Development of a Comprehensive One Health Tickborne Disease Surveillance Website and Informational Brochures for the State of Kansas

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Overview

♦ Location of applied practice experience Mentor for project ♦ Background ♦ Methods Discussion MPH Competencies Addressed

MPH APE site location

 & Kansas Department of Health and Environment
 & Bureau of Epidemiology and Public Health Informatics—Infectious Disease Epidemiology and Response section



MPH APE mentor

- Ingrid Garrison, DVM, MPH, DACVPM
 - Public Health Veterinarian for the state of Kansas since 2008
 - Board certification in Veterinary Preventative Medicine
 - Completed a 2-year fellowship with the CDC's Epidemic Intelligence Service



Background

- 75% of human
 vector-borne
 diseases are due to
 ticks
- # of U.S. casesdoubled between2004 and 2019
- 7 new tickborne diseases (TBDs) discovered in U.S. since 2004

Total Reported Cases of Tickborne Disease, 2004–2019



 A One Health approach needed
 Increase tickborne disease (TBD) awareness in physicians, veterinarians, and the general public

> &Lack of TBD knowledge/awareness by family and general practice physicians

Pets can act as a sentinel for TBD risk in people

Central location for comprehensive, specific TBD information

Background



Five TBDs in Kansas

Rocky Mountain spotted fever ♦ Ehrlichiosis ♦Lyme disease Anaplasmosis



Rocky Mountain spotted fever (RMSF)

Rickettsia rickettsii

Obligate, intracellular bacteria

Member of the spotted fever group

Over 20 members in this group

Rocky Mountain spotted fever (RMSF)

♦ Tickborne transmission Output Description - Output main vector in Kansas *⊗Dermacentor andersoni* – main vector in NW U.S. **Rhipicephalus sanguineous* - main vector in Arizona, New Mexico region



Geographic Distribution of the American dog tick



RMSF in People

- ♦ Incubation period: 3-12 days from time of tick bite
- Initial symptoms are nonspecific
 - ♦Headache
 - ♦Fever
 - ♦ Lethargy
 - ♦Muscle pain
 - ♦Gastrointestinal upset
- Characteristic rash appears 2-4 days after onset of fever



RMSF in dogs

♦ Clinical signs ♦ Fever ♦ Lameness ♦ Lymphadenopathy ♦ Edema ♦ Hyperemic skin lesions ♦ Possible bleeding disorders



Ehrlichiosis

♦ Multiple species that cause disease *♦ Ehrlichia chaffeensis* Most common in people *♦ Ehrlichia canis* Most common in dogs *♦ Ehrlichia ewingii* ♦ Can infect people and dogs ♦ All are obligate intracellular bacteria



Ehrlichiosis

Tickborne transmission

♦ E. chafeensis and E. ewingii: Lone star tick (*Amblyomma americanum*)

$\otimes E.$ canis: brown dog tick (*Rhipicephalus sanguineus*)





Ehrlichiosis in People

- Incubation period: 7-14 days from time of tick bite
- ♦ Initial symptoms similar to RMSF
 - ♦ Fever
 - ♦ Headache
 - ♦ Lethargy
 - ♦ Muscle pain
 - ♦ Gastrointestinal upset
- Rash can occur in 1/3rd of cases, usually appears around day 5 of illness



Ehrlichiosis in dogs

♦ Incubation period: 1-3 weeks Clinical signs
 ♦ Lethargy ♦ Inappetance ♦ Lameness ♦ Polyarthritis ♦ Thrombocytopenia ♦ Other body systems affected in severe cases



Lyme Disease

 Most common TBD reported
 in people in the U.S. ♦ Causative agent: Borrelia burgdorferi – spirochete bacteria ♦ Transmitted by ticks ♦ Tick vector in Kansas: *Ixodes* scapularis (black-legged tick)



Black-legged tick



Lyme Disease in People

- ♦ Incubation period: 3 to 30+ days after tick bite
- ♦ Early symptoms: ♦ Fever ♦Headache *♦*Muscle aches ♦ Fatigue ♦ Erythema migrans rash occurs in 75% of people



Lyme Disease in Dogs

♦ Incubation period: 3 to 5 months ♦ Clinical signs: ♦ Lethargy ♦Inappetance ♦ Fever ♦ Lymphadenopathy ♦ Can also become a chronic condition in dogs

LYME Disease in Dags

Managing Lyme Disease in Dogs and Symptoms of Lyme Disease in Dogs

Tularemia

- Highly contagious, select agent
 Inhalation
 - ♦ Close contact
 - ♦ Tick transmitted (Lone star tick, Amblyomma americanum)
- Reportable disease in animals



Tularemia in People

- ♦ Fever
- ♦ Headache
- ♦ Lethargy
- ♦ Ulcerative skin lesions
- Oculoglandular form
- Oropharyngeal form
- Respiratory form (pneumonia)
- Gastrointestinal form





Tularemia in Cats

- ♦ Incubation period: 1 to 10 days
- ♦ Fever
- \diamond Lymphadenopathy
- Anorexia
- ♦ Icterus
- Hepatomegaly/splenomegalyLife-threatening



Goal:

Increase TBD awareness in physicians, veterinarians, and the general public

Methods

TBD Website Creation with:
Kansas Tick Guide
Interactive TBD map for Kansas

Informational Brochures for Veterinarians and Pet Owners



Methods

♦ Interactive TBD map for Kansas ♦ Reported human TBD cases (2012-2019) ◆Based on CDC's confirmed and probable case definitions ♦ County of exposure, age, gender, ethnicity, and race ♦ Laboratory diagnosed pet TBD cases (2012-2020) ♦KSVDL VetView database ♦IDEXX data (voluntary veterinarian reporting)

♦ Spotted Fever Group Rickettsiosis
♦ 1306 human cases reported between 2012-2019
♦ Males (66.6%) > Females (33.4%)
♦ Over 40yrs age group (64.2%)
♦ White, non-Hispanic or Latino (95.3% of known)

	Incidence of annual human SFGR cases per 100,000 population		
Year	Kansas	United States	
2012	4.9	1.4	
2013	5.81	1.08	
2014	3.8	1.18	
2015	5.0	1.3	
2016	4.5	1.33	
2017	7.52	1.93	
2018	6.21	1.71	
2019	7.28	Not Available	

Spotted Fever Rickettsiosis

> \$ 11 cases of RMSF/SFGR in dogs diagnosed between 2012-2020
> \$ 126 SFGR exposures detected

Year	SFGR definitive diagnosis with serology	RMSF diagnosis with PCR	SFGR exposures
2012	0	0	19
2013	2	0	8
2014	3	0	23
2015	2	1	12
2016	0	0	12
2017	1	0	16
2018	0	0	12
2019	0	0	9
2020	2	0	15

Canine Cases, KSVDL

- \$ 307 human cases reported to KDHE between 2014 and 2019
- ♦ Males (61.2%) > Females (37.8%)
- ♦ Over 40yrs age group (71.7%)
- White, non-Hispanic or Latino (93.4%)

	Incidence of annual human Ehrlichiosis cases per 100,000 population	
Year	Kansas	United States
2014	1.75	0.48
2015	1.58	0.42
2016	1.78	0.45
2017	Not Available	0.53
2018	2.06	0.58
2019	1.61	Not Available

2 Ehrlichia canis
 infections in dogs
 detected with PCR

♦ 41 *Ehrlichia* seropositive dogs

Year	<i>Ehrlichia canis</i> definitive diagnosis with PCR	<i>Ehrlichia ewingii</i> definitive diagnosis with PCR	Ehrlichiosis exposures determined by serology
2012	0	0	1
2013	0	0	0
2014	0	1	1
2015	2	2	0
2016	0	2	4
2017	0	1	12
2018	0	1	2
2019	0	2	13
2020	0	1	8

KSVDL, canine test results

♦ Lyme Disease

- ♦ 241 human cases reported to KDHE between 2012-2019
- ♦ Females (52.7%) > Males (47.3%)
- All age groups had cases reported but 56.9% were in over 40yrs age group
- White, non-Hispanic or Latino
 (87.8%)
- No pet data to report from
 KSVDL

	Incidence of annual human Lyme disease cases per 100,000 population		
Year	Kansas	United States	
2012	0.7	9.9	
2013	1.17	11.62	
2014	0.72	10.54	
2015	0.79	11.90	
2016	1.34	11.32	
2017	1.34	13.18	
2018	1.03	10.34	
2019	1.2	Not Available	

♦ Tularemia

- ♦ 193 human cases reported to KDHE between 2012-2019
- ♦ Males (62.7%) > Females (37.3%)
- ♦ Age 40yrs age group (58%)
- Most common TBD in children (20.2% in children 0-12yrs)
- & White, non-Hispanic or Latino (94.2%)

	Number of annual human tularemia cases per 100,000 population		
Year	Kansas	United States	
2012	0.8	0.1	
2013	0.97	0.06	
2014	0.93	0.06	
2015	1.17	0.10	
2016	0.86	0.07	
2017	1.03	0.07	
2018	0.65	0.07	
2019	0.34	Not Available	

♦Tularemia

- \$\$ 35 cases in animals diagnosed via bacterial culture at KSVDL (2012-2020)

 - ♦1 dog
- Only reportable TBD of the 5 that is reportable in animals

Year	Definitive diagnosis of tularemia in cats via bacterial culture
2012	1 + 1 cotton-top tamarin
2013	2
2014	7
2015	6
2016	6
2017	1 + 1 dog
2018	6
2019	3
2020	1

KSVDL data



Conclusions

- ♦ The only website of its kind
- ♦ Limitations:
 - Our of human cases by physicians likely
 Aligned to the set of the
 - Substantial underestimation of cases in pets by using just KSVDL
 data

MPH Foundational Competencies

#	Competency	Description
1	Apply epidemiological methods to the breadth of settings and situations in public health practice	Review of cases of human and animal zoonotic tickborne diseases in Kansas
3	Analyze quantitative and qualitative data using biostatistics, informatics, computer-based programming and software, as appropriate	Review of cases of human and animal zoonotic tickborne diseases in Kansas
9	Design a population-based policy, program, project or intervention	Create a web page detailing human and animal tickborne disease cases in Kansas, by county
21	Perform effectively on inter-professional teams	Work with people in several different sections of KDHE to analyze data and create web page
22	Apply systems thinking tools to a public health issue	Use multidisciplinary methods and tools for data collection and analysis



♦ Dr. Ingrid Garrison ♦ Drs. Sanderson, Kastner, and Larson ♦ Dr. Mulcahy and Barta ♦ KDHE Public Health Tracking Group and Response Section