# Spatial and Temporal Incidence of *Brucella canis* in the State of Kentucky: A Retrospective Study



### Introduction

Brucella canis (B. canis) is a zoonotic gram-negative coccobacillus carried by dogs, resulting in abortions in females and epididymitis, orchitis and scrotal swelling in males. Discospondylitis and ocular disease are also possible manifestations in canines. Human workers that inappropriately handle canine reproductive tissues and aborted fetuses are at greatest risk of contracting the disease. Clinical signs in humans are often vague and nonspecific, which could result in a significant delay in diagnosing and treating the organism. Although there are several dog breeding operations in Kentucky, the incidence of *B. canis* was unknown prior to January of 2019.

The authors hope the data generated from this project could assist in raising awareness of this pathogen amongst physicians and health officials in the state of Kentucky, as well as assist in furthering epidemiologic research of this pathogen across the United States.

# Hypothesis and Objectives

**Hypothesis:** The incidence of human brucellosis caused by *B. canis* is higher than the number of brucellosis cases reported over the last 11 years.

- . Investigate the incidence of this pathogen over an 11 year observation period, within the state of Kentucky, among animals and humans.
- 2. Identify areas of the state with an elevated risk for *B.canis* transmission based on historical data reviewed. Such areas would be identified as "hotbeds" and organized into predetermined Area Development Districts (ADD) maintained by the state of Kentucky (Figure 1).

# Methods and Materials

#### To determine the incidence of canine brucellosis:

- United States Animal Laboratory Information Management System (USALIMS) was searched from 1 January 2008 to 31 January 2019 for samples submitted requesting brucellosis testing via the categories: Blood culture, Tissue Culture, Polymerase Chain Reaction for *Brucella* genus, and Indirect Fluorescent Antibody (IFA) Testing/Card Agglutination.
- An excel spread sheet with relevant accession numbers were generated.
- Locations where positive samples originated were mapped out in their respective Area development District.

#### To determine the incidence of human brucellosis caused by *B. canis*:

- 11 years of reportable disease summaries published by the Infectious Disease Branch of Kentucky Cabinet for Health and Family Services (KCHFS) and the Centers for Disease Control and Prevention (CDC), were reviewed.
- Officials at local and state health departments were contacted for data concerning *Brucella canis* infections in humans.
- Locations of positive cases were mapped out by Area Development District.

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responsible for a hand full of counties (Kcadd.org)

## Results

#### **Canine brucellosis cases:**

Parameters used to search USALIMS generated over 1200 accessions, containing 2,322 samples, spanning six states and encompassing 78 dog breeds. Excluding the "Tissue culture" category due to zero positive results, the cumulative incidence for individual tests requests were calculated (Table 1). The cumulative incidence for B. canis across all testing methods was determined to be 0.05 or 5 positive results per 100 cases over the 11 year observation period.

#### Human brucellosis cases:

Human brucellosis cases were not reported by species; however, from 2008 to 2019 there were a total of 11 reported cases. The incidence rate was based on the average population (4,399,969.7) between 2008 and 2019 and was determined to be 0.25 per 100,000 population. Attempts were made to contact health officials to determine locations of infections, but were unsuccessful.

For canine cases, the authors identified 5 ADDs where positive samples originated, with the Barren River Area Development District (ADD #4), being overrepresented. The remaining ADDs with positive cases were Purchase (ADD#1), Pennyrile (ADD #2), Green River (ADD #3), and Lincoln Trial (ADD #5).

The data obtained for human cases were inadequate to meet the goals of the project. Human cases of brucellosis were not reported via species in the databases used. Additionally, ADDs were not identified in human cases reported after 2004. Thus, the investigators were unable to determine if an overlap exists between canine brucellosis cases and human brucellosis cases within Area Development Districts.

The investigators were able to determine the incidence rate of brucellosis in humans to be extremely low. The cumulative incidence in dogs appears to be low as well. The overrepresented ADD for canine brucellosis was an unexpected finding amongst investigators. The Barren River Area Development District contains a thriving University community with numerous historic and natural tourist destinations. The population in this area is less than Bluegrass and Kentuckiana (KIPDA) Area Development Districts, which contain the two largest cities in the state. It is unknown how many kennel operations are within the Barren River Area Development District, or how often said kennel operations are routinely screening their breeding stock for the presence of *B. canis*. Human physicians and public health practitioners in this area should consider *B. canis* on their list of differentials in patients presenting with vague clinical signs.

Table 1. Cumulative incidence of Brucella canis between 1 January 2008 and 1 January 2019				
Test Request	# of Samples Tested	# of Positives	Cumulative incidence over 11 years	Cumulative incidence per 100 tests (over 11 year period)
Polymerase Chain Reaction for <i>Brucella</i> Genus	36	7	19%	0.19
<i>B. canis</i> Blood culture	71	6	8%	0.08
<i>B. canis</i> IFA/Card Agglutination	1329	57	4%	0.04
All methods	1436	70	5%	0.05

The authors conclude it would be advantageous for health department and public health agencies to speciate cases of brucella infections (in humans) and include Area Development Districts during disease reporting. The availability of this information could assist future One Health investigators during epidemiological investigations of this pathogen in the future.

# References

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Discussion

Conclusion