiwan, Americas including Caribbean.<br/><i>B. gibsonii</i>: North Africa, South Asia including Japan, SW USA.<br/><i>B. felis</i>: Africa, S Asia.<br/><i>B. cati</i>: India</p>  |   | N | D,C | <p><i>B. canis</i> and <i>B. gibsonii</i> in dogs; <i>B. felis</i>, <i>B. cati</i> in cats. Tick-borne. Ticks vary with spp., and geography. Vector species include <i>Rhipicephalus</i> spp, <i>Dermacentor</i> spp, <i>Haemaphysalis</i> spp, plus others experimentally.</p> <p><i>B. canis</i> subspecies have slightly different distributions and pathogenicity. Frequently imported into Germany from South Europe. Two reports of <i>B. gibsonii</i> in immuno- suppressed owners.</p> |
|                                                                                                      | UK                                                                                                                                                                                                                                                              | N |   |     | <p><b>Reported only on imported dogs</b><br/>Potential tick vectors exist <i>D. reticulatus</i> and <i>R. sanguineu</i>.<br/><b><i>Rhipicephalus sanguineus</i> sporadic</b></p>                                                                                                                                                                                                                                                                                                               |
|                                                                                                      | Ireland                                                                                                                                                                                                                                                         | U |   |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <p><i>Cytauxzoon felis</i><br/>(Babesiosis)</p>                                                      | North America                                                                                                                                                                                                                                                   |   | N | C   | <p>In US, bobcat is definitive host, with various ticks as vectors. Invariably fatal in domestic cats.</p>                                                                                                                                                                                                                                                                                                                                                                                     |
|                                                                                                      | UK                                                                                                                                                                                                                                                              | U |   |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                                      | Ireland                                                                                                                                                                                                                                                         | U |   |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <p><i>Hepatazoon canis</i>,<br/><i>H. americanum</i>,<br/><i>H. felis</i><br/>(Hepatozoonosis)</p>   | <p><i>H. canis</i> in S. Europe, Mediterranean, Africa, Pacific and Indian Oceans, Asia, including Japan, and Americas wherever <i>Rhipicephalus sanguineus</i> is found.<br/><i>H. americanum</i> in southeast USA- tick vector <i>Ambylomma maculatum</i></p> |   | N | D,C | <p>Carnivore hosts - dog, cat and wild cats. Vertical transmission also reported in dogs.</p>                                                                                                                                                                                                                                                                                                                                                                                                  |

|                                                                                   |                                                                           |          |     |  |                                                                                                                                                                                                                                                                                                                                |
|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------|----------|-----|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                   | <b>UK</b>                                                                 | <b>U</b> |     |  | Tick vectors not present with exception of <i>Rhipicephalus sanguineus</i> <b>sporadic</b>                                                                                                                                                                                                                                     |
|                                                                                   | <b>Ireland</b>                                                            | <b>U</b> |     |  |                                                                                                                                                                                                                                                                                                                                |
| <b><i>B. burgdorferi sensu stricto</i></b><br><b>(Borreliosis - Lyme disease)</b> | Lyme borreliosis occurs in temperate climates of the northern hemisphere. | Y        | D,C |  | Lyme disease is transmitted by <i>Ixodid</i> ticks. The main vectors are <i>Ixodes ricinus</i> (Europe), <i>I. persulcatus</i> (Asia). <i>I. scapularis (dammini)</i> (Northeastern and upper Midwestern USA), <i>I. pacificus</i> (Western USA). globally, more than 100 animal species have been recorded as reservoir hosts |
|                                                                                   | <b>UK</b>                                                                 | <b>Y</b> |     |  | BSAVA, Royal Vet. College, Univ. of Liverpool, UK questionnaire.<br><b><i>Ixodes ricinus</i> endemic.</b>                                                                                                                                                                                                                      |
|                                                                                   | <b>Ireland</b>                                                            | <b>U</b> |     |  | <b><i>Ixodes ricinus</i> endemic</b>                                                                                                                                                                                                                                                                                           |
| <b><i>B. garinii, B. afzelii, B. valaisiana</i></b><br><b>(Borreliosis)</b>       |                                                                           |          |     |  |                                                                                                                                                                                                                                                                                                                                |
|                                                                                   | <b>UK</b>                                                                 | <b>U</b> |     |  |                                                                                                                                                                                                                                                                                                                                |
|                                                                                   | <b>Ireland</b>                                                            | <b>U</b> |     |  |                                                                                                                                                                                                                                                                                                                                |

\*Taylor, Jackson, Zimmer, Huntley, Tomlinson, Grant (2006). Qualitative Veterinary Risk Assessment: introduction of exotic diseases (other than Rabies) in the UK.

Y= endemic (reported by scientific evidence).

N= exotic (reported by scientific evidence).

U= unknown (no reports found).

## ***ANNEX II***

### ***Distribution of tick borne diseases in MS and third countries (Table 1 to Table 14 )***

Table 1: reported incidence of Babesiosis in European Union Countries (EU);

Table 2: reported incidence of Babesiosis in non- EU European Countries;

Table 3: reported incidence of Babesiosis in Listed Countries;

Table 4: Reported incidence of *Borrelia* spp in European Union Countries (EU);

Table 5: Reported incidence of *Borrelia* spp in non- EU European Countries;

Table 6: Reported incidence of *Rickettsia* in European Union Countries (EU);

Table 7: Reported incidence of *Rickettsia* in non- EU European Countries;

Table 8: Reported incidence of *Rickettsia* in Listed Countries;

Table 9: Reported incidence of Hepatozoonosis in European Union countries (EU);

Table 10: Reported incidence of Hepatozoonosis in non- EU European Countries;

Table 11: Reported incidence of Hepatozoonosis in Listed Countries;

Table 12: Reported incidence of TBE European Union countries (EU);

Table 13: Reported incidence of TBE in non- EU European Countries;

Table 14: Reported incidence of TBE in Listed Countries.

Notes for all the following tables:

RUSSIAN FEDERATION: consists of 88 subjects (regions). Please note that the following Republics are NOT part of the Russian Federation: Moldova, Georgia, Ukraine, Armenia, Azerbaijan, Turkmenistan, Uzbekistan, Kazakhstan, Kyrgyzstan and Tajikistan.

GUADELOUPE (FRANCE): includes St Barthelemy and St Martin (French part of the island).

\*Taylor, Jackson, Zimmer, Huntley, Tomlinson, Grant (2006). Qualitative Veterinary Risk Assessment: introduction of exotic diseases (other than Rabies) in the UK.

Table 1. **REPORTED INCIDENCE OF BABESIOSIS IN EUROPEAN UNION COUNTRIES (EU)**

| Country               | Reporting        | Tick species          | BABESIA                |                    | References                  |
|-----------------------|------------------|-----------------------|------------------------|--------------------|-----------------------------|
|                       |                  |                       | <i>Babesia</i> species | Prevalence         |                             |
| <b>Austria</b>        |                  | <i>D. reticulatus</i> |                        |                    | Zahler and Gothe, 1997      |
| <b>Belgium</b>        |                  | <i>D. reticulatus</i> | <i>B. canis</i>        | Indigenous-3 cases | Losson <i>et al.</i> , 1999 |
| <b>Bulgaria</b>       | No report- found |                       |                        |                    |                             |
| <b>Cyprus</b>         | No report found  |                       |                        |                    |                             |
| <b>Czech Republic</b> | No report found  |                       |                        |                    |                             |
| <b>Denmark</b>        | No report found  |                       |                        |                    |                             |
| <b>Estonia</b>        | No report found  |                       |                        |                    |                             |
| <b>Finland</b>        | No report found  |                       |                        |                    |                             |

|                            |                 |                                                          |                 |                                                                                                                                                                                                                 |                                                            |
|----------------------------|-----------------|----------------------------------------------------------|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|
| <b>France</b>              |                 | <i>D. reticulatus</i>                                    | <i>B. canis</i> | Endemic. 2 permanent foci: 1 <sup>st</sup> = SW-W zone (Languedoc to Sologne); 2 <sup>nd</sup> = Lyon at zone centre extending to Burgundy to centre of France. Also Southern Jura seroprevalence 62.4% (n=101) | Bourdoiseau, 2006<br>Martinod and Gilod, 1991              |
|                            |                 |                                                          | <i>B. canis</i> | Regions Lorraine and Toulouse: Tot 1 dog (with perennial fistulas positive for Babebiosis)                                                                                                                      | Marjolet, 2002<br>Tarello, 2003                            |
| <b>Martinique (France)</b> | No report found |                                                          |                 |                                                                                                                                                                                                                 |                                                            |
| <b>Guadeloupe (France)</b> | No report found |                                                          |                 |                                                                                                                                                                                                                 |                                                            |
| <b>Reunion (France)</b>    | No report found |                                                          |                 |                                                                                                                                                                                                                 |                                                            |
| <b>Germany</b>             |                 | <i>D. reticulatus</i><br>covering large areas of Germany |                 |                                                                                                                                                                                                                 |                                                            |
|                            |                 |                                                          | <i>B. canis</i> | <i>B. canis</i> isolated from 88 dogs from the Offenburg/Lahr/Freiburg area (Southwestern Germany).                                                                                                             | Gothe and Wegerdt, 1991                                    |
|                            |                 |                                                          | <i>B. canis</i> | Endemic in Bavaria (12 dogs) and Regensburg.                                                                                                                                                                    | Zahler <i>et al.</i> , 2000a; Zahler <i>et al.</i> , 2000b |

|                |  |                                |                   |                                                                                                                                                                        |                                                                                                                  |
|----------------|--|--------------------------------|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
|                |  |                                | <i>B. canis</i>   | 1 dog in North Germany which had never left North Germany                                                                                                              | Jensen and Nolte, 2005                                                                                           |
|                |  |                                | <i>B. canis</i>   | 1 dog from Berlin (autochthonous)                                                                                                                                      | Heile <i>et al.</i> , 2006; Zahler and Goethe, 2001                                                              |
|                |  | Bavarian meadow and on one dog | <i>B. canis</i>   | 5 dogs (n=77) which had been imported and 1 dog (n=51) which had been taken abroad (predominantly Mediterranean countries), 1 dog (n=12) which had never left Germany. | Gothe, 1999                                                                                                      |
|                |  |                                | <i>B. microti</i> | 15% (serological studies) of dogs                                                                                                                                      | Liebisch, G. and Liebisch, A. 1999                                                                               |
|                |  |                                | <i>B. canis</i>   | Regions of Bavaria, Duren area, North-Rhine-Westphalia, Berlin, Kehl, Offenburg, Lahr, Emmendingen, München: total 15 dogs                                             | Durbaum, 1999;<br>Engelbrecht <i>et al.</i> , 2002<br>Zahler <i>et al.</i> 2000a<br>Zahler <i>et al.</i> , 2000b |
| <b>Greece</b>  |  |                                | <i>B. canis</i>   | Seroprevalence 2,6% particularly in dogs in poor condition or from “non-endemic” regions such as Germany                                                               | Jensen <i>et al.</i> , 2003                                                                                      |
| <b>Hungary</b> |  |                                |                   | Diagnosed in 63 autochthonous dogs in Budapest                                                                                                                         | Mathe <i>et al.</i> , 2006                                                                                       |

|                   |                 |                                        |                                                                             |                                                                                                                                                                                                                       |                                                                                             |
|-------------------|-----------------|----------------------------------------|-----------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|
|                   |                 | <i>D. reticulatus</i>                  |                                                                             | 2 dogs on a hunting trip to Hungary tested positive for Babebiosis on return to Italy                                                                                                                                 | Furnarello <i>et al.</i> , 2005                                                             |
|                   |                 |                                        | <i>B. canis canis</i>                                                       | <i>D. reticulatus</i> was found on 49.5% of tick infested dogs with <i>babesiae</i> (n=577); specimens of the tick found in many geographical areas: Trasdanube, Szabolcs-Szatmar-Bereg, Csongrad, Pest and Budapest. | Foldvari <i>et al.</i> , 2005                                                               |
|                   |                 |                                        |                                                                             | 66 dogs (21,3%) positive for Babebiosis)                                                                                                                                                                              | Foldvari and Farkas, 2005                                                                   |
|                   |                 |                                        |                                                                             | 184 ticks found in 100 dogs / significant relation                                                                                                                                                                    | Farkas and Foldvari, 2001                                                                   |
|                   |                 | <i>D. reticulatus</i> found on one dog | Small <i>babesiae</i> ( <i>B. microti</i> -like or <i>B. gibsoni</i> -like) | Prevalence of 5.7% (37/651 animals) in dogs from 13 locations of the country                                                                                                                                          | Farkas <i>et al.</i> , 2004<br>Hornok <i>et al.</i> , 2006                                  |
| <b>Ireland</b>    | No report found |                                        |                                                                             |                                                                                                                                                                                                                       |                                                                                             |
| <b>Italy</b>      |                 |                                        | <i>B. canis</i>                                                             | 10.8% seroprevalence (n=429) in 1-year study in Puglia and Basilicata regions. High seroprevalence in a military kennels in Grosseto (61.3%) (n=31)                                                                   | Puccini <i>et al.</i> , 1998<br>Bizzetti <i>et al.</i> , 1997<br>Torina and Caracappa, 2006 |
|                   |                 |                                        | <i>B. canis</i>                                                             | Northeast Italy: tot 23 dogs                                                                                                                                                                                          | Furnarello <i>et al.</i> , 2005                                                             |
| <b>Latvia</b>     | No report found |                                        |                                                                             |                                                                                                                                                                                                                       |                                                                                             |
| <b>Lithuania</b>  | No report found |                                        |                                                                             |                                                                                                                                                                                                                       |                                                                                             |
| <b>Luxembourg</b> | No report found |                                        |                                                                             |                                                                                                                                                                                                                       |                                                                                             |

|                    |                 |                       |                                     |                                                                                                                                                                                                                                                                                           |                                                                                                                             |
|--------------------|-----------------|-----------------------|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| <b>Malta</b>       | No report found |                       |                                     |                                                                                                                                                                                                                                                                                           |                                                                                                                             |
| <b>Netherlands</b> |                 |                       | <i>B. canis</i>                     | Diagnosed in 2 dogs which had not traveled to endemic areas                                                                                                                                                                                                                               | Zandvliet <i>et al.</i> , 2004                                                                                              |
|                    |                 | <i>D. reticulatus</i> | <i>B. canis</i>                     | Outbreak (23 dogs) in the spring and autumn of 2004- possibility of canine Babebiosis becoming endemic                                                                                                                                                                                    | Matjila <i>et al.</i> , 2005                                                                                                |
|                    |                 |                       | <i>B. canis</i>                     | Regions Hague and Arnheim regions: 124 dogs                                                                                                                                                                                                                                               | Houwers <i>et al.</i> , 2004; Matjila <i>et al.</i> , 2005 ; Zandvliet <i>et al.</i> , 2004 ; De Lange <i>et al.</i> , 2005 |
| <b>Poland</b>      |                 |                       |                                     | <i>Babesia</i> spp not detected in dogs infested with <i>I. ricinus</i> suggests that the domestic dog may not be a reservoir for <i>Babesia</i> in Szczecin and northwestern Poland; moreover this area does not have populations of <i>D. reticulatus</i> or <i>R. sanguineus</i> ticks | Skotarczak <i>et al.</i> , 2004                                                                                             |
|                    |                 |                       | <i>B. canis</i>                     | Northwest Poland: 0 infected dogs (among 192)                                                                                                                                                                                                                                             | Skotarczak <i>et al.</i> , 2004                                                                                             |
| <b>Portugal</b>    |                 |                       | <i>B. canis</i> and <i>T .annae</i> | Infection in 10 immunosuppressed cats from Spain and Portugal and <i>B. canis</i> in a <i>Babesia</i> symptomatic cat                                                                                                                                                                     | Criado-Fornelio <i>et al.</i> , 2003a                                                                                       |

|                           |                 |                     |                                                           |                                                                                                                                                                                                       |                                                                            |
|---------------------------|-----------------|---------------------|-----------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|
| <b>Azores (Portugal)</b>  | No report found |                     |                                                           |                                                                                                                                                                                                       |                                                                            |
| <b>Madeira (Portugal)</b> | No report found |                     |                                                           |                                                                                                                                                                                                       |                                                                            |
| <b>Romania</b>            |                 |                     |                                                           | Dogs tested positive in Germany after a trip in Romania                                                                                                                                               | Gothe and Wegerdt, 1991                                                    |
| <b>Slovakia</b>           |                 |                     | <i>B. canis</i>                                           | Region lowlands: 3 dogs                                                                                                                                                                               | Chandoga <i>et al.</i> , 2002                                              |
| <b>Slovenia</b>           |                 |                     | <i>B. canis</i> and <i>B. canis vogeli</i>                | 4,6% <i>-B. canis</i> and 1,3% <i>-B. canis vogeli</i> (n=238)-based on PCR subtyping                                                                                                                 | Duh <i>et al.</i> , 2004                                                   |
| <b>Spain</b>              |                 | <i>I. hexagonus</i> | <i>Theleiria annae</i><br>(related to <i>B. gibsoni</i> ) | 62 canine samples were positive for small <i>Babesia</i> in northern Spain; previously suggested as endemic amongst dogs in northwest Spain (n=157). <i>I. hexagonus</i> the main candidate as vector | Camacho, 2006; Camacho <i>et al.</i> , 2001; Camacho <i>et al.</i> , 2003a |
|                           |                 |                     | <i>B. gibsoni</i>                                         | Fatality in one dog; also detected in blood from a <i>babesia</i> -symptomatic dog                                                                                                                    | Suarez <i>et al.</i> , 2001; Criado-Fornelio <i>et al.</i> , 2003c         |
|                           |                 |                     | <i>B. canis</i> and <i>T. annae</i>                       | Infection in 10 immunosuppressed cats from Spain and Portugal and <i>B. canis</i> in a <i>Babesia</i> symptomatic cat                                                                                 | Criado-Fornelio <i>et al.</i> , 2003b                                      |
|                           |                 |                     | <i>B. microti</i> -like agents                            | Infection in 157 dogs (among 258 cases) from northwest Spain                                                                                                                                          | Camacho <i>et al.</i> , 2001                                               |
|                           |                 |                     |                                                           | <i>B. canis</i>                                                                                                                                                                                       |                                                                            |

|                                                  |                 |                      |                  |                                                            |                                      |
|--------------------------------------------------|-----------------|----------------------|------------------|------------------------------------------------------------|--------------------------------------|
|                                                  |                 |                      | <i>B. equi</i> , |                                                            | Criado-Fornelio <i>et al.</i> , 2004 |
|                                                  |                 |                      |                  |                                                            | Camacho <i>et al.</i> , 2001         |
| <b>Balearic Islands (Spain)</b>                  | No report found |                      |                  |                                                            |                                      |
| <b>Canary Islands (Spain)</b>                    |                 | <i>R. sanguineus</i> | <i>B. canis</i>  | Endemic 6.9% (n=700) (Tenerife)                            | Stenzenberger and Goethe, 1999       |
| <b>Ceuta (Spain)</b>                             | No report found |                      |                  |                                                            |                                      |
| <b>Melilla (Spain)</b>                           | No report found |                      |                  |                                                            |                                      |
| <b>Sweden</b>                                    | No report found |                      |                  |                                                            |                                      |
| <b>UK</b>                                        |                 |                      | <i>B. canis</i>  | England, Wales Scotland: 4 dogs (among 12) with Babebiosis | Manser, 2003                         |
| <b>Gibraltar (UK)</b>                            | No report found |                      |                  |                                                            |                                      |
| <b><u>Other studies</u></b>                      |                 |                      |                  |                                                            |                                      |
| <b>France, Croatia, Poland</b>                   |                 |                      | <i>B. canis</i>  |                                                            | Caccio <i>et al.</i> , 2002          |
| <b>Southern Europe (France, Portugal, Spain)</b> |                 |                      | <i>B. canis</i>  | 50-70% of mammals infected                                 | Criado-Fornelio <i>et al.</i> , 2004 |

Table 2: REPORTED INCIDENCE OF BABESIOSIS IN NON-EU EUROPEAN COUNTRIES

| Country        | Reporting       | Comments | BABESIA      |                        | References |
|----------------|-----------------|----------|--------------|------------------------|------------|
|                |                 |          | Tick species | <i>Babesia</i> species |            |
| <b>Andorra</b> | No report found |          |              |                        |            |

|                           |                 |                                                             |                 |                                                                                                                                                                                                                                                                    |                                       |
|---------------------------|-----------------|-------------------------------------------------------------|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|
| <b>Belarus</b>            | No report found |                                                             |                 |                                                                                                                                                                                                                                                                    |                                       |
| <b>Bosnia-Herzegovina</b> |                 |                                                             |                 | 7 dogs on a hunting trip to Bosnia and Herzegovina tested positive for Babesiosis on return to Italy                                                                                                                                                               | Furnarello <i>et al.</i> , 2005       |
| <b>Croatia</b>            |                 |                                                             |                 | 8 dogs on a hunting trip to Croatia tested positive for Babesiosis on return to Italy                                                                                                                                                                              | Furnarello <i>et al.</i> , 2005       |
| <b>Liechtenstein</b>      | No report found |                                                             |                 |                                                                                                                                                                                                                                                                    |                                       |
| <b>Monaco</b>             | No report found |                                                             |                 |                                                                                                                                                                                                                                                                    |                                       |
| <b>Norway</b>             | No report found |                                                             |                 |                                                                                                                                                                                                                                                                    |                                       |
| <b>Russian Federation</b> |                 | <i>D. reticulatus</i> (not found in <i>I. persulcatus</i> ) | <i>B. canis</i> | 21 dogs from southwestern Siberia tested positive                                                                                                                                                                                                                  | Rar <i>et al.</i> , 2005a; Rar, 2005b |
| <b>San Marino</b>         | No report found |                                                             |                 |                                                                                                                                                                                                                                                                    |                                       |
| <b>Switzerland</b>        |                 |                                                             | <i>B. canis</i> | Autochthonous cases in canton Solothurn                                                                                                                                                                                                                            | Sager <i>et al.</i> , 2005            |
|                           |                 |                                                             |                 | Low prevalence (0.8%) in 3-year study of strays dogs in S. Switzerland (n=371); endemic in southern and western parts-further spread to the Obergosgen (canton Solothurn) region where detected in 5 dogs which has not traveled abroad or been to endemic regions | Deplazes <i>et al.</i> , 1995;        |
| <b>Turkey</b>             |                 |                                                             | <i>B. canis</i> | 6 dogs with uncomplicated babesiosis                                                                                                                                                                                                                               | Ulutas <i>et al.</i> , 2005           |

|                |                 |  |  |                                   |  |
|----------------|-----------------|--|--|-----------------------------------|--|
|                |                 |  |  | 1 dog with complicated babesiosis |  |
| <b>Vatican</b> | No report found |  |  |                                   |  |

Table 3: **REPORTED INCIDENCE OF BABESIOSIS IN LISTED COUNTRIES**

| Country          | Reporting       | Comments | BABESIA           |                        | References                                                                                                                                                                                                                              |                                                                  |
|------------------|-----------------|----------|-------------------|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|
|                  |                 |          | Tick species      | <i>Babesia</i> species |                                                                                                                                                                                                                                         | Prevalence                                                       |
| <b>Canada</b>    |                 |          |                   |                        | <i>Babesia</i> DNA was detected in 1 dog from Ontario Province                                                                                                                                                                          | Birkenheuer <i>et al.</i> , 2005                                 |
| <b>Greenland</b> | No report found |          |                   |                        |                                                                                                                                                                                                                                         |                                                                  |
| <b>USA</b>       |                 |          | <i>B. gibsoni</i> |                        | Fatality in a dog in Indiana with multiple bite wounds received during a fight with 3 Pit Bull Terriers; also identified in a dog from Oklahoma                                                                                         | Irizarry-Rovira <i>et al.</i> , 2001; Kocan <i>et al.</i> , 2001 |
|                  |                 |          |                   |                        | <i>Babesia</i> was detected by PCR in dogs in 29 states: <i>B gibsoni</i> in 91% (n=144); 93% of these dogs were American Pi Bull Terriers, and infection in other dogs was associated with having been recently bitten by another dog. | Birkenhauer <i>et al.</i> , 2005                                 |
|                  |                 |          |                   | <i>B. conradae</i>     |                                                                                                                                                                                                                                         | Reported in dogs in California                                   |

|                             |                 |  |                         |                                                                                                         |                                                          |
|-----------------------------|-----------------|--|-------------------------|---------------------------------------------------------------------------------------------------------|----------------------------------------------------------|
|                             |                 |  | <i>B. gibsoni</i> -like | Reported in dogs from Oklahoma                                                                          | Meinkoth <i>et al.</i> , 2002                            |
| <b>Aruba (Netherlands)</b>  | No report found |  |                         |                                                                                                         |                                                          |
| <b>Antigua and Barbuda</b>  | No report found |  |                         |                                                                                                         |                                                          |
| <b>Barbados</b>             | No report found |  |                         |                                                                                                         |                                                          |
| <b>Bermuda</b>              | No report found |  |                         |                                                                                                         |                                                          |
| <b>Cayman Islands</b>       | No report found |  |                         |                                                                                                         |                                                          |
| <b>Grenadines</b>           | No report found |  |                         |                                                                                                         |                                                          |
| <b>Jamaica</b>              | No report found |  |                         |                                                                                                         |                                                          |
| <b>Montserrat (UK)</b>      | No report found |  |                         |                                                                                                         |                                                          |
| <b>Netherlands Antilles</b> |                 |  |                         | <i>B. canis</i> reported as endemic                                                                     | Zandvliet <i>et al.</i> , 2004                           |
| <b>St Kitts &amp; Nevis</b> | No report found |  |                         |                                                                                                         |                                                          |
| <b>St Vincent</b>           | No report found |  |                         |                                                                                                         |                                                          |
| <b>Trinidad and Tobago</b>  | No report found |  |                         |                                                                                                         |                                                          |
| <b>Argentina</b>            | No report found |  |                         |                                                                                                         |                                                          |
| <b>Chile</b>                | No report found |  |                         |                                                                                                         |                                                          |
| <b>Falkland Islands</b>     | No report found |  |                         |                                                                                                         |                                                          |
| <b>Mexico</b>               | No report found |  |                         |                                                                                                         |                                                          |
| <b>Australia</b>            |                 |  | <i>B. gibsoni</i>       | Identified in 3 related American Pitt Bull Terriers; also found in isolates from southeastern Australia | Muhn timer et al., 2002; Jefferies <i>et al.</i> , 2003. |

|                    |                 |                      |                                                                                          |                                                                                                                                                                                                                                                                                                                                        |                                |
|--------------------|-----------------|----------------------|------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|
|                    |                 | <i>R. sanguineus</i> | <i>B. canis vogeli</i>                                                                   | Confirmed as endemic                                                                                                                                                                                                                                                                                                                   | Jefferies <i>et al.</i> , 2003 |
| <b>New Zealand</b> | No report found |                      |                                                                                          |                                                                                                                                                                                                                                                                                                                                        |                                |
| <b>Bahrain</b>     | No report found |                      |                                                                                          |                                                                                                                                                                                                                                                                                                                                        |                                |
| <b>Hong Kong</b>   | No report found |                      |                                                                                          |                                                                                                                                                                                                                                                                                                                                        |                                |
| <b>Japan</b>       |                 |                      | <i>B. canis vogeli</i><br><i>B. gibsoni</i><br><i>B. odocoilei</i> / <i>B. divergens</i> | <i>B. canis vogeli</i> isolated from ticks in Aomori, Nara, Hiroshima, Oita and Okinawa Prefectures; <i>B. gibsoni</i> Osaka, Hiroshima, Miyazaki and Okinawa Prefectures; <i>B. odokoilei</i> and <i>B. divergens</i> showed 97.7 and 97.6% homology respectively with DNA isolated from ovatus ticks in Akita and Fukui Prefectures. | Inokuma <i>et al.</i> , 2003a  |
|                    |                 |                      |                                                                                          | 6.3% and 8.8% of 80% free-roaming dogs on Okinawa Island showed infection with <i>B. canis</i> and <i>B. gibsoni</i> respectively                                                                                                                                                                                                      | Inokuma <i>et al.</i> , 2004   |
|                    |                 |                      |                                                                                          | 29.8 of 411 blood samples from dogs of the fighting breed Tosa (87 with histories of fighting, 54 without) from the Aomori Prefecture I northeastern Japan tested positive for <i>B. gibsoni</i> -only one was from a dog without a history of dog fighting                                                                            | Matsuu <i>et al.</i> , 2004    |

|                               |                 |                                                                                                            |  |                                                                                                                                                                                                                                                   |                             |
|-------------------------------|-----------------|------------------------------------------------------------------------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|
|                               |                 | The positive dogs had a significantly lower rate of tick exposure and a higher rate of bites by other dogs |  | 35 dogs from 115 dogs tested positive for <i>B. gibsoni</i> infection; these consisted of 28 Tosa dogs, 4 American Pitt Bull Terriers and 3 mongrels in Aomori, Fukushima, Ibaraki, Gunma, Tokyo, Kanagawa and Nagano Prefectures (eastern Japan) | Miyama <i>et al.</i> , 2005 |
| <b>Singapore</b>              | No report found |                                                                                                            |  |                                                                                                                                                                                                                                                   |                             |
| <b>Taiwan</b>                 | No report found |                                                                                                            |  |                                                                                                                                                                                                                                                   |                             |
| <b>United Arab Emirates</b>   | No report found |                                                                                                            |  |                                                                                                                                                                                                                                                   |                             |
| <b>Ascension Island (UK)</b>  | No report found |                                                                                                            |  |                                                                                                                                                                                                                                                   |                             |
| <b>Faroe Islands</b>          | No report found |                                                                                                            |  |                                                                                                                                                                                                                                                   |                             |
| <b>Fiji</b>                   | No report found |                                                                                                            |  |                                                                                                                                                                                                                                                   |                             |
| <b>French Guiana (France)</b> | No report found |                                                                                                            |  |                                                                                                                                                                                                                                                   |                             |
| <b>French Polynesia</b>       | No report found |                                                                                                            |  |                                                                                                                                                                                                                                                   |                             |
| <b>Guam</b>                   | No report found |                                                                                                            |  |                                                                                                                                                                                                                                                   |                             |
| <b>Iceland</b>                | No report found |                                                                                                            |  |                                                                                                                                                                                                                                                   |                             |
| <b>Mauritius</b>              | No report found |                                                                                                            |  |                                                                                                                                                                                                                                                   |                             |
| <b>Mayotte</b>                | No report found |                                                                                                            |  |                                                                                                                                                                                                                                                   |                             |
| <b>New Caledonia (France)</b> | No report found |                                                                                                            |  |                                                                                                                                                                                                                                                   |                             |
| <b>St Helena</b>              | No report found |                                                                                                            |  |                                                                                                                                                                                                                                                   |                             |

|                                 |                 |  |  |  |  |
|---------------------------------|-----------------|--|--|--|--|
| <b>St Pierre &amp; Miquelon</b> | No report found |  |  |  |  |
| <b>Vanuatu</b>                  | No report found |  |  |  |  |
| <b>Wallis &amp; Futuna</b>      | No report found |  |  |  |  |

Table 4: REPORTED INCIDENCE OF *BORRELIA* SPP IN EUROPEAN UNION COUNTRIES (EU)

| Country               | Reporting | Tick species      | <i>BORRELIA</i>            |                                                                                                                                   | References                                               |
|-----------------------|-----------|-------------------|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|
|                       |           |                   | <i>Borrelia</i> species    | Prevalence                                                                                                                        |                                                          |
| <b>Belgium</b>        |           |                   | <i>Canine Lyme disease</i> |                                                                                                                                   | Mckenna <i>et al.</i> , 1995                             |
| <b>Czech Republic</b> |           |                   |                            | 75 (33.7%) among 145 dogs                                                                                                         | Sykora <i>et al.</i> , 1990                              |
| <b>Denmark</b>        |           |                   | <i>B. burgdorferi</i>      | hunting dogs                                                                                                                      | Hansen and Dietz, 1989;<br>Ostergard and Rasmussen, 2000 |
| <b>Finland</b>        |           | <i>I. ricinus</i> | <i>B. burgdorferi</i>      | Helsinki, 1210 <i>I. ricinus</i> ticks<br>Prevalence from 2.8% to 7.9% (3 regions)<br>Total 294 ticks found<br>7 positive (2.38%) | Junttila <i>et al.</i> , 1994                            |
| <b>France</b>         |           |                   | <i>B. burgdorferi</i>      | Western France, hunting and military dogs, 182 cases among 3928                                                                   | Doby <i>et al.</i> , 1988                                |
|                       |           |                   | <i>B. burgdorferi</i>      | Central regions, Pyrenees. 108 positive dogs among 210                                                                            | Euzeby and Raffi, 1988                                   |
|                       |           |                   |                            | Aquitaine, 2% positive among 3718 dogs                                                                                            | Cabannes <i>et al.</i> , 1996                            |

|                |  |  |                         |                                                                                                                          |                                    |
|----------------|--|--|-------------------------|--------------------------------------------------------------------------------------------------------------------------|------------------------------------|
|                |  |  | <i>Lyme disease</i>     |                                                                                                                          | Bussieras and Chermette, 1993      |
|                |  |  | <i>Lyme disease</i>     |                                                                                                                          | Andre-Fontaine and Ganiere, 1989   |
| <b>Germany</b> |  |  | <i>B. burgdorferi</i>   | 32 (14.8%) positive dogs among 216                                                                                       | Bauerfeind <i>et al.</i> , 1998    |
|                |  |  | <i>B. burgdorferi</i>   | Northern Baden, 22% infected                                                                                             | Beichel <i>et al.</i> , 1996       |
|                |  |  | <i>B. burgdorferi</i>   | Berlin, 189 dogs, 5.8% positive. 29 cats                                                                                 | Kasbohrer and Schonberg, 1990      |
|                |  |  | <i>B. burgdorferi</i>   | Leipzig, 25% among 41 dogs<br>12.5% among 77 cats                                                                        | Lindner and Bockel, 1995           |
|                |  |  |                         | South Germany, 36 positive among 72 dogs (50%)                                                                           | Krampitz and Bark, 1987            |
|                |  |  | <i>B. burgdorferi</i>   | Giessen, 32 positive dogs among 216                                                                                      | Kreis, 1996                        |
|                |  |  | <i>Lyme disease</i>     | Sachsen, 25.3% positive among 3267 dogs<br>16.3% among 999 dogs from other regions<br>21.2% dogs among 501 from Hannover | Holst, 1996                        |
|                |  |  |                         | Munich, 22 dogs                                                                                                          | Reusch <i>et al.</i> , 1994        |
|                |  |  | <i>B. burgdorferi</i>   | Nurnberg, 3 dogs                                                                                                         | Heim and Weber, 1991               |
|                |  |  | <i>Lyme borreliosis</i> | Northern Germany                                                                                                         | Liebisch A., and Liebisch G., 1993 |
| <b>Italy</b>   |  |  | <i>B. burgdorferi</i>   | 5 Provinces in Campania, 54 positive dogs among 200                                                                      | Gravino <i>et al.</i> , 1989       |

|                   |  |  |                                                                  |                                                                                                                                     |                                    |
|-------------------|--|--|------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
|                   |  |  | <i>Lyme borreliosis</i>                                          | Tuscany, wild rodents<br>88.9% n=11<br>Fallow deer ( <i>Cervus dama</i> )<br>64.3% n=28<br>Wild boar ( <i>Sus crofa</i> )<br>0% n=5 | Mannelli <i>et al.</i> , 1999      |
|                   |  |  | <i>B. burgdorferi</i>                                            | Messina region                                                                                                                      | Giudice <i>et al.</i> , 2003       |
| <b>Netherland</b> |  |  | <i>Lyme borreliosis</i>                                          | 22.8 (3%) of positive dogs                                                                                                          | Gossens <i>et al.</i> , 2001       |
|                   |  |  | <i>B. burgdorferi</i>                                            | 7 positive dogs among 15 symptomatic dogs<br>None among 11 asymptomatic dogs                                                        | Hovius <i>et al.</i> , 2000        |
|                   |  |  | <i>B. burgdorferi s. lato, stricto, afzelii, garinii, valais</i> | Eindhoven, 20 among 138 ticks (=14.5%)                                                                                              | Hovius <i>et al.</i> , 1998        |
|                   |  |  | <i>Lyme borreliosis</i>                                          | 32 dogs among 47 suspected dogs and 12 positive among 39 healthy dogs                                                               | Hovius, 1990                       |
|                   |  |  | <i>Lyme borreliosis</i>                                          | 1 dog with contact with ticks                                                                                                       | Overduin and Van Den Bogaard, 1997 |
| <b>Norway</b>     |  |  | <i>B. burgdorferi sensu lato</i>                                 | Aust Agder, 87 dogs, 13.8%<br><i>B. afzelii</i> , 205 <i>E. equi</i>                                                                | Akerstedt <i>et al.</i> , 1996     |
|                   |  |  | <i>B. burgdorferi</i>                                            | Agder region                                                                                                                        | Csango <i>et al.</i> , 1998        |
|                   |  |  | <i>Lyme disease</i>                                              | 2 dogs                                                                                                                              | Overnes <i>et al.</i> , 1992       |
| <b>Poland</b>     |  |  | <i>B. burgdorferi sensu lato</i>                                 | Northwest, 6 dogs among 15 infected dogs                                                                                            | Skortarczak and Wodecka, 2003      |

|                 |                 |  |                                               |                                                               |                                   |
|-----------------|-----------------|--|-----------------------------------------------|---------------------------------------------------------------|-----------------------------------|
|                 |                 |  | <i>B. burgdorferi</i>                         | Northwest, 1 positive ( <i>B. burgdorferi sensu stricto</i> ) | Skortarczak and Wodecka, 2005     |
|                 |                 |  | <i>B. burgdorferi</i>                         | No data                                                       | Anusz and Horban, 1996            |
| <b>Slovakia</b> | No report found |  |                                               |                                                               |                                   |
| <b>Slovenia</b> |                 |  | <i>Lyme Borreliosis</i>                       | 32 among 180 cases (18%)                                      | Mehle, 1996                       |
|                 |                 |  |                                               | Kosice, 47.4% IHA<br>24.1-36.8%<br>ELISA<br>among 56 dogs     | Nadzamova <i>et al.</i> , 2000    |
|                 |                 |  | <i>B. burgdorferi</i>                         | Kosice, 21=27% among<br>78 dogs                               | Stefancikova <i>et al.</i> , 1996 |
|                 |                 |  | <i>B. burgdorferi sensu lato</i>              | Kosice, 256 tested<br>128=50% positive                        | Stefancikova <i>et al.</i> , 1998 |
| <b>Spain</b>    |                 |  | <i>B. burgdorferi</i>                         | Leon, 95 dogs 2.1% positive                                   | Roio Vazquez, 1997                |
|                 |                 |  | <i>B. burgdorferi</i>                         | 308 dogs, 21%                                                 | Delgado and Carmenes, 1995        |
|                 |                 |  | <i>Lyme borreliosis</i>                       | Soria, 146 dogs, 17 positive<br>(11.6%)                       | Merino <i>et al.</i> , 2000       |
|                 |                 |  | <i>Lyme disease</i>                           | Barcelona,                                                    |                                   |
|                 |                 |  | <i>Lyme disease</i>                           | 30.43% prevalence                                             | Bhide <i>et al.</i> , 2004        |
| <b>Sweden</b>   |                 |  |                                               | 5 among 55 dogs                                               | Font <i>et al.</i> , 1992         |
|                 |                 |  |                                               | 20% among 20 dogs                                             | Musgrave <i>et al.</i> , 1988     |
|                 |                 |  | <i>B. burgdorferi</i><br><i>Ehrlichia spp</i> | Uppsala, 3.9% among 588                                       | Egenvall <i>et al.</i> , 2000     |

|    |  |                   |                                                  |                                                                                                                                                      |                                 |
|----|--|-------------------|--------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|
|    |  | <i>I. ricinus</i> | <i>B. burgdorferi</i><br><i>Sensu lato</i>       | 23 out of 25 provinces 3% positive for B.: Jamtland<br>23% positive for B.: Sodermanland<br>Especially southern and western parts                    | Gustanfson <i>et al.</i> , 1995 |
|    |  |                   | <i>Borreliosis and Granulocytic Ehrlichiosis</i> | 11-13% among 8210 dogs<br>1-21% among 170 cats positive for <i>Borrelia</i> , 27-36% among 6372 dogs, 0-14% of 88 cats positive for <i>Ehrlichia</i> | Artursson <i>et al.</i> , 1994  |
|    |  |                   |                                                  | 106 dogs: 33 dogs positive for <i>Borrelia</i> , 64 for <i>Ehrlichia</i> and 11 for both                                                             | Egenvall <i>et al.</i> , 1994   |
|    |  |                   |                                                  | No data                                                                                                                                              | Ytterberg and Bjoersdorff, 2002 |
| UK |  |                   | <i>B. burgdorferi</i>                            | London, 2/40 <i>B. burgd.</i> ;<br>Richmond 3/25 <i>B. burgd.</i>                                                                                    | Guy and Farquhar, 1991          |
|    |  |                   | <i>Lyme disease</i>                              | Hamsphire, 3 positive dogs among 115<br>Hereford, 4 positive dogs among 41                                                                           | Liu <i>et al.</i> , 1988        |
|    |  |                   | <i>Lyme disease</i>                              |                                                                                                                                                      | May <i>et al.</i> , 1991        |
|    |  |                   |                                                  | 4 dogs, 1 positive for <i>Borrelia</i> , 1 for <i>Borrelia</i> and <i>Ehrlichia</i>                                                                  | Lachowicz <i>et al.</i> , 2004  |

Table 5: REPORTED INCIDENCE OF *BORRELIA* SPP IN NON-EU EUROPEAN COUNTRIES

| Country            | Reporting             | Tick species | <i>Borrelia</i> spp              |                                                                                                        | References                      |
|--------------------|-----------------------|--------------|----------------------------------|--------------------------------------------------------------------------------------------------------|---------------------------------|
|                    |                       |              | <i>Borrelia</i> species          | Prevalence                                                                                             |                                 |
| Croatia            |                       |              | <i>B. burgordferi</i>            | 4 dogs among 10, 40% <i>B. burgordferi</i>                                                             | Poljak <i>et al.</i> , 2000     |
| Russian Federation | <i>Ixodes</i>         |              |                                  | Cherkessk town, 48 dogs, 320 ticks found                                                               | Novikova, 2005                  |
| Switzerland        |                       |              | <i>B. burgordferi sensu lato</i> |                                                                                                        | Bernasconi <i>et al.</i> , 1997 |
|                    | <i>Ixodes ricinus</i> |              | <i>B. burgordferi</i>            | 874 <i>Ixodes ricinus</i> PCR> <i>B. afzelii</i> , <i>s. l. Garinii</i> , <i>valaisiana Lusitaniae</i> | Casati <i>et al.</i> , 2004     |
|                    |                       |              | <i>B. afzelii</i>                |                                                                                                        | Speck <i>et al.</i> , 2001      |

Table 6: REPORTED INCIDENCE OF *RICKETTSIA* IN EUROPEAN UNION COUNTRIES (EU)

NB – many reports should be treated with a degree of caution due to the difficulties associated with confirmation of diagnosis and the changes in classification.

| Country  | Reporting       | Tick species | <i>Rickettsia</i>         |               | References                |
|----------|-----------------|--------------|---------------------------|---------------|---------------------------|
|          |                 |              | <i>Rickettsia</i> species | Prevalence    |                           |
| Austria  | No report found |              |                           |               |                           |
| Belgium  |                 |              | <i>E. canis</i>           | Imported dogs | Vercammen and Deken, 1996 |
| Bulgaria | No report found |              |                           |               |                           |
| Cyprus   | No report found |              |                           |               |                           |

|                            |                 |  |                                  |                                                                                                         |                                                            |
|----------------------------|-----------------|--|----------------------------------|---------------------------------------------------------------------------------------------------------|------------------------------------------------------------|
| <b>Czech Republic</b>      | No report found |  |                                  |                                                                                                         |                                                            |
| <b>Denmark</b>             |                 |  | <i>Borrelia, Ehrlichia</i>       | Vendsyssel region, 16.7 Borrelia, 5.6% Ehrlichia                                                        | Ostergard, 2000                                            |
| <b>Estonia</b>             | No report found |  |                                  |                                                                                                         |                                                            |
| <b>Finland</b>             |                 |  | <i>E. canis</i>                  |                                                                                                         | Jarvinen and Taponen 1997                                  |
| <b>France</b>              |                 |  | <i>E. canis</i>                  |                                                                                                         | Beaufils <i>et al.</i> , 1990; Sainz <i>et al.</i> , 1998  |
|                            |                 |  | <i>A. platys</i>                 |                                                                                                         | Gothe 1999                                                 |
|                            |                 |  |                                  | Gard region 21 cats seropositive                                                                        | Beaufils <i>et al.</i> , 1999                              |
| <b>Guadeloupe (France)</b> | No report found |  |                                  |                                                                                                         |                                                            |
| <b>Martinique (France)</b> | No report found |  |                                  |                                                                                                         |                                                            |
| <b>Reunion (France)</b>    |                 |  | <i>E. canis, A platys</i> likely | 31%                                                                                                     | Beugnet <i>et al.</i> , 2002 ; Muller <i>et al.</i> , 2004 |
| <b>Germany</b>             |                 |  | <i>E. canis</i>                  |                                                                                                         | Gothe, 1998<br>Gothe, 1999<br>Dongus <i>et al.</i> 1996;   |
|                            |                 |  | <i>A. phagocytophilum</i>        | Antibodies to <i>A. phagocytophilum</i> were found in 563 (50.1%) out of 1124 tested dogs from Germany. | Barutzki <i>et al.</i> , 2006                              |
|                            |                 |  |                                  | 1 cat; 1 dog                                                                                            | Pott-Opitz, 2001; Luckshander <i>et al.</i> , 2003         |

|        |  |                      |                   |                                                                                                                                                                                                                                                                                                                                      |                                                            |
|--------|--|----------------------|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|
|        |  | <i>R.sanguineus</i>  | <i>R.conorii</i>  | Between 1995 and 1998, 60 dogs infected with <i>R.sanguineus</i> and 483 dogs infected with <i>E.canis</i> were detected in Germany. Of 8 <i>R.sanguineus</i> infested and <i>E.canis</i> infected dogs, <i>R.conorii</i> infections could be detected serologically in 3 animals which had been taken either to Italy or to Greece. | Gothe, 1999.                                               |
| Greece |  |                      | <i>E. canis</i>   | 1 dog seropositive for <i>E. hepatozoon</i> , negative for <i>Anaplasma</i> (Thessaloniki)                                                                                                                                                                                                                                           | Mylonakis <i>et al.</i> 2004a                              |
|        |  |                      | <i>E. canis</i>   |                                                                                                                                                                                                                                                                                                                                      | Klag <i>et al.</i> , 1991                                  |
|        |  |                      | <i>A. platys</i>  |                                                                                                                                                                                                                                                                                                                                      | Kontos <i>et al.</i> , 1991<br>Kontos <i>et al.</i> , 1988 |
|        |  | <i>Rhipicephalus</i> | <i>R. conorii</i> | Antibodies to <i>R.conorii</i> were found in 7.9% of residents from northern Greece (n=1584), highest in rural areas. The infection rate of <i>Rhipicephalus</i> ticks collected from domestic animals in the Fokida region of central Greece was shown by PCR to                                                                    | Cocco <i>et al.</i> , 2003; Mannelli <i>et al.</i> , 2003  |

|                |                 |                                 |                                     |                                                                                                                                                                                                                                                     |                                                                                                                                |
|----------------|-----------------|---------------------------------|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|
|                |                 |                                 |                                     | be 1.6%.                                                                                                                                                                                                                                            |                                                                                                                                |
| <b>Hungary</b> | No report found |                                 |                                     |                                                                                                                                                                                                                                                     |                                                                                                                                |
| <b>Ireland</b> | No report found |                                 |                                     |                                                                                                                                                                                                                                                     |                                                                                                                                |
| <b>Italy</b>   |                 | <i>I. ricinus</i><br>widespread | <i>E. canis</i>                     |                                                                                                                                                                                                                                                     | Cuteri <i>et al.</i> 2002                                                                                                      |
|                |                 |                                 | <i>E. canis</i><br><i>A. platys</i> | Seroprevalence for <i>E. canis</i> in Sicily (Southern Italy) of 21.7% (n=342)<br><br>About 50% of seroprevalence for <i>E. canis</i> in Sardinia region<br><br>Reported in central Italy<br><br>85 out of 423 dogs found positive in Puglia region | Paoletti <i>et al.</i> 2004;<br>Torina and Caracappa, 2006;<br>Cocco <i>et al.</i> ,2003<br>Tarello, 2003<br>Buonavoglia, 1995 |
|                |                 |                                 |                                     | Northern Sardinia, 1000 dogs, high seroprevalence with Ehrlichiosis and Rickettsiosis 50% = 500                                                                                                                                                     | Cocco <i>et al.</i> , 2003                                                                                                     |
|                |                 |                                 |                                     | Tuscany 400 blood sera from cats<br><br>(176 from public or private cat keepers/kennels<br><br>224 from private houses and gardens<br><br>50 (12.5%) with positive results                                                                          | Ebani and Andreani, 2002                                                                                                       |

|                    |                 |  |                                              |                                                                                                                                                               |                                 |
|--------------------|-----------------|--|----------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|
|                    |                 |  |                                              | No specific numbers                                                                                                                                           | Sparagano <i>et al.</i> , 2003  |
|                    |                 |  |                                              | 2 among 14 dogs<br>(14,28%)                                                                                                                                   | Martino <i>et al.</i> , 2004    |
|                    |                 |  |                                              | West Sicily 240 out of<br>436 = 55% of ownerless<br>dogs 33 out of 300 =<br>11% of dogs with owners                                                           | Tringali <i>et al.</i> , 2001   |
|                    |                 |  |                                              | Southern Italy, 1 dog                                                                                                                                         | Manna <i>et al.</i> , 2004      |
|                    |                 |  |                                              |                                                                                                                                                               | Moretti <i>et al.</i> , 2004    |
| <b>Latvia</b>      | No report found |  |                                              |                                                                                                                                                               |                                 |
| <b>Lithuania</b>   | No report found |  |                                              |                                                                                                                                                               |                                 |
| <b>Luxembourg</b>  | No report found |  |                                              |                                                                                                                                                               |                                 |
| <b>Malta</b>       |                 |  | <i>E. canis</i> , <i>A. platys</i><br>likely |                                                                                                                                                               |                                 |
| <b>Netherlands</b> |                 |  | <i>E. canis</i> , <i>B. canis</i>            | 75 dogs diagnosed with a<br><i>Babesia canis</i> and/or an<br><i>Ehrlichia canis</i> infection.<br>The majority of the dogs<br>had visited an endemic<br>area | Zandvliet et al., 2004          |
| <b>Poland</b>      |                 |  | <i>E. canis</i>                              |                                                                                                                                                               | Poneczka and Smielewska-os 2003 |
|                    |                 |  | <i>A. phagocytophila</i>                     | Cases of <i>A.</i><br><i>phagocytophila</i> infection<br>in North- western Poland                                                                             | Skotarczak B, 2004a             |
|                    |                 |  |                                              | Northern Poland, 192<br>samples 2 positiv for <i>E.</i><br><i>phagocytophila</i>                                                                              | Skotarczak B, 2004b             |

|                           |                 |  |                                           |                                                                                                                                                                      |                                                                                             |
|---------------------------|-----------------|--|-------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|
| <b>Portugal</b>           |                 |  | <i>E. canis</i>                           | Indirect report Belgium                                                                                                                                              | Vercammen and Deken 1996                                                                    |
|                           |                 |  | <i>E. canis</i>                           | In ticks                                                                                                                                                             | Filipe <i>et al.</i> 1992<br>Bacellar <i>et al.</i> , 1995                                  |
|                           |                 |  | <i>R.conorii</i>                          | Antibodies against <i>R.conorii</i> were detected in dogs from Portugal. 11.5% of 3239 clinical samples tested for rickettsiosis were infected with <i>R.conorii</i> | Nuncio, <i>et al.</i> 1999; Bacellar, <i>et al.</i> 2003                                    |
| <b>Azores (Portugal)</b>  | No report found |  |                                           |                                                                                                                                                                      |                                                                                             |
| <b>Madeira (Portugal)</b> |                 |  | <i>E. canis</i> , <i>A. platys</i> likely | 50% out of 104 dogs tested positive to <i>E. canis</i>                                                                                                               | Bacellar <i>et al.</i> , 1995                                                               |
| <b>Romania</b>            | No report found |  |                                           |                                                                                                                                                                      |                                                                                             |
| <b>Slovakia</b>           |                 |  | <i>I.E. canis</i>                         | East Slovakia, 78 dogs                                                                                                                                               | Letkova <i>et al.</i> 2004                                                                  |
| <b>Slovenia</b>           |                 |  |                                           |                                                                                                                                                                      |                                                                                             |
|                           |                 |  | <i>A. phagocytophila</i>                  | Cases of <i>A. phagocytophila</i> infection                                                                                                                          | Tozon <i>et al.</i> , 2003                                                                  |
|                           |                 |  |                                           |                                                                                                                                                                      | Lakkarwar <i>et al.</i> , 2003                                                              |
| <b>Spain</b>              |                 |  | <i>E. canis</i>                           |                                                                                                                                                                      | Aguirre <i>et al.</i> 2004b; Sainz <i>et al.</i> 1998<br>Solano-Gallego <i>et al.</i> 2006a |
|                           |                 |  | <i>A. platys</i>                          |                                                                                                                                                                      | Sainz <i>et al.</i> 1999                                                                    |
|                           |                 |  |                                           | Northwest, 41 cats (among 235). Seroprevalence 17,9%                                                                                                                 | Ortuno <i>et al.</i> , 2005                                                                 |

|                                     |                 |  |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                               |
|-------------------------------------|-----------------|--|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|
|                                     |                 |  |                      | 122 serological samples<br>10.6%, seropositive with<br>PCR 0%                                                                                                                                                                                                                                                                                                                                                                                                | Aguierre <i>et al.</i> , 2004b                                                |
|                                     |                 |  |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Ainz <i>et al.</i> , 2000                                                     |
|                                     |                 |  |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Camacho <i>et al.</i> , 2003b                                                 |
|                                     |                 |  |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Bayon <i>et al.</i> , 1999                                                    |
|                                     |                 |  | <i>R.conorii</i>     | 206 diseased and 260<br>clinically healthy dogs<br>from 3 different regions<br>of north eastern Spain<br>showed a seroprevalence<br>for <i>R.conorii</i> of 56.4%.<br><br>In Albacete province,<br>88% of patients<br>diagnosed with spotted<br>fever group <i>rickettsiosis</i><br>between<br><br>1997 and 2003 and with<br>positive serological<br>results for <i>R. conorii</i> had<br>regular or recent contact<br>with rural milieu or with<br>animals. | Bartolome,J. <i>et al.</i> 2005<br><br>Solano-Gallego, L. <i>et al.</i> 2006b |
| <b>Balearic Islands<br/>(Spain)</b> |                 |  | <i>Ehrlichia</i> sp. | Novel <i>Ehrlichia</i> reported<br>from Majorca –<br>serological evidence                                                                                                                                                                                                                                                                                                                                                                                    | Solano—Gallego <i>et al.</i> , 2006                                           |
| <b>Canary Islands<br/>(Spain)</b>   | No report found |  |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                               |
| <b>Ceuta (Spain)</b>                | No report found |  |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                               |

|                        |                 |  |  |                                     |                                 |
|------------------------|-----------------|--|--|-------------------------------------|---------------------------------|
| <b>Melilla (Spain)</b> | No report found |  |  |                                     |                                 |
| <b>Sweden</b>          |                 |  |  | Seroprevalence 17,7% among 611 dogs | Egenvall <i>et al.</i> , 2000   |
|                        |                 |  |  | Diagnosed at regular intervals      | Engvall and Egenvall, 2002      |
|                        |                 |  |  |                                     | Bjoerdorff <i>et al.</i> , 1999 |
| <b>UK</b>              |                 |  |  | 1 case of a dog imported from Italy | Gould <i>et al.</i> , 2000      |
|                        |                 |  |  | No abstract available               | Shaw <i>et al.</i> , 2001       |
|                        |                 |  |  | 1 dog                               | Lachowicz <i>et al.</i> , 2004  |
| <b>Gibraltar (UK)</b>  | No report found |  |  |                                     |                                 |

Table 7: REPORTED INCIDENCE OF *RICKETTSIA* IN NON-EU EUROPEAN COUNTRIES

| Country                   | Reporting       | Tick species | <i>Rickettsia</i>         |                                                                                                                                             | References                       |
|---------------------------|-----------------|--------------|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|
|                           |                 |              | <i>Rickettsia</i> species | Prevalence                                                                                                                                  |                                  |
| <b>Andorra</b>            | No report found |              |                           |                                                                                                                                             |                                  |
| <b>Belarus</b>            | No report found |              |                           |                                                                                                                                             |                                  |
| <b>Bosnia-Herzegovina</b> |                 |              | <i>R. conorii</i>         | 1.6 % of sera (n=231) tested positive                                                                                                       | Punda-Polic <i>et al.</i> , 1995 |
| <b>Croatia</b>            |                 |              |                           |                                                                                                                                             | Ramprabhu <i>et al.</i> , 2001   |
|                           |                 |              | <i>R. rickettsii</i>      | A study carried out during 1998-1999 in eastern Croatia found that out of 102 subjects with a history of tick bite, 8 were seropositive for | Topolovec <i>et al.</i> 2003     |

|                           |                 |  |                        |                                                                                      |                                                                |
|---------------------------|-----------------|--|------------------------|--------------------------------------------------------------------------------------|----------------------------------------------------------------|
|                           |                 |  |                        | <i>rickettsiae</i> spp., with high titres of antibodies against <i>R. rickettsii</i> |                                                                |
| <b>Liechtenstein</b>      | No report found |  |                        |                                                                                      |                                                                |
| <b>Monaco</b>             | No report found |  |                        |                                                                                      |                                                                |
| <b>Norway</b>             | No report found |  |                        |                                                                                      |                                                                |
| <b>Russian Federation</b> | No report found |  |                        |                                                                                      |                                                                |
| <b>San Marino</b>         | No report found |  |                        |                                                                                      |                                                                |
| <b>Switzerland</b>        |                 |  | <i>E. canis</i>        | Twenty-two of 996 (2.2%) serum samples had antibodies to <i>E. canis</i>             | Pusterla <i>et al.</i> , 1998                                  |
|                           |                 |  | <i>Ehrlichia canis</i> |                                                                                      | Rambprabhu <i>et al.</i> , 2001; Pusterla <i>et al.</i> , 2000 |
| <b>Vatican</b>            | No report found |  |                        |                                                                                      |                                                                |

Table 8: REPORTED INCIDENCE OF *RICKETTSIA* IN LISTED COUNTRIES (please see the definition of listed countries)

| Country          | Reporting       | Tick species | <i>Rickettsia</i>         |                                                                   | References                                                   |
|------------------|-----------------|--------------|---------------------------|-------------------------------------------------------------------|--------------------------------------------------------------|
|                  |                 |              | <i>Rickettsia</i> species | Prevalence                                                        |                                                              |
| <b>Canada</b>    |                 |              | <i>E. canis</i>           |                                                                   | Firneisz <i>et al.</i> , 1990                                |
|                  |                 |              | <i>A. phagocytophilum</i> | 1 dog infected by <i>A. phagocytophilum</i> from Vancouver Island | Lester <i>et al.</i> , 2005                                  |
| <b>Greenland</b> | No report found |              |                           |                                                                   |                                                              |
| <b>USA</b>       |                 |              | <i>E. canis</i>           | North Carolina – all 4 species                                    | Magnarelli <i>et al.</i> , 1995; Seaman <i>et al.</i> , 2004 |

|  |  |  |                                            |                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                            |
|--|--|--|--------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
|  |  |  | <i>E. ewingii</i>                          | Texas                                                                                                                                                                                                                                                                                                                                                        | Long <i>et al.</i> , 2004                                                                                                                  |
|  |  |  | <i>E. ewingii</i><br><i>E. chaffeensis</i> | Georgia, Missouri                                                                                                                                                                                                                                                                                                                                            | Long <i>et al.</i> , 2004; Varela <i>et al.</i> , 2004; Steiert and Gilfoy, 2002; Liddel <i>et al.</i> , 2003; Mixson <i>et al.</i> , 2004 |
|  |  |  | <i>A. platys</i>                           | Oklahoma, North Carolina                                                                                                                                                                                                                                                                                                                                     | Kordick <i>et al.</i> , 1999; Mathew <i>et al.</i> , 1997;Bradfield <i>et al.</i> , 1996                                                   |
|  |  |  | <i>A. phagocytophylum</i>                  | Whashington State                                                                                                                                                                                                                                                                                                                                            | Poitout <i>et al.</i> , 2005                                                                                                               |
|  |  |  | <i>R. rickettsii</i> ,                     | 31.3% of dogs from animal shelters and veterinary hospitals in Rhode Island were seropositive for <i>R. rickettsii</i> . This was shown not to be associated with the distribution of deer ticks. 27 sick Walker Hounds in North Carolina were investigated for evidence of tick-borne infections: of the 27 dogs, 22 seroreactive to <i>R. rickettsii</i> . | Hinrichsen <i>et al.</i> , 2001; Kordick <i>et al.</i> , 1999                                                                              |
|  |  |  | <i>R. rickettsii</i> ,                     | 17.2% of cats from private homes, feral cat colonies and animal shelters in California and Wisconsin were seropositive for <i>R. rickettsii</i> (n=170)                                                                                                                                                                                                      | Case <i>et al.</i> , 2006                                                                                                                  |

|                             |                 |  |                      |                                                                                                                                                                                                                                                                                                                                |                                |
|-----------------------------|-----------------|--|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|
| <b>Aruba (Netherlands)</b>  | No report found |  |                      |                                                                                                                                                                                                                                                                                                                                |                                |
| <b>Antigua and Barbuda</b>  | No report found |  |                      |                                                                                                                                                                                                                                                                                                                                |                                |
| <b>Barbados</b>             | No report found |  |                      |                                                                                                                                                                                                                                                                                                                                |                                |
| <b>Bermuda</b>              | No report found |  |                      |                                                                                                                                                                                                                                                                                                                                |                                |
| <b>Cayman Islands</b>       | No report found |  |                      |                                                                                                                                                                                                                                                                                                                                |                                |
| <b>Grenadines</b>           | No report found |  |                      |                                                                                                                                                                                                                                                                                                                                |                                |
| <b>Jamaica</b>              | No report found |  |                      |                                                                                                                                                                                                                                                                                                                                |                                |
| <b>Montserrat (UK)</b>      | No report found |  |                      |                                                                                                                                                                                                                                                                                                                                |                                |
| <b>NetherlandsAntilles</b>  |                 |  | <i>E. canis</i>      |                                                                                                                                                                                                                                                                                                                                | Zandvliet <i>et al.</i> , 2004 |
| <b>St Kitts &amp; Nevis</b> | No report found |  |                      |                                                                                                                                                                                                                                                                                                                                |                                |
| <b>St Vincent</b>           | No report found |  |                      |                                                                                                                                                                                                                                                                                                                                |                                |
| <b>Trinidad and Tobago</b>  | No report found |  |                      |                                                                                                                                                                                                                                                                                                                                |                                |
| <b>Argentina</b>            |                 |  | <i>R. rickettsii</i> | Between 1993 and 1994, 4 patients of 105 healthy subjects living in proximity to patient(s) with spotted fever group rickettsial infection were seropositive with <i>R. rickettsii</i> . <i>Amblyomma cajennense</i> , a known vector of <i>R. rickettsii</i> in South America, was collected from pets and horses in the area | Ripoll <i>et al.</i> , 1999    |

|                               |                 |  |                                  |                              |                                                                             |
|-------------------------------|-----------------|--|----------------------------------|------------------------------|-----------------------------------------------------------------------------|
| <b>Chile</b>                  |                 |  | <i>E. canis</i>                  |                              | Lopez <i>et al.</i> , 1999                                                  |
| <b>Falkland Islands</b>       | No report found |  |                                  |                              |                                                                             |
| <b>Mexico</b>                 |                 |  | <i>E. canis</i>                  | Indirect report from Belgium | Vercammen and Deken, 1996                                                   |
|                               |                 |  | <i>E. canis</i>                  | Yucatan                      | Rodriguez-Vivas <i>et al.</i> , 2005                                        |
| <b>Australia</b>              |                 |  | <i>A. platys</i>                 |                              | Brown <i>et al.</i> , 2001                                                  |
| <b>New Zealand</b>            | No report found |  |                                  |                              |                                                                             |
| <b>Bahrain</b>                | No report found |  |                                  |                              |                                                                             |
| <b>Hong Kong</b>              | No report found |  |                                  |                              |                                                                             |
| <b>Japan</b>                  |                 |  | <i>E. canis</i>                  |                              | Watanabe <i>et al.</i> , 2004; Suto <i>et al.</i> , 2001                    |
|                               |                 |  | <i>A. platys</i>                 |                              | Inokuma <i>et al.</i> , 2002 ; Inokuma <i>et al.</i> , 2003b                |
| <b>Singapore</b>              | No report found |  |                                  |                              |                                                                             |
| <b>Taiwan</b>                 |                 |  | <i>E. canis</i> <i>A. platys</i> |                              | Chen YenPing and Huang Huipei, 2003;<br>Cheng FengPang <i>et al.</i> , 2004 |
| <b>United Arab Emirates</b>   | No report found |  |                                  |                              |                                                                             |
| <b>Ascension Island (UK)</b>  | No report found |  |                                  |                              |                                                                             |
| <b>Faroe Islands (DK)</b>     | No report found |  |                                  |                              |                                                                             |
| <b>Fiji</b>                   | No report found |  |                                  |                              |                                                                             |
| <b>French Guiana (France)</b> | No report found |  |                                  |                              |                                                                             |
| <b>French Polynesia</b>       | No report found |  |                                  |                              |                                                                             |
| <b>Guam</b>                   | No report found |  |                                  |                              |                                                                             |

|                                 |                 |  |  |  |  |
|---------------------------------|-----------------|--|--|--|--|
| <b>Iceland</b>                  | No report found |  |  |  |  |
| <b>Mauritius</b>                |                 |  |  |  |  |
| <b>Mayotte</b>                  | No report found |  |  |  |  |
| <b>New Caledonia (France)</b>   | No report found |  |  |  |  |
| <b>St Helena</b>                | No report found |  |  |  |  |
| <b>St Pierre &amp; Miquelon</b> | No report found |  |  |  |  |
| <b>Vanuatu</b>                  | No report found |  |  |  |  |
| <b>Wallis &amp; Futuna</b>      | No report found |  |  |  |  |

Table 9: REPORTED INCIDENCE OF HEPATOZOONOSIS IN EUROPEAN UNION COUNTRIES (EU)

| Country               | Reporting       | Tick species                    | Hepatozoonosis            |            | References |
|-----------------------|-----------------|---------------------------------|---------------------------|------------|------------|
|                       |                 |                                 | <i>Hepatozoon</i> species | Prevalence |            |
| <b>Austria</b>        | No report found |                                 |                           |            |            |
| <b>Belgium</b>        | No report found | <i>Rhipicephalus sanguineus</i> |                           |            |            |
| <b>Bulgaria</b>       | No report found |                                 |                           |            |            |
| <b>Cyprus</b>         | No report found |                                 |                           |            |            |
| <b>Czech Republic</b> | No report found |                                 |                           |            |            |
| <b>Denmark</b>        | No report found |                                 |                           |            |            |
| <b>Estonia</b>        | No report found |                                 |                           |            |            |
| <b>Finland</b>        | No report found |                                 |                           |            |            |

|                            |                 |                                 |                                    |  |                                                             |
|----------------------------|-----------------|---------------------------------|------------------------------------|--|-------------------------------------------------------------|
| <b>France</b>              |                 | <i>Rhipicephalus sanguineus</i> | <i>H. canis</i>                    |  | Beaufils <i>et al.</i> , 1996                               |
| <b>Guadeloupe (France)</b> | No report found |                                 |                                    |  |                                                             |
| <b>Martinique (France)</b> | No report found |                                 |                                    |  |                                                             |
| <b>Reunion (France)</b>    | No report found |                                 |                                    |  |                                                             |
| <b>Germany</b>             |                 | <i>R. sanguineus</i>            | <i>H. cani</i><br>in imported dogs |  | Deinert <i>et al.</i> , 1997<br>Arnold <i>et al.</i> , 1998 |
| <b>Greece</b>              |                 | <i>Rhipicephalus sanguineus</i> | <i>H. canis</i>                    |  | Mylonakis <i>et al.</i> , 2004                              |
| <b>Hungary</b>             | No report found |                                 |                                    |  |                                                             |
| <b>Ireland</b>             | No report found |                                 |                                    |  |                                                             |
| <b>Italy</b>               |                 | <i>Rhipicephalus sanguineus</i> | <i>H. canis</i>                    |  | Tarello, 2006                                               |
| <b>Latvia</b>              | No report found |                                 |                                    |  |                                                             |
| <b>Lithuania</b>           | No report found |                                 |                                    |  |                                                             |
| <b>Luxembourg</b>          | No report found |                                 |                                    |  |                                                             |
| <b>Madeira (Portugal)</b>  | No report found |                                 |                                    |  |                                                             |
| <b>Malta</b>               | No report found |                                 |                                    |  |                                                             |
| <b>Netherlands</b>         | No report found |                                 |                                    |  |                                                             |
| <b>Poland</b>              | No report found |                                 |                                    |  |                                                             |
| <b>Portugal</b>            |                 |                                 | <i>H. canis</i>                    |  | Silva and Correia, 1998                                     |
| <b>Azores</b>              | No report found |                                 |                                    |  |                                                             |

|                                 |                 |                                 |                 |  |                                                                                 |
|---------------------------------|-----------------|---------------------------------|-----------------|--|---------------------------------------------------------------------------------|
| <b>(Portugal)</b>               |                 |                                 |                 |  |                                                                                 |
| <b>Madeira (Portugal)</b>       | No report found |                                 |                 |  |                                                                                 |
| <b>Romania</b>                  | No report found |                                 |                 |  |                                                                                 |
| <b>Slovakia</b>                 | No report found |                                 |                 |  |                                                                                 |
| <b>Slovenia</b>                 | No report found |                                 |                 |  |                                                                                 |
| <b>Spain</b>                    |                 | <i>Rhipicephalus sanguineus</i> | <i>H. canis</i> |  | Criado-Fornelio <i>et al.</i> , 2003a;<br>Criado-Fornelio <i>et al.</i> , 2003b |
| <b>Balearic Islands (Spain)</b> | No report found |                                 |                 |  |                                                                                 |
| <b>Canary Islands (Spain)</b>   |                 |                                 | <i>H. canis</i> |  | Stenzenberger and Gothe, 1999                                                   |
| <b>Ceuta (Spain)</b>            | No report found |                                 |                 |  |                                                                                 |
| <b>Melilla (Spain)</b>          | No report found |                                 |                 |  |                                                                                 |
| <b>Sweden</b>                   | No report found |                                 |                 |  |                                                                                 |
| <b>UK</b>                       | No report found |                                 |                 |  |                                                                                 |
| <b>Gibraltar (UK)</b>           | No report found |                                 |                 |  |                                                                                 |

Table 10: **REPORTED INCIDENCE OF HEPATOZOONOSIS IN NON-EU EUROPEAN COUNTRIES**

| <b>Country</b> | <b>Reporting</b> | <b>Tick species</b> | <b>Hepatozoonosis</b>               |                   | <b>References</b> |
|----------------|------------------|---------------------|-------------------------------------|-------------------|-------------------|
|                |                  |                     | <i>Hepatozoon</i><br><b>species</b> | <b>Prevalence</b> |                   |
| <b>Andorra</b> | No report found  |                     |                                     |                   |                   |
| <b>Belarus</b> | No report found  |                     |                                     |                   |                   |

|                           |                 |  |  |  |  |
|---------------------------|-----------------|--|--|--|--|
| <b>Bosnia-Herzegovina</b> | No report found |  |  |  |  |
| <b>Croatia</b>            | No report found |  |  |  |  |
| <b>Liechtenstein</b>      | No report found |  |  |  |  |
| <b>Monaco</b>             | No report found |  |  |  |  |
| <b>Norway</b>             | No report found |  |  |  |  |
| <b>Russian Federation</b> | No report found |  |  |  |  |
| <b>San Marino</b>         | No report found |  |  |  |  |
| <b>Switzerland</b>        | No report found |  |  |  |  |
| <b>Vatican</b>            | No report found |  |  |  |  |

Table 11: REPORTED INCIDENCE OF HEPATOZOONOSIS IN LISTED COUNTRIES

| Country          | Reporting       | Tick species | Hepatozoonosis            |                                                                                                                         | References                                                                                                     |
|------------------|-----------------|--------------|---------------------------|-------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|
|                  |                 |              | <i>Hepatozoon</i> species | Prevalence                                                                                                              |                                                                                                                |
| <b>Canada</b>    | No report found |              |                           |                                                                                                                         |                                                                                                                |
| <b>Greenland</b> | No report found |              |                           |                                                                                                                         |                                                                                                                |
| <b>USA</b>       |                 |              | <i>H. americanum</i>      | Emerging disease. Texas, now spreading north and east into Louisiana, Alabama, Oklahoma, Georgia, Tennessee and Florida | Vincent-Johnson <i>et al.</i> , 1997; Baneth, 2001; Ewing and Panciera, 2003; Baneth and Vincent-Johnson, 2005 |
| <b>Aruba</b>     | No report found |              |                           |                                                                                                                         |                                                                                                                |

|                             |                 |                                 |                 |  |                            |
|-----------------------------|-----------------|---------------------------------|-----------------|--|----------------------------|
| <b>(Netherlands)</b>        |                 |                                 |                 |  |                            |
| <b>Antigua and Barbuda</b>  | No report found |                                 |                 |  |                            |
| <b>Barbados</b>             | No report found |                                 |                 |  |                            |
| <b>Bermuda</b>              | No report found |                                 |                 |  |                            |
| <b>Cayman Islands</b>       | No report found |                                 |                 |  |                            |
| <b>Grenadines</b>           | No report found |                                 |                 |  |                            |
| <b>Jamaica</b>              | No report found |                                 |                 |  |                            |
| <b>Montserrat (UK)</b>      | No report found |                                 |                 |  |                            |
| <b>Netherlands Antilles</b> | No report found |                                 |                 |  |                            |
| <b>St Kitts &amp; Nevis</b> | No report found |                                 |                 |  |                            |
| <b>St Vincent</b>           | No report found |                                 |                 |  |                            |
| <b>Trinidad and Tobago</b>  | No report found |                                 |                 |  |                            |
| <b>Argentina</b>            |                 | <i>Rhipicephalus sanguineus</i> | <i>H. canis</i> |  | Silva <i>et al.</i> , 1999 |
| <b>Chile</b>                | No report found |                                 |                 |  |                            |
| <b>Falkland Islands</b>     | No report found |                                 |                 |  |                            |
| <b>Mexico</b>               | No report found |                                 |                 |  |                            |
| <b>Australia</b>            |                 |                                 |                 |  |                            |
| <b>New Zealand</b>          |                 |                                 |                 |  |                            |

|                               |                 |                                 |                 |  |                                                          |
|-------------------------------|-----------------|---------------------------------|-----------------|--|----------------------------------------------------------|
| <b>Bahrain</b>                | No report found |                                 |                 |  |                                                          |
| <b>Hong Kong</b>              | No report found |                                 |                 |  |                                                          |
| <b>Japan</b>                  |                 | <i>Rhipicephalus sanguineus</i> | <i>H. canis</i> |  | Murata <i>et al.</i> , 1991; Murata <i>et al.</i> , 1993 |
| <b>Singapore</b>              | No report found |                                 |                 |  |                                                          |
| <b>Taiwan</b>                 | No report found |                                 |                 |  |                                                          |
| <b>United Arab Emirates</b>   | No report found |                                 |                 |  |                                                          |
| <b>Ascension Island (UK)</b>  | No report found |                                 |                 |  |                                                          |
| <b>Faroe Islands</b>          | No report found |                                 |                 |  |                                                          |
| <b>Fiji</b>                   | No report found |                                 |                 |  |                                                          |
| <b>French Guiana (France)</b> | No report found |                                 |                 |  |                                                          |
| <b>French Polynesia</b>       | No report found |                                 |                 |  |                                                          |
| <b>Guam</b>                   | No report found |                                 |                 |  |                                                          |
| <b>Iceland</b>                | No report found |                                 |                 |  |                                                          |
| <b>Mauritius</b>              | No report found |                                 |                 |  |                                                          |
| <b>Mayotte</b>                | No report found |                                 |                 |  |                                                          |
| <b>New Caledonia (France)</b> | No report found |                                 |                 |  |                                                          |
| <b>St Helena</b>              | No report found |                                 |                 |  |                                                          |
| <b>St Pierre &amp;</b>        | No report found |                                 |                 |  |                                                          |

|                            |                 |  |  |  |  |
|----------------------------|-----------------|--|--|--|--|
| <b>Miquelon</b>            |                 |  |  |  |  |
| <b>Vanuatu</b>             | No report found |  |  |  |  |
| <b>Wallis &amp; Futuna</b> | No report found |  |  |  |  |

Table 12: **REPORTED INCIDENCE OF TBE IN EUROPEAN UNION COUNTRIES (EU)**

\*INTERNATIONAL SCIENTIFIC WORKING GROUP ON TBE. ISW-TBE (2006) Management of Tick-borne Encephalitis. Compendium of Scientific Literature 2006. Accessed via [http://www.tbe-info.com/tbe.aspx\\_param\\_target\\_is\\_51401\\_and\\_1\\_is\\_2.v.aspx](http://www.tbe-info.com/tbe.aspx_param_target_is_51401_and_1_is_2.v.aspx) on 27 April 2006.

| Country                    | Reporting       | Tick species | TBE                |                        | References*  |
|----------------------------|-----------------|--------------|--------------------|------------------------|--------------|
|                            |                 |              | TBE pathogen agent | Prevalence             |              |
| <b>Austria</b>             |                 |              |                    | COMMON                 | ISW-TBE 2006 |
| <b>Belgium</b>             | No report found |              |                    |                        |              |
| <b>Bulgaria</b>            |                 |              |                    | RARE                   | ISW-TBE 2006 |
| <b>Cyprus</b>              | No report found |              |                    |                        |              |
| <b>Czech Republic</b>      |                 |              |                    | COMMON                 | ISW-TBE 2006 |
| <b>Denmark</b>             |                 |              |                    | COMMON Bornholm Island | ISW-TBE 2006 |
| <b>Estonia</b>             |                 |              |                    | COMMON                 | ISW-TBE 2006 |
| <b>Finland</b>             |                 |              |                    | COMMON SW Coast        | ISW-TBE 2006 |
| <b>France</b>              |                 |              |                    | COMMON                 | ISW-TBE 2006 |
| <b>Guadeloupe (France)</b> | No report found |              |                    |                        |              |
| <b>Martinique (France)</b> | No report found |              |                    | COMMON                 | ISW-TBE 2006 |

|                                 |                 |  |  |        |              |
|---------------------------------|-----------------|--|--|--------|--------------|
| <b>Reunion (France)</b>         | No report found |  |  |        |              |
| <b>Germany</b>                  |                 |  |  | COMMON | ISW-TBE 2006 |
| <b>Greece</b>                   |                 |  |  | RARE   | ISW-TBE 2006 |
| <b>Hungary</b>                  |                 |  |  | COMMON | ISW-TBE 2006 |
| <b>Ireland</b>                  | No report found |  |  |        |              |
| <b>Italy</b>                    |                 |  |  | RARE   | ISW-TBE 2006 |
| <b>Latvia</b>                   |                 |  |  | COMMON | ISW-TBE 2006 |
| <b>Lithuania</b>                |                 |  |  | COMMON | ISW-TBE 2006 |
| <b>Luxembourg</b>               | No report found |  |  |        |              |
| <b>Malta</b>                    | No report found |  |  |        |              |
| <b>Netherlands</b>              | No report found |  |  |        |              |
| <b>Poland</b>                   |                 |  |  | COMMON | ISW-TBE 2006 |
| <b>Portugal</b>                 | No report found |  |  |        |              |
| <b>Azores (Portugal)</b>        | No report found |  |  |        |              |
| <b>Madeira (Portugal)</b>       | No report found |  |  |        |              |
| <b>Romania</b>                  |                 |  |  | RARE   | ISW-TBE 2006 |
| <b>Slovakia</b>                 |                 |  |  | COMMON | ISW-TBE 2006 |
| <b>Slovenia</b>                 |                 |  |  | COMMON | ISW-TBE 2006 |
| <b>Spain</b>                    | No report found |  |  |        |              |
| <b>Balearic Islands (Spain)</b> | No report found |  |  |        |              |

|                               |                 |  |  |        |              |
|-------------------------------|-----------------|--|--|--------|--------------|
| <b>Canary Islands (Spain)</b> | No report found |  |  |        |              |
| <b>Ceuta (Spain)</b>          | No report found |  |  |        |              |
| <b>Melilla (Spain)</b>        | No report found |  |  |        |              |
| <b>Sweden</b>                 |                 |  |  | COMMON | ISW-TBE 2006 |
| <b>UK</b>                     | No report found |  |  |        |              |
| <b>Gibraltar (UK)</b>         | No report found |  |  |        |              |

Table 13: **REPORTED INCIDENCE OF TBE IN NON-EU EUROPEAN COUNTRIES**

| Country                   | Reporting       | Tick species | TBE                |            | References*  |
|---------------------------|-----------------|--------------|--------------------|------------|--------------|
|                           |                 |              | TBE pathogen agent | Prevalence |              |
| <b>Andorra</b>            | No report found |              |                    |            |              |
| <b>Belarus</b>            |                 |              |                    | COMMON     | ISW-TBE 2006 |
| <b>Bosnia-Herzegovina</b> |                 |              |                    |            |              |
| <b>Croatia</b>            |                 |              |                    | COMMON     | ISW-TBE 2006 |
| <b>Liechtenstein</b>      |                 |              |                    | COMMON     | ISW-TBE 2006 |
| <b>Monaco</b>             | No report found |              |                    |            |              |
| <b>Norway</b>             |                 |              |                    | RARE       | ISW-TBE 2006 |
| <b>Russian Federation</b> |                 |              |                    | COMMON     | ISW-TBE 2006 |
| <b>San Marino</b>         | No report found |              |                    |            |              |
| <b>Switzerland</b>        |                 |              |                    | COMMON     | ISW-TBE 2006 |

|                |                 |  |  |  |  |
|----------------|-----------------|--|--|--|--|
| <b>Vatican</b> | No report found |  |  |  |  |
|----------------|-----------------|--|--|--|--|

Table 14: **REPORTED INCIDENCE OF TBE IN LISTED COUNTRIES** (Please see the definition of listed countries)

| <b>Country</b>                  | <b>Reporting</b> | <b>Tick species</b> | <b>TBE</b>                |                   | <b>References*</b> |
|---------------------------------|------------------|---------------------|---------------------------|-------------------|--------------------|
|                                 |                  |                     | <b>TBE pathogen agent</b> | <b>Prevalence</b> |                    |
| <b>Canada</b>                   | No report found  |                     |                           |                   |                    |
| <b>Greenland</b>                | No report found  |                     |                           |                   |                    |
| <b>USA</b>                      | No report found  |                     |                           |                   |                    |
| <b>Aruba<br/>(Netherlands)</b>  | No report found  |                     |                           |                   |                    |
| <b>Antigua and<br/>Barbuda</b>  | No report found  |                     |                           |                   |                    |
| <b>Barbados</b>                 | No report found  |                     |                           |                   |                    |
| <b>Bermuda</b>                  | No report found  |                     |                           |                   |                    |
| <b>Cayman Islands</b>           | No report found  |                     |                           |                   |                    |
| <b>Grenadines</b>               | No report found  |                     |                           |                   |                    |
| <b>Jamaica</b>                  | No report found  |                     |                           |                   |                    |
| <b>Montserrat<br/>(UK)</b>      | No report found  |                     |                           |                   |                    |
| <b>Netherlands<br/>Antilles</b> | No report found  |                     |                           |                   |                    |
| <b>St Kitts &amp; Nevis</b>     | No report found  |                     |                           |                   |                    |
| <b>St Vincent</b>               | No report found  |                     |                           |                   |                    |
| <b>Trinidad and</b>             | No report found  |                     |                           |                   |                    |

|                               |                 |  |  |      |              |
|-------------------------------|-----------------|--|--|------|--------------|
| <b>Tobago</b>                 |                 |  |  |      |              |
| <b>Argentina</b>              | No report found |  |  |      |              |
| <b>Chile</b>                  | No report found |  |  |      |              |
| <b>Falkland Islands</b>       | No report found |  |  |      |              |
| <b>Mexico</b>                 | No report found |  |  |      |              |
| <b>Australia</b>              | No report found |  |  |      |              |
| <b>New Zealand</b>            | No report found |  |  |      |              |
| <b>Bahrain</b>                | No report found |  |  |      |              |
| <b>Hong Kong</b>              | No report found |  |  |      |              |
| <b>Japan</b>                  |                 |  |  | RARE | ISW-TBE 2006 |
| <b>Singapore</b>              | No report found |  |  |      |              |
| <b>Taiwan</b>                 | No report found |  |  |      |              |
| <b>United Arab Emirates</b>   | No report found |  |  |      |              |
| <b>Ascension Island (UK)</b>  | No report found |  |  |      |              |
| <b>Faroe Islands</b>          | No report found |  |  |      |              |
| <b>Fiji</b>                   | No report found |  |  |      |              |
| <b>French Guiana (France)</b> | No report found |  |  |      |              |
| <b>French Polynesia</b>       | No report found |  |  |      |              |
| <b>Guam</b>                   | No report found |  |  |      |              |
| <b>Iceland</b>                | No report found |  |  |      |              |
| <b>Mauritius</b>              | No report found |  |  |      |              |

|                                     |                 |  |  |  |  |
|-------------------------------------|-----------------|--|--|--|--|
| <b>Mayotte</b>                      | No report found |  |  |  |  |
| <b>New Caledonia<br/>(France)</b>   | No report found |  |  |  |  |
| <b>St Helena</b>                    | No report found |  |  |  |  |
| <b>St Pierre &amp;<br/>Miquelon</b> | No report found |  |  |  |  |
| <b>Vanuatu</b>                      | No report found |  |  |  |  |
| <b>Wallis &amp;<br/>Futuna</b>      | No report found |  |  |  |  |

### **ANNEX III**

*Adapted from rRecords from the dataset Ticks (Ixodoidea) distribution for the British Isles provided by Biological Records Centre\**

<http://www.searchnbn.net/interactive/info.jsp> Accessed 26 January 2007

\*Biological Records Centre CEH Monks Wood, Abbots Ripton, Huntingdon, Cambridgeshire, Source: Museum

Compiler: Martyn, K. P

| <b>Site name</b>                         | <b>Date Recorded</b> | <b>Determiner</b> | <b>VICECOUNTY</b> | <b>SPECIES</b> | <b>COMMENTS</b>                | <b>ASSOC NAME</b> | <b>ASSOC SPECIES</b> |
|------------------------------------------|----------------------|-------------------|-------------------|----------------|--------------------------------|-------------------|----------------------|
| Belfast                                  | 1981                 | Martyn, K.P.      | Down              | 6709 4401      | On dog imported from Australia | Canis (domestic)  | 9720 203             |
| Holborn                                  | November, 1963       | Varma, Dr M.      | Middlesex         | 6709 4401      | In house                       |                   |                      |
| Corby                                    | 1974                 | Hyatt, K.H.       | Northamptonshire  | 6709 4401      | On dogs                        | Canis (domestic)  | 9720 203             |
| Islington                                | September, 1983      | Martyn, K.P.      | Middlesex         | 6709 4401      | On girl                        | Homo sapiens      | 9714 401             |
| Clapham                                  | 7/10/1980            | Barnett, S.F.     | Surrey            | 6709 4401      | Dog                            | Canis (domestic)  | 9720 203             |
| Stormont                                 | 17/9/1968            | Barnett, S.F.     | Down              | 6709 4401      | Dog                            | Canis (domestic)  | 9720 203             |
| Bedford Zoo                              | 16/5/1967            | Barnett, S.F.     | Bedfordshire      | 6709 4401      | Ostrich                        |                   |                      |
| Earls Court, Kensington Church Street nr | July, 1983           | Martyn, K.P.      | Surrey            | 6709 4401      | Dog                            | Canis (domestic)  | 9720 203             |
| Wrexham                                  | December, 1912       | Anon.             | Denbighshire      | 6709 4401      | Dog                            | Canis (domestic)  | 9720 203             |

|                        |                |              |                 |           |                                                 |                  |          |
|------------------------|----------------|--------------|-----------------|-----------|-------------------------------------------------|------------------|----------|
| Wrexham,<br>Brymbo nr  | 22/3/1913      | Anon.        | Flintshire      | 6709 4401 | Dog                                             | Canis (domestic) | 9720 203 |
| Southampton            | 7/4/1936       | Anon.        | South Hampshire | 6709 4401 | Found in furniture                              |                  |          |
| Knightsbridge          | 6/4/1936       | Anon.        | Surrey          | 6709 4401 | In bedding and furniture from Italy             |                  |          |
| London,<br>Fulham Road | 24/12/1935     | Anon.        | Surrey          | 6709 4401 | In furniture from Rome,collector lived in Italy |                  |          |
| Ruislip                | 11/9/1967      | Hyatt, K.H.  | Middlesex       | 6709 4401 | On dog                                          | Canis (domestic) | 9720 203 |
| Ipswich                | 27/2/1976      | Hyatt, K.H.  | East Suffolk    | 6709 4401 | On human                                        | Homo sapiens     | 9714 401 |
| Brighton               | February, 1977 | Brewster, B. | East Sussex     | 6709 4401 | On dog                                          | Canis (domestic) | 9720 203 |

Assotype: Host

Status: unknown