



Public Health  
England

Protecting and improving the nation's health

# Human Animal Infection and Risk Surveillance Group

Risk review and statement on the risk  
*Brucella canis* presents to the UK human  
population

February 2021

# Contents

About the Human Animal Infections and Risk Surveillance group .....	3
Version control .....	4
Summary.....	4
Background.....	5
Possibility of human exposure .....	8
Impact on human health.....	8
Interim outcomes and recommendations .....	9
References.....	11
Annex A - Evidence gaps identified .....	12

# About the Human Animal Infections and Risk Surveillance group

This document was prepared by Public Health England (PHE) on behalf of the joint Human Animal Infections and Risk Surveillance (HAIRS) group.

HAIRS is a multi-agency cross-government horizon scanning and risk assessment group, which acts as a forum to identify and discuss infections with potential for interspecies transfer (particularly zoonotic infections).

Members include representatives from PHE, Department for the Environment, Food and Rural Affairs (Defra), Department of Health and Social Care (DHSC), Animal and Plant Health Agency, Food Standards Agency, Public Health Wales, Welsh Government, Public Health Scotland, Scottish Government, Public Health Agency of Northern Ireland and the Department of Agriculture, Environment and Rural Affairs for Northern Ireland.

Find [more information on the risk assessment processes used by the HAIRS group.](#)



# Version control

Date of this assessment: February 2021

Version: 1.0

Completed by: HAIRS members and external experts

Non-HAIRS members consulted: John McGiven & Andrew Frost, APHA; Bengü Said, Katherine Russell & Emily Dobell, PHE; Alessandro Gerada, Brucella Reference Unit (BRU); Nick Beeching, BRU and Liverpool University Hospitals Foundation NHS Trust

## Summary

*Brucella canis* historically has not been regarded as endemic in the UK. Since summer 2020 there has been an unexpectedly high number of reports of *B. canis* infection in dogs, mostly directly imported into the UK from Eastern Europe. *B. canis* is a recognised zoonotic pathogen, but human cases are rarely reported globally. To date no confirmed cases of *B. canis* human infection have been reported following contact with an infected dog in the UK. Imported dogs from *B. canis* endemic countries present an ongoing animal and public health risk to the UK.

Given the gaps in the evidence base on *B. canis*, principally on the epidemiology of *B. canis* and clinical aspects of disease in dogs and humans, the HAIRS group determined that a thorough risk assessment could not be completed at this stage and a qualitative description of the risk was the more appropriate action.

Based on the available evidence, the group concluded that individuals at greatest risk of exposure to *B. canis* are those with potential contact with *B. canis* contaminated materials, especially fluids and tissues associated with breeding and parturition, either in an occupational or domestic setting. The potential impact of human *B. canis* infection is greatest for those with underlying health concerns or Brucella specific risk factors.

The group made a number of recommendations which included that veterinary professionals and those in contact with dogs most likely to be infected (dogs imported from endemic countries) should be informed of the possible risk and health impacts of *B. canis* infections, as well as how clinically suspect animals can be diagnosed within the UK. Pre-import screening for *B. canis* is not required for pet travel but this could be a voluntary measure for prospective pet dog importers. The group also agreed that further research is required to address the large gaps in the *B. canis* evidence base to enable a more accurate risk assessment to be completed.

## Background

*Brucella* species have a global distribution, and while most of these species have a host preference, they have the ability to infect many mammalian species. Several *Brucella* species are pathogenic to humans, including *B. melitensis* (principally seen in goats, sheep and camels), *B. suis* (pigs), *B. abortus* (cattle), *B. canis* (dogs), *B. ceti* and *B. pinnipedialis* (marine mammals). Brucellosis is rarely fatal in humans, with the greatest risk of morbidity and mortality associated with *B. melitensis*.

The UK is regarded as Officially *Brucella* Free (OBF), that is, a non-endemic region for terrestrial *Brucella*. *B. abortus* was last detected in Great Britain in 2004 and in Northern Ireland in 2012. *B. melitensis* and *B. suis* have never been detected in UK livestock. Surveillance programmes for *B. melitensis* in sheep and goats and *B. abortus* in cattle are in place. In addition, trade controls including pre-importation testing and trading with other OBF countries are designed to manage the risk of importation of disease. *Brucella* species in marine animals are occasionally reported in the UK and are addressed in a specific HAIRS risk assessment (1). Human cases of brucellosis are rarely reported in the UK (<20 annually in the last decade), the majority of which can be attributed or presumed to be due to exposure outside the UK due to relevant risk factors in exposure history (2, 3) (PHE data).

*B. canis* is an important cause of reproductive failure in dogs and can also cause discospondylitis (4, 5). It has a wide geographical distribution and is known to be endemic in the Americas, parts of Asia, Africa and eastern or central Europe (4). *B. canis* has historically not been regarded as endemic in the UK, and in the past has been very infrequently reported in dogs imported from endemic countries (6 to 9), with only 2 cases confirmed by APHA prior to 2020, both in imported dogs. Pre or post-import testing of dogs for *B. canis* is not required, so identification of *B. canis* infection in dogs in the UK has usually followed clinical disease, either through non-specific bacterial culture investigations or, through specific *B. canis* testing if the veterinarian is sufficiently aware of the disease. As of early February 2021, it is not a notifiable or reportable animal pathogen if identified in a dog in the UK.

The clinical signs of *B. canis* infection in dogs are not pathognomonic, and infection can be subclinical. The most common clinical signs of *B. canis* infection in dogs are reproductive failure (in dogs and bitches), as well as lameness, back or joint pain often as a result of discospondylitis. Antimicrobial treatment is usually unsuccessful at clearing infection from affected dogs due to the ability of *B. canis* to sequester intracellularly for long periods and cause episodic bacteraemia (10). Even following antimicrobial treatment, an animal is considered infected for life, and therefore could present a risk of onward infection to canine and human contacts. Thus, euthanasia of infected dogs is considered the only way to completely remove the risk of onward transmission. The decision to euthanise is a matter for the owner(s) and their private veterinary surgeon. If an infected animal is not euthanised, it is recommended that it is neutered and concurrently treated with a course of antimicrobials. Pre-operative treatment reduces the risk to the vet at the time of surgery and continuing the course post-operatively

suppresses any potential recrudescence of infection in the dog due to the stress of the surgery. Even if infected dogs are treated and neutered, the only way to ensure *B. canis* is not spread to other animals is to prevent close physical contact with other dogs or sharing of environments. Infected dogs, even if treated, may still be at risk of recrudescence of infection at any point and should be reviewed and tested by their veterinary surgeon if they develop clinical signs commensurate with *B. canis* infection.

Human infection with *B. canis* is infrequently reported in the scientific literature from endemic countries, but given the generally mild and non-specific nature of human infections and the lack of validated tests for *B. canis* infection in humans, cases could be under-reported globally (10). In summer 2020, human testing for *B. canis* was carried out for those in the UK with known exposure to *B. canis* infected dogs and suggestive clinical presentation. As of early February 2021, no cases of *B. canis* human infection following contact with an infected dog in the UK have been confirmed.

Infrequent and sporadic reports of diagnoses in imported dogs from several known endemic countries have been received by APHA in recent years. Some of these cases have been reported to the UK veterinary profession via letters to the Veterinary Record (6, 7, 9). Since July 2020, an increasing number of suspect canine cases of *B. canis* have been reported by private veterinarians and/or veterinary laboratories to APHA following clinical suspicion and/or laboratory identification (bacteriology, serology or PCR). As of February 2021, more than 40 canine cases of brucellosis (confirmed and probable based on laboratory, clinical and epidemiological investigations), including one large household cluster in England with evidence of dog-to-dog transmission, have been reported in the UK. Apart from the household cluster, for which the source of infection is still under investigation, the remainder are believed to have acquired their *B. canis* infection outside of the UK. These imported cases have all been diagnosed in dogs adopted by UK owners from organisations specialising in rehoming dogs from overseas, the vast majority are in young dogs imported from Romania. The young age range in canine cases reported to date may not be a consequence of clinical disease being more explicit in younger dogs but could be due to a large influx of younger dogs in recent months or years.

A review of domestic dog commercial import data by Defra found that to end of November 2020, commercial imports of dogs from Romania had increased in 2020 by 51% compared to 2019 imports with 29,348 dogs brought into the country by commercial means by the end of November 2020 (Table 1). Significant increases in imported dog numbers are also noted for Hungary, Poland, Bosnia and Herzegovina, Russia and Greece, but to date, no *B. canis* infected dogs have been reported from these countries.

**Table 1. Top 10 source countries for UK commercial imports of domestic dogs, in decreasing order by number of total dogs imported year to November 2020**

<b>Countries (ordered by 2020 total dog import numbers</b>	<b>2019 total consignments</b>	<b>2019 total dogs</b>	<b>2020* total consignments</b>	<b>2020* total dogs</b>	<b>% change in dog import numbers 2019 to 2020</b>
<b>Romania</b>	13,450	19,489	21,776	29,348	+51%
<b>Spain</b>	3,739	4,896	4,547	5,723	+17%
<b>Ireland</b>	3,183	7,363	2,681	5,566	-24%
<b>Hungary</b>	1,529	2,146	3,325	4,583	+114%
<b>Cyprus</b>	3,338	3,455	3,857	3,914	+13%
<b>Poland</b>	997	1,159	2,861	3,452	+198%
<b>United States</b>	776	2,604	772	1,458	-44%
<b>Bosnia &amp; Herzegovina</b>	31	174	122	1,323	+660%
<b>Russian Federation</b>	52	70	377	615	+779%
<b>Greece</b>	190	294	332	550	+87%

\* Data as of November 2020

## Possibility of human exposure

*B. canis* has been isolated from canine seminal fluids, vaginal secretions, post-abortion and post-parturition vaginal fluids, saliva, nasal secretions and urine, although reproductive fluids are those predominantly associated with transmission of infection. Contact with joint fluid, blood and tissue from infected dogs may also present a risk of human exposure to *B. canis* (5, 10, 11). Unprotected contact with contaminated tissues and fluids associated with parturition or spontaneous abortion in infected dogs is believed to present the greatest risk of exposure to human, and other canine, contacts.

Human *B. canis* infections reported in the scientific literature have been attributed to close contact with infected dogs or contaminated materials, especially from dogs that recently aborted or gave birth, or through laboratory exposure. Thus, individuals with the potential for exposure to *B. canis* infected dogs or *B. canis* contaminated materials either in an occupational setting (breeders, kennels, veterinary and laboratory staff) or domestic setting are regarded as those at greatest risk of infection. The risk of human infection in these settings can be reduced if adequate personal protective equipment (PPE) is worn.

Infected imported dogs from endemic countries present an ongoing exposure risk to the UK canine and human population. However, a lack of or limited testing and/or reporting in other nations makes identifying a country as *B. canis* endemic problematic. There are no requirements for *B. canis* safe sourcing or pre/post-import testing for *B. canis* from endemic countries. It is currently unknown what proportion of imported dogs from endemic countries are infected. *B. canis* infected imported dogs have been reported sporadically in the past. The reason for the increase in reporting since summer 2020 is currently not known. However, as veterinary knowledge on the risk of *B. canis* in imported dogs increases, more samples are likely to be submitted for *B. canis* testing and the current understanding on the epidemiology of *B. canis* in the imported canine population, and risk of human exposure, is likely to change.

## Impact on human health

Human cases of *B. canis* infection are infrequently reported in the scientific literature. Based on limited case reports from endemic countries, clinical signs in human cases are generally non-specific and include fever (intermittent), chills, malaise, splenomegaly, and peripheral lymphadenopathy. The incubation period varies from weeks to years and symptoms can develop suddenly or gradually and may be persistent or recurrent over several years (4, 10).

Children (<5 years old) and immunocompromised individuals (particularly HIV infected individuals) are believed to be at greater risk of infection, and possibly clinical disease. The risk *B. canis* infection presents to pregnant individuals has not previously been addressed but, based on other *Brucella* species, infection during pregnancy could present a risk for adverse pregnancy outcomes in humans (12, 13). No fatal human cases of *B. canis* infection have been reported in the literature.

There are no reports of human-to-human transmission of *B. canis*, although this is theoretically possible as transfusion, transplantation and transmission via contact with reproductive tissues have been reported for other *Brucella* species, although in very limited numbers (14).

Since summer 2020 more than 250 individuals with exposure to *B. canis* infected dogs in the UK were risk assessed and offered testing as appropriate. To date, no confirmed human cases of *B. canis* infection have been reported in the UK.

In terms of risk from treated or managed infected dogs, owners and handlers should be made aware of the ongoing, but reduced risk of infection and be advised of possible symptoms of *B. canis* infection in humans. Owners, particularly those with underlying conditions which put them at higher risk of infection, should inform their health professionals of possible exposure to *B. canis*.

## Interim outcomes and recommendations

There are many evidence gaps affecting the interpretation of the risk *B. canis* presents to human health in the UK, some of which are outlined in Annex A. The HAIRS group has determined that at this stage, it is inappropriate to assign a risk level to the exposure and impact assessments of *B. canis* on human health in the UK due to the low level of confidence in the supporting evidence. Instead, a qualitative description of the risk was deemed the most appropriate action.

The Group determined that, based on the currently available information:

- there is little evidence to suggest *B. canis* is currently endemic in the UK pet dog population, but further research is required to confirm this
- dogs imported from *B. canis* endemic countries currently present the greatest risk of *B. canis* exposure for the UK human population
- individuals in contact with dogs imported from *B. canis* endemic countries, or that have bred with such dogs, are those most likely to be exposed to *B. canis*
- individuals in contact with dogs which have never resided or travelled to *B. canis* endemic countries are less likely to be exposed to *B. canis*
- the risk of human exposure is dependent on the type and degree of contact an individual has with an infected dog, such that:
  - highest risk exposures include instances in which an individual may be in direct contact with secretions and tissues contaminated with *B. canis*, for example veterinary procedures, laboratory testing of specimens or assisting or cleaning up after parturition or abortion of an infected dog
  - lowest risk exposures include instances in which an individual is unlikely to be in contact with secretions and tissues contaminated with *B. canis*, for example grooming, walking or basic care of an infected dog which has received appropriate treatment and is not showing clinical signs

- the impact of *B. canis* infection on human health appears to be dependent on the level of exposure and underlying risk factors:
  - for most individuals, *B. canis* exposure is unlikely to result in clinical disease, or if it does it is most likely to result in mild or uncomplicated illness
  - it is possible that individuals with underlying health conditions or recognised risk factors might experience more severe clinical illness if infected. *B. canis* exposure could result in a significant health impact

Based on the above, the HAIRS Groups makes the following recommendations:

- to highlight to veterinary professionals the risk of *B. canis* infection in dogs from known endemic countries
- if an imported dog with clinical signs suggestive of a possible *B. canis* infection is presented to a vet, staff attending the case should use appropriate PPE, and consider appropriate sampling and submission to laboratories for testing
- veterinary staff should warn laboratory staff when *B. canis* is suspected (particularly for imported dogs) to ensure appropriate biosafety cabinet and BSL-3 precautions are used in the lab to prevent exposure in laboratory staff
- when a positive canine result is obtained, further consideration should be given to the appropriate management of the risk to human health. Detailed advice on this will need to be made available on Government websites
- the risk of *B. canis* infection in imported dogs from endemic countries should be highlighted to potential owners, especially those determined to be at greater risk of infection, as well as advice given on recommended veterinary management (euthanasia) for test positive animals. Encourage private pre-breeding tests if appropriate, through PVS and BSAVA
- encourage charities or organisations importing dogs from *B. canis* endemic countries to ensure *B. canis* negative pre-export testing for the dog(s) in the country of origin before importing into the UK

## References

1. HAIRS. HAIRS risk assessment: marine mammal *Brucella* species. 2013.
2. England PH. Common animal-associated infections (England and Wales): first and second quarters 2020. 2020.
3. Government H. Zoonoses Report UK 2017. 2018.
4. Spickler AR. Brucellosis: *Brucella canis*. The Center for Food Security & Public Health; 2018.
5. Johnson CA, Carter TD, Dunn JR, Baer SR, Schalow MM, Bellay YM, et al. Investigation and characterization of *Brucella canis* infections in pet-quality dogs and associated human exposures during a 2007 to 2016 outbreak in Michigan. *J Am Vet Med Assoc*. 2018;253(3):322-36.
6. Dunne J, Sehgal K, McMillan A, Perret L. Canine brucellosis in a dog imported into the UK. *Vet Rec*. 2002;151(8):247.
7. Morgan H, Pintos V, Rys H, Wake T, Grace K, Perrett L, et al. *Brucella canis* in a dog in the UK. *Vet Rec*. 2017;180(15):384-5.
8. Taylor DJ. Serological evidence for the presence of *Brucella canis* infection in dogs in Britain. *Vet Rec*. 1980;106(5):102-4.
9. Whatmore AM, Perrett L, Friggens M. Second UK isolation of *Brucella canis*. *Vet Rec*. 2017;180(25):617.
10. Hensel ME, Negron M, Arenas-Gamboa AM. Brucellosis in Dogs and Public Health Risk. *Emerg Infect Dis*. 2018;24(8):1401-6.
11. Edwards D, Walsh A, Fletcher N, Perrett L, Whatmore AM, Wood L, et al. *Brucella canis*: an emerging hazard following the importation of rescue dogs. *PHE Zoonoses Newsletter*. 2017(19):8-10.
12. Arenas-Gamboa AM, Rossetti CA, Chaki SP, Garcia-Gonzalez DG, Adams LG, Ficht TA. Human Brucellosis and Adverse Pregnancy Outcomes. *Curr Trop Med Rep*. 2016;3(4):164-72.
13. Inan A, Erdem H, Elaldi N, Gulsun S, Karahocagil MK, Pekok AU, et al. Brucellosis in pregnancy: results of multicenter ID-IRI study. *Eur J Clin Microbiol Infect Dis*. 2019;38(7):1261-8.
14. Tuon FF, Gondolfo RB, Cerchiari N. Human-to-human transmission of *Brucella* - a systematic review. *Trop Med Int Health*. 2017;22(5):539-46.

## Annex A - Evidence gaps identified

How virulent is *B. canis* for humans (for example, as compared to *B. abortus*, *B. melitensis* and *B. suis*) in terms of ability to infect and subsequently cause serious disease?

What is the current prevalence of *B. canis* in the UK dog population?

Is the recent increase in canine cases a reflection of increased awareness, increased submissions, a change in testing or increased imports?

What is the efficacy of treatment of dogs or puppies (neutering and antibiotics) in reducing infection risk to humans and other dogs?

What is the relative impact of non-reproductive routes of disease transmission: dog to dog and dog to human (that is, those remaining after dogs have been neutered)?

What is the epidemiology of *B. canis* in presumed endemic countries that are a significant source of importations into the UK (for example, Eastern Europe)?

What proportion of imported dogs are infected?

How many imported dogs from endemic countries are subsequently used for breeding?

Are significant numbers of dogs from endemic countries entering the UK temporarily for breeding purposes, or conversely are UK dogs travelling to endemic countries for breeding purposes before returning to the UK?

How many organisations and/or individuals are involved in transporting dogs from *B. canis* endemic countries and what are the links between these importers and how has the pattern changed since the pandemic travel restrictions?

What proportion of diagnoses are being reported to animal and human health authorities in the UK?

How likely are GPs to consider brucellosis as a differential diagnosis for individuals with no recent travel history?

What are the availability and reliability of diagnostic tests for humans in the UK?

What is the relative risk of imported 'pedigree' dogs (or these dogs being moved temporarily for breeding purposes) against rescue dogs?

Are there any differences in virulence between *B. canis* strains?

# About Public Health England

Public Health England exists to protect and improve the nation's health and wellbeing, and reduce health inequalities. We do this through world-leading science, research, knowledge and intelligence, advocacy, partnerships and the delivery of specialist public health services. We are an executive agency of the Department of Health and Social Care, and a distinct delivery organisation with operational autonomy. We provide government, local government, the NHS, Parliament, industry and the public with evidence-based professional, scientific and delivery expertise and support.

Public Health England  
Wellington House  
133-155 Waterloo Road  
London SE1 8UG  
Tel: 020 7654 8000

Website: [www.gov.uk/phe](http://www.gov.uk/phe)  
Twitter: [@PHE\\_uk](https://twitter.com/PHE_uk)  
Facebook: [www.facebook.com/PublicHealthEngland](https://www.facebook.com/PublicHealthEngland)

© Crown copyright 2021

Version 1.0

Prepared by: PHE on behalf of the HAIRS Group  
For queries relating to this document, please contact: [HAIRS@phe.gov.uk](mailto:HAIRS@phe.gov.uk)

**OGL**

You may re-use this information (excluding logos) free of charge in any format or medium, under the terms of the Open Government Licence v3.0. To view this licence, visit [OGL](http://www.nationalarchives.gov.uk/doc/open-government-licence/version/3). Where we have identified any third party copyright information you will need to obtain permission from the copyright holders concerned.

Published: February 2021  
PHE gateway number: GW-1937



PHE supports the UN Sustainable  
Development Goals

