Absence of *Babesia gibsoni* in New Zealand dogs

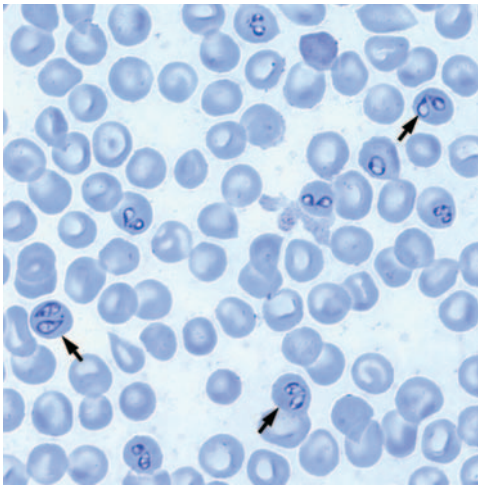
Babesia gibsoni is a tickborne blood parasite of wild and domestic dogs. There was no evidence of infection in a targeted survey of 155 New Zealand dogs.

Canine babesidae have historically been classified as 'large babesia' (*Babesia canis* spp) and 'small babesia' (Babesia gibsoni) based on the size of their intraerythrocyte forms[1][2]. Genetic sequencing technology using the polymerase chain reaction (PCR) has allowed further subdivision[1][2][3][4].

Babesia canis is subdivided into three subtypes or strains: *Babesia canis rossi* (Southern Africa; extremely virulent), *Babesia canis canis* (Europe; less virulent) and *Babesia canis volgeli* (Northern Africa, North America and Australia; low virulence).

Babesia gibsoni has three strains: 'Asia', 'California' and a recently identified small babesia endemic in northwest Spain. *Babesia gibsoni* (Asia) is the most widespread, occurring in Japan, Sri Lanka, Malaysia, the midwest and eastern United States of America, and Australia[1][2][5][6][7][8]. Infection is most common in fighting dogs such as American Pit Bull terriers and American Staffordshire terriers[5][7][9][10][11]. *Babesia gibsoni* (Asia) was confirmed in Australia only recently, in three American Pit Bull terriers belonging to the same owner at a single premise in Victoria[8]. No direct epidemiological link with imported dogs has been found, suggesting that the disease is endemic.

Babesia gibsoni (California) is endemic in California[1][12][13]. It is epidemiologically and genotypically distinctive but closely related to babesia isolated from wildlife and humans from the western United States[1][4][14].



Babesia canis parasitising red blood cells in a blood smear from an infected dog

A small canine babesia that is more closely linked phylogenetically to *B microti*[2] than to *B gibsoni* has been found to be endemic in northwest Spain[15]. *Babesia microti* is a small babesia with a host range primarily in rodents but it is also an important zoonosis in the eastern United States[1][15]. Greatest sequence similarity was found to the genus *Theileria* (which causes lymphoproliferative disease in African and Eurasian cattle) and the name *T annae* has been proposed[2].

Transmission

Babesia gibsoni is transmitted by ticks and direct transmission via blood may occur. New Zealand has only one endemic tick, *Haemaphysalis longicornis,* and this can transmit the parasite. *Haemaphysalis longicornis* occurs mainly in the North Island but substantial numbers have recently been found in areas in the South Island. Primarily a tick of cattle and deer, it has been recorded on a variety of other animals in New Zealand, including dogs, sheep, hedgehog, human, hare, rabbit, black rat, Norway rat, mouse, stoat, weasel, cat, donkey, horse, pig, ferret, possum, goat, sheep and yak[16].

There is a strong association between fighting dogs and *B gibsoni* (Asia), which suggests there is direct transmission through bite wounds. Direct transmission may also occur through blood transfusions and sharing of surgical instruments or needles[7]. Transplacental transmission is believed to occur but has not been documented under controlled conditions[7].

Clinical signs

The clinical signs of *B gibsoni* infection vary greatly. Recent reports of cases of *B gibsoni* (Asia) in the southeastern United States document mild disease and, in some cases, even inapparent infection[7][11].

Disease has two forms: acute and chronic[17]. In the acute form the clinical signs are fever, lethargy, haemolytic anaemia and marked thrombocytopenia[11]. The anaemia is regenerative and usually develops steadily over a two- to four-week period. Death, or recovery with the development of a carrier state, can occur. Parasitaemia can persist for at least 38 months[18]. In some cases in which the disease is fulminant, with multiple organ failure and death, the signs are not solely related to the parasitaemia but also to the body's immune response[17]. The chronic form presents as intermittent fever, lethargy and weight loss and may persist for years[18]. Most dogs that recover, with or without treatment, become carriers[18][19][20], and may have no clinical signs but may be a source of infection for other dogs and ticks.

Drugs have not proven effective in eliminating *B gibsoni* from infected dogs[5]. Some antibabesial drugs can reduce the severity of clinical signs and the mortality rate.

Babesia gibsoni (California) can cause severe illness in immune-compromised people[4][14]. There are no documented reports of zoonosis from *B gibsoni* (Asia).

Diagnosis

Babesia gibsoni can be hard to diagnose as the clinical signs are not specific; regenerative anaemia and general ill health occur in many other diseases. The fact that most *B gibsoni* infections are Coomb's positive makes differentiation from autoimmune haemolytic

Table 1: Numbers of dogs imported into New Zealand from countries where *Babesia gibsoni* is found, for the year ended 31 December 2001

Country	Number of dogs (percentage of imports)	
Australia	1730	(72.0%)
United Kingdom	426	(17.7%)
USA	155	(6.4%)
Canada	29	(1.2%)
Continental Europe	26	(1.1%)
Japan	10	(0.4%)
Ireland	10	(0.4%)
South Korea	8	(0.3%)
Malaysia	7	(0.3%)
Taiwan	3	(0.1%)
Total	2404	

anaemia difficult. In its early stages and in the carrier state there may be low or negligible parasitaemia.

The indirect fluorescent antibody (IFAT) test has a high sensitivity and is particularly effective in detecting subclinical infection[21][22]. However, there is considerable serologic cross-reactivity among *Babesia* species[21] and to other protozoal parasites[22]. The PCR can differentiate strains of *B gibsoni*.

Potential for introduction

Dogs are imported from countries in which *B gibsoni* is endemic, and serological testing before importation is not routine. *Babesia gibsoni* could, therefore, be released into New Zealand.

Most imported dogs (72%) come from Australia (Table 1). If *B gibsoni* is widespread in Australia, this trade poses the greatest risk to New Zealand. A significant number of dogs are also imported from the USA and Canada. Only a small number are from continental Europe but, because of the ease of movement of dogs within the European Community, dogs from the United Kingdom and Ireland are also potential hazards[23].

There have been 73 tick interceptions in New Zealand between 1980 and 2000[24] and a further eight from April 2000 to April 2002 (Stone M, personal communication). *Rhipicephalus sanguineus* was identified in 34 interceptions. Six of the eight interceptions over the last two years have been from Australia, and four of these were on dogs.

Ticks are relatively resistant to chemical treatment. The recommended acaricide (fipronil, Frontline, Merial) used pre-importation is about 90% effective after 48 hours. The recent introduction of tick inspections for all imported dogs and cats should decrease the probability of introduction of exotic ticks.

Survey for *Babesia gibsoni*

A survey was conducted to obtain prompt, preliminary information on whether *B gibsoni* is present in New Zealand dogs and gave a basis for deciding if import conditions should be imposed to prevent its introduction. The greatest potential for introduction comes from *B gibsoni* (Asia) infected dogs from Australia. Infection with this strain is most common in fighting breeds so these were targeted to maximise the likelihood of detecting the parasite were it present in this country.

Table 2: Sex, breed and geographic origin of dogs participating in survey

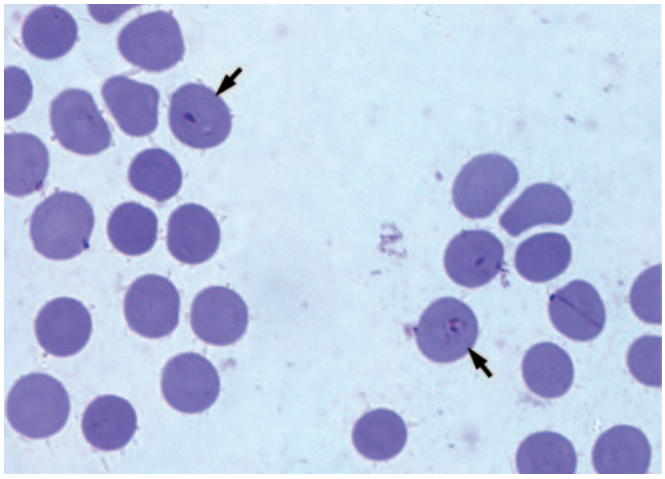
Sample attribute	Numbers in group
Sex	
Males	85
Females	70
Breed	
Staffordshire Bull terrier	47
American Pit Bull terrier	32
Greyhound	32
Pit Bull terrier cross	14
Staffordshire Bull terrier cross	13
Other breeds	17
Geographic distribution	
Northland	3
Auckland (including pound dogs)	37
Central North Island	38
Lower North Island	29
Upper South Island	8
Central South Island	29
Lower South Island	11

Owners of American Pit Bull terriers and American Staffordshire Bull terriers were targeted through their breed associations and through veterinary clinics. Veterinary clinicians were contacted through *Vetscript* and faxes to veterinary clinics, and requested to submit blood samples from appropriate dogs. Samples were obtained from pound dogs from Auckland. Greyhounds were also targeted as they generally come from large kennels where tick transmitted disease is likely to be more common.

At least 100 samples were sought. Based on random sampling statistics, in a large population with an estimated prevalence of 5%, the chances of missing infection would have been 0.006[25].

In all, 155 samples were obtained (Table 2). Eighty-five were from male dogs and 70 from females. Thirty-two (21%) were from American Pit Bull terriers, 47 (30%) from Staffordshire Bull terriers, 32 (21%) from Greyhounds, 14 (9%) from Pit Bull cross dogs and 13 (8%) from Staffordshire Bull terrier cross dogs. Thirty-one (20%) samples came from the Auckland pound, the others were from throughout New Zealand, from Northland to Southland.

Ages of the sampled dogs ranged from seven months to 13 years with most pound dogs being one year old and the others averaging six years. Most came from households with one to four dogs although the Greyhounds generally came from large (25 to 100 dog) kennels.



Babesia gibsoni is more difficult to find on blood smears

Testing

Samples were tested serologically using the IFAT and blood smears were examined for parasites. The tests were performed at the Onderstepoort Veterinary Institute in South Africa.

The IFAT was chosen as it has high sensitivity. A titre of 1:80 or greater was determined to be positive. The antigen was from a *B gibsoni* infected dog from Sri Lanka that entered South Africa in the 1980s.

Samples that tested positive to the IFAT were to be re-tested and the corresponding blood smears examined for at least one hour. Parallel *B canis* and *B gibsoni* antigens were to be used to eliminate *B canis* infection. Positive cases would also have been subjected to PCR analysis at North Carolina State University.

Results

All 155 samples were negative on the IFAT. No parasites were detected.

Conclusion

This survey provides reasonable evidence that *Babesia gibsoni* is unlikely to be present in New Zealand dogs. Import controls to prevent introduction of the disease are therefore warranted.

Acknowledgements

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Helen Beban

International Animal Trade

MAF Biosecurity Authority

Wellington

Email: bebanh@maf.govt.nz