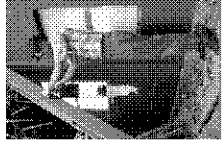
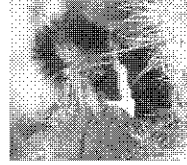


Zoonoses/Vector-Borne Disease Update for Colorado



Elisabeth Lawaczek, DVM
State Public Health Veterinarian



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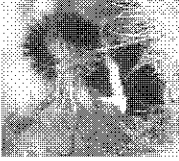
Topics

- Skunk Rabies update
 - Colorado Rabies Resource Guide
 - COHELP
- WNV update
- Tick-Borne Relapsing Fever Increase in 2011



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Update on Skunk Rabies in Colorado



Elisabeth Lawaczek, DVM
State Public Health Veterinarian



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Skunk Rabies in CO

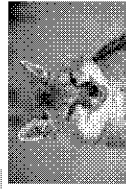
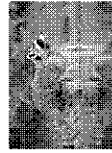
- 2011- slower year
- spread from eastern CO towards Front Range
 - Colorado Springs
 - Parker, Douglas County
 - Extreme eastern edge of Aurora
 - Was only east of I-25 until rabid skunks in Pueblo and Larimer counties in fall 2010
 - Not found in Denver, Boulder or Weld counties . . . yet
- Prediction of spread?*
 - Don't know distribution & density of skunk population
 - Relocation by property owners possibly contributing
 - Foxes or other species contributing?
 - Some "new areas" may be due to increase in surveillance



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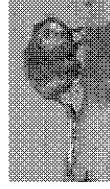
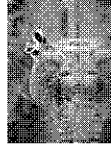
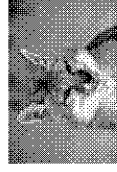
Rabies in Colorado

- Colorado's reservoir species:
 - Bat & skunk (raccoon, fox in other parts of U.S.)



Rabies in Colorado

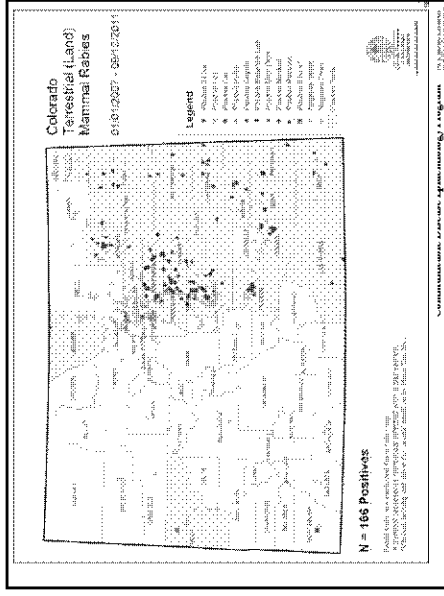
- Spill over infections



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Lab Confirmed Rabid Animals, Colorado 2009

County	Bat	Skunk	Other	Total
Adams	1			1
Archuleta	1	5		6
Boulder	32			32
Chaffee	1			1
Denver	12			12
El Paso	2	9	1 horse 1 mink 1 fox	14
Elbert		5		5
Gilpin	1			1
Jefferson	2			2
Kit Carson	1			1
Larimer	5			5
Lincoln	1			1
Montezuma	1			1
Morgan	1	8		9
Otero	2			2
Prowers	1	1	1 fox	2
Weld	1			1
Yuma	5	5		10
Total	61	38	4	103

Previous annual record of lab confirmed rabid animals = 70 (all bats in 2006)

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Lab Confirmed Rabid Animals, Colorado 2010

County	Bat	Skunk	Other	Total
Adams	1	3		4
Archuleta	1	2	1 horse*	4
Bart	1			1
Boulder	16			16
Clear Creek	2			2
Denver	3	10		13
Douglas	1			1
El Paso	8	5	1 Fox, 1 Fox*, 1 Fox*	14
Elbert	1	20	1 Male Deer, 2 Fox*, 1 Fox*	24
Gunnison	3			3
Huerfano	1			1
La Plata	1			1
Larimer	1	1		2
Lincoln	2			2
Montezuma	4		1 coyote*	5
Morgan	4		1 mink*	5
Park	8			8
Pueblo	1		1 cat*	2
Prowers	1			1
Saguache	1			1
Summit	5	4		9
Teller	1			1
Yuma	0	0		0
Total	61	38	12	111

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Lab Confirmed Rabid Animals 2010

■ Spring- most skunk rabies cases

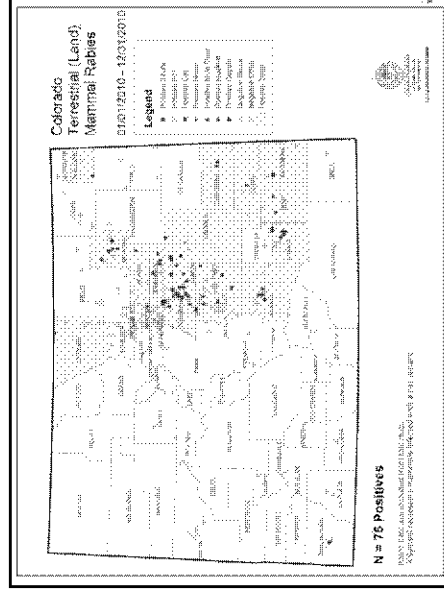
	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Total
Bat	0	0	0	0	1	14	16	17	10	3	1	0	62
Skunk	2	5	11	14	10	4	6	2	3	4	1	1	68
Fox	0	0	0	1	3	2	0	0	0	0	0	0	6
Other	1	0	1	1	1	0	0	0	0	0	0	1	6
Total	3	5	12	16	13	21	23	19	13	7	3	1	136

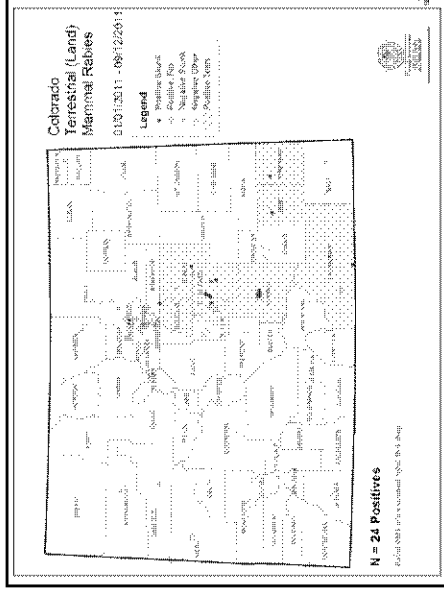
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2010 Denominator

County	Bat	Skunk	Other	Total	Tested Bats	Tested Skunks
Adams	1	3		4	4	4
Archuleta	1	2	1 horse*	4	11	11
Boulder	16			16	110	6
Cherokee	2			2	0	2
Clear Creek	2			2	4	0
Douglas	1	10		11	20	17
Eagle	1	5	1 Fox, 1 Fox*	7	6	0
El Paso	8	5	1 Male Deer, 2 Fox*, 1 Fox*	19	34	22
Elbert	1	20		21	1	0
Gunnison	4			4	42	13
Huerfano	1			1	8	0
La Plata	1			1	10	0
Larimer	7	1		8	38	10
Lincoln	2			2	13	0
Montezuma	4		1 coyote*	5	0	4
Morgan	4	1	1 mink*	6	1	0
Otero	2			2	1	0
Park	8			8	1	0
Prowers	1	1	1 cat*	3	1	0
Pueblo	5	4		9	24	15
Saguache	6			6	1	0
Total	61	63	12	136		

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Communicable Disease Epidemiology Program





**Rabies in Colorado
January 1 – September 19, 2011
Lab Confirmed Rabies Positive Animals**

County	Bat	Skunk	Fox	Other	Total
Adams	1				1
Blanco		1			1
Boulder	10				10
Chaffee		2			2
Clear Fork					
Denver	10				10
Douglas	3	1			4
El Paso	4				4
Elbert	4	0	1		14
Fronton	1	0			2
Garfield	2				2
Harrison		8			8
Huerfano		0			0
La Plata		0			0
Lafayette		0			0
Las Animas	1				1
Lincoln					
Mesa	1				1
Montezuma					
North Fork					
Ouray					
Pueblo	1				1
Rocky Mountain	8	9			17
Saguache					
Seminole	1				1
Silver					
W&H	5				5
Yuma					
TOTAL	54	23	1	0	84

Rabies Preparedness

COLORADO RABIES RESOURCE GUIDE

THE SOURCEBOOK IS DEVELOPED BY
 THE COLORADO RABIES TASK FORCE

Communicable Disease Epidemiology Program
 Colorado Department of Public Health & Environment

- CORAB Task Force & Colorado Rabies Resource Guide
- Target audience: animal control, local public health, veterinarians, wildlife officials, wildlife rehabbers, wildlife control operators
- "How to" manual for response

Rabies Preparedness

CDPHE has prepared COHELP use for rabies questions from public

Algorithms- trained to direct public to correct agency (or to seek medical/veterinary care) & provide phone #'s for certain agencies

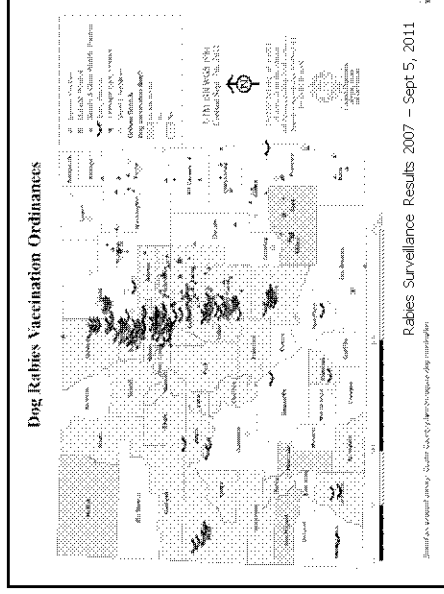
1-877-482-2911

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 Colorado Department of Public Health & Environment

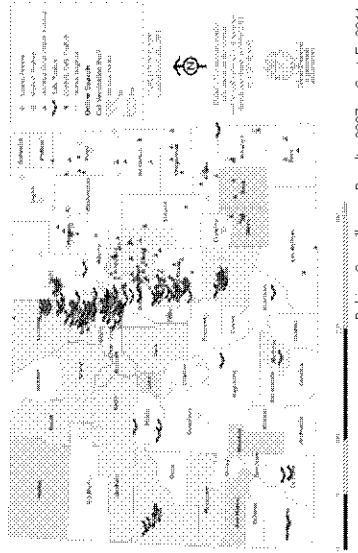
Rabies Vaccination Requirements for Dogs & Cats in CO

- Workgroup to create bill for statewide rabies vaccination requirement for dogs & cats
- CVMA leading effort to form "Coalition to Protect People and Animals from Rabies" (CPPAR)
- CDPHE on steering committee as subject matter expert

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 Colorado Department of Public Health & Environment



Cat Rabies Vaccination Ordinances



Rabies Surveillance Results 2007 – Sept 5, 2011
 Source: The Colorado Department of Public Health, Rabies Surveillance Reporting on Rabies

West Nile Virus

- 2011- 09/15- 6 cases, 0 deaths
- 2010- 81 human cases, with 4 deaths
- 2009- 103 human cases, with 3 deaths
- 2008- 71 cases w/ 2 deaths
- 2007- 578 cases w/ 7 deaths
- 2003- 2,847 cases w/ 63 deaths
- 2007 – 2009 Boulder, Larimer & Weld-highest#
- 2010- Mesa County also Communicable Disease Epidemiology Program



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2010

County of Residence	New cases			Total cases			Total deaths		
	Fever	Meningitis	Encephalitic	Fever	Meningitis	Encephalitic	Fever	Meningitis	Encephalitic
Adams	3	2	2	7	-	-	-	-	-
Boulder	4	1	0	5	-	-	-	-	-
Denver	1	1	1	3	-	-	-	-	-
Douglas	1	-	-	1	-	-	-	-	-
El Paso	1	-	-	1	-	-	-	-	-
Jefferson	1	-	-	1	-	-	-	-	-
Kit Carson	1	-	-	1	-	-	-	-	-
La Plata	1	-	-	1	-	-	-	-	-
Larimer	10	2	1	13	-	-	-	-	-
Mesa	8	3	1	12	-	-	-	-	-
Monte	1	-	-	1	-	-	-	-	-
Phillips	4	-	-	4	-	-	-	-	-
Prowers	2	1	1	4	-	-	-	-	-
Pueblo	1	1	1	3	-	-	-	-	-
Saguache	2	-	-	2	-	-	-	-	-
Weld	12	6	1	19	-	-	-	-	-
COLORADO	65	17	9	91	4	4	4	4	4



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Human West Nile Virus Infections: Colorado, 2011

■ Updated September 15, 2011

County of Residence	New cases			Total cases			Total deaths		
	Fever	Meningitis	Encephalitic	Fever	Meningitis	Encephalitic	Fever	Meningitis	Encephalitic
Archuleta	1	-	-	1	-	-	1	-	-
Boulder	1	-	-	1	-	-	1	-	-
Denver	1	-	-	1	-	-	1	-	-
La Plata	1	-	-	1	-	-	1	-	-
Larimer	1	-	-	1	-	-	1	-	-
COLORADO	4	1	1	6	1	1	6	1	1



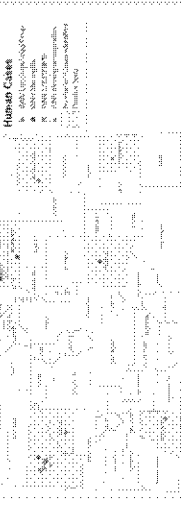
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Colorado West Nile Virus 2010 Annual Surveillance

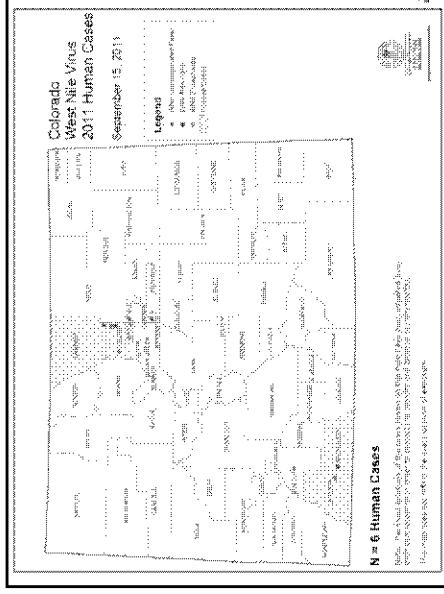
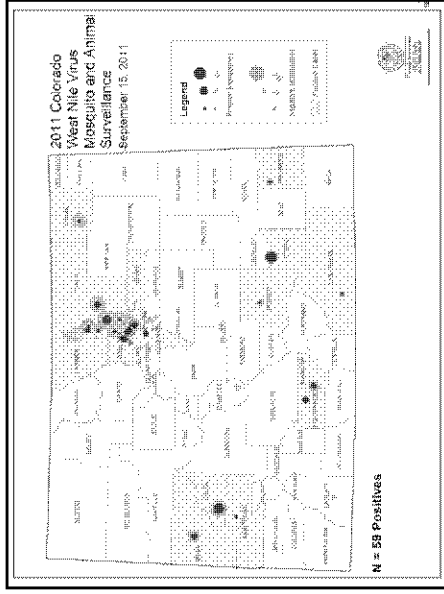


N = 46 Positives

Colorado West Nile Virus 2010 Human Cases



N = 30 Human Cases



West Nile virus- 2012 Project

- 2012- CDPHE plans outreach to Denver metro area and north central CO hospitals
 - Encourage WNV testing of aseptic meningitis & encephalitis cases, when herpes & enterovirus have been ruled out
 - Serum & CSF to CDPHE; we will forward to CDC if negative for WNV to test for other arboviruses (e.g. Powassan, SLE)

AMCA 2011, Anaheim, California

West Nile Virus in the United States: 1999-2010

Roger Nasci, Nicole Lindsey, Jenn Lehman, Erin Staples and Marc Fischer
State Health Department ArboNET contributors

Aberrational Disease Branch
Division of Vector-Borne Diseases
Center for Disease Control and Prevention

Communicable Disease Epidemiology Program

USA West Nile Virus 2010

Reported to ArboNET as of 2/22/2011

Year	WNND	WNF	Total	Presumptive Viremic Donors
2010	619	390	1009	117

West Nile virus (WNV) activity reported to ArboNET, by county, United States, 2010

Estimated WNV Infections and Case Reporting - 2010

619 WNND cases
x 140 infections/WNND
≈ 86,660 people infected in 2010

86,660 Infections
x 0.2 (20% of infections are symptomatic)
≈ 17,332 symptomatic WNF in 2010

390 Reported WNF cases
+ 17,332 estimated WNF Cases
≈ 2% of WNF cases reported in 2010

Extrapolation from seroprevalence studies
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Estimated WNV Infections & Case Reporting –CO 2010

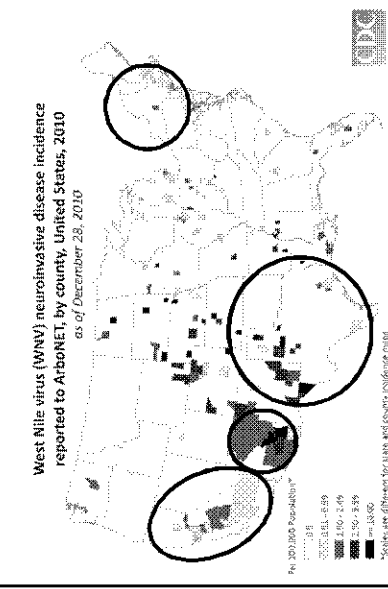
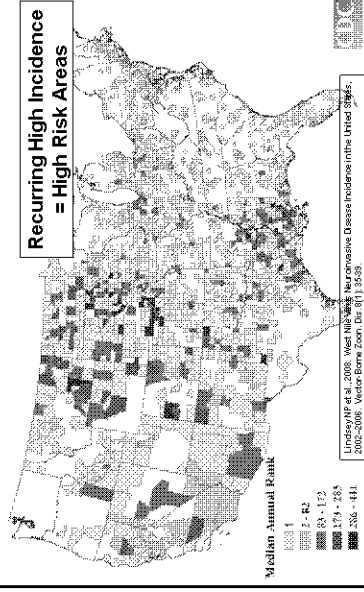
26 WNVND cases
x 140 infections/WNVND
≈ 3640 people infected in 2010

3640 Infections
x 0.2 (20% of infections are symptomatic)
≈ 728 symptomatic WNF in 2010

55 Reported WNF cases
± 728 estimated WNF Cases
≈ 8% of WNF cases reported in 2010

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Median Rank of Annual WNVND Incidence by County, 2002 to 2007



What's the level of burden & risk for WNV exposure in CO?

- Since intro of WNV in Colorado, 2002, through 2010: 4,454 cases; 902 severe neurologic cases & 90 deaths
- Since non-hospitalized patients are less likely to be tested & treated AND based on our knowledge of WNV, ~additional unreported 26,000 cases in CO- 2002-2009
- Extrapolate seroprevalence studies--large % of CO resident not yet exposed

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Tickborne Relapsing Fever

- caused by spirochetes *Borrelia hermslij*, *B. parkerii*, & *B. turicatae*
- Symptoms: recurring fever, generalized body aches, headaches, chills, and sweats
- 1st described in U.S. in CO in 1915- Upper Bear Creek Canyon in Evergreen
- reportable 1920-1930
- dropped from reportable disease list from 1931-1976
- investigation of a cluster of TBRF cases in 1977 appeared to trigger CDPHE to make TBRF reportable again in 1977

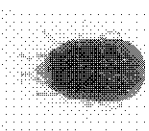
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Biology of TBRF

- Rodents such as ground & tree squirrels or chipmunks = typical environmental reservoirs
- Soft-bodied ticks (*Omithodorus*) = biological vector of TBRF & can transmit multiple different species of spirochete bacteria of *Borrelia* genus

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Biology of TBRF

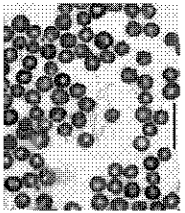


- Ticks bite typically @ night during sleep & usually attach for <1 hour. These bites are painless, rarely perceived or apparent, and typically go unnoticed
- transplacental transmission has been reported
- median incubation period= 7 days (range: 2–18 days)
- Without treatment, up to 10 relapsing episodes might occur
- mortality rate < 2% in treated patients & as high as 10% in untreated individuals



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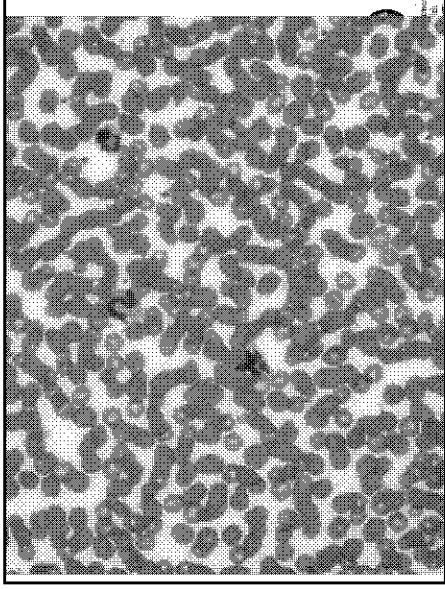
Diagnosis



- confirmed by blood culture or visualization of spirochetes on examination of a peripheral blood smear
- Blood smear examination during a febrile episode ~70% sensitive
- Other diagnostic methods: blood culture, PCR, and serology (CDC Fort Collins)



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TBRF background

- endemic in mountainous west & southwestern U.S.
- <30 cases reported nationally each year
- usually occurs during summer in people who are on vacation and/or are traveling to mountainous regions at higher elevations
- commonly reported in persons visiting seasonally-occupied cabins infested with rodents and/or their soft ticks

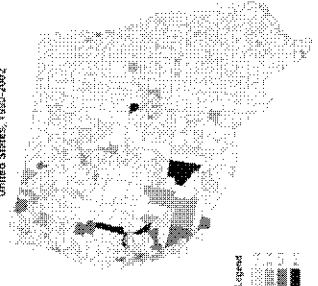


In the United States, TBRF most often occurs after staying in a rustic cabin where rodents have made their nests.



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Reported Cases of Tick-Borne Relapsing Fever by County United States, 1990-2002



Legend
 0
 1-2
 3-4
 5-6
 7-8
 9-10
 11-12
 13-14
 15-16
 17-18
 19-20
 21-22
 23-24
 25-26
 27-28
 29-30
 31-32
 33-34
 35-36
 37-38
 39-40
 41-42
 43-44
 45-46
 47-48
 49-50



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2011 Banner Year for TBRF

- YTD September 20th, 2011: 10 cases
- 8 confirmed & 2 probable
 - 1 case of vertical transmission to a term infant
- Median of 1.9 cases reported annually 2000-2010 (range, 0-4 cases/yr)
- 6 (60%) cases required hospitalization
 - all cases have or are expected to recover fully
- 6 (60%) cases exposed in San Luis Valley in/near Crestone in Saguache County
- 9 (90%) cases exposed in southcentral CO
- 4 (40%) case were in out of state visitors



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TBRF clusters

- Mother & infant in Saguache County- recently moved from Front Range into "rental" property
- Great Sand Dunes National Park (Saguache County portion of park)- 3 members of work crew overnighted in cabin accessible only by NPS rangers or contractors & visiting researchers
 - 2 from out of state
- Youth Camp west of Buena Vista- 2 out of state teenage volunteers; 625 campers & volunteers attend weekly
- Remaining individual cases:
 - Broomfield County resident visiting cabin in Teller County
 - Chaffee County resident visiting cabin in Crestone, Saguache County
 - Ouray County resident thought to be exposed @ home



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Investigations

- Local public health interviewed cases with support from EIS Officer Dr. Jeff McCollum
- Site visits by local environmental health if rental unit, lodging, or site of multiple case
- Environmental assessment, trapping of rodents & sample collection at GSDNP



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Reducing Risk

- crack & crevice acaricide treatment of cabins
- Rodent exclusion
- reduce rodent numbers (e.g. trapping)
- Removal of rodent nesting material-further facilitate tick remediation
- Consult with pest control specialist to develop overall integrated pets management plan



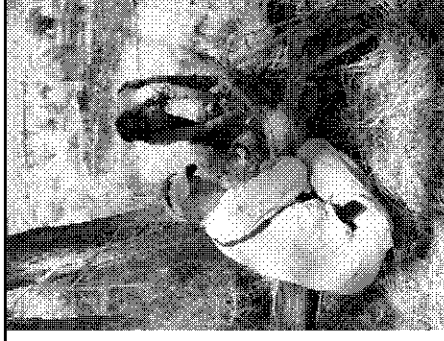
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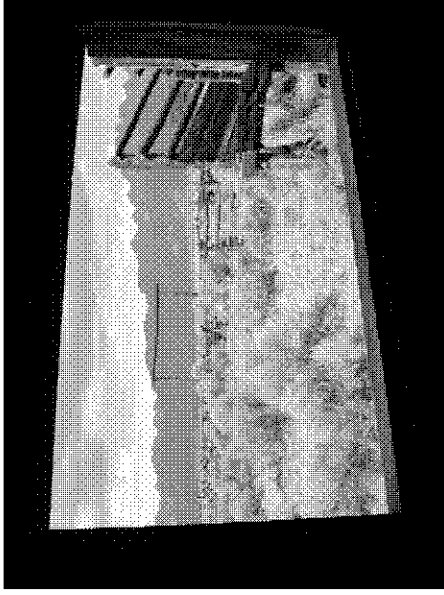


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GSDNP Environmental Investigation

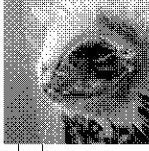
- 58 baited live animal traps were set 7/25/11 pm & collected 7/26/11 a.m.:
- 15 chipmunks, 2 woodrats, 1 rabbit
- One chipmunk blood- spirochete + & culture positive
- One *O. hermsii* tick from combing of rodents



Communicable Disease Epidemiology Program

Capnocytophaga canimorsus

- Commensal bacteria found in mouths of dogs & cats
- associated with dog & cat bites
- Two cases reported to CDPHE in 2010
 - ICU- Denver area
 - Death in Mesa County resident
- Neither had animal bites in history



Communicable Disease Epidemiology Program

Capnocytophaga canimorsus

- Patient from Denver area- who survived
 - 43 yr old veterinary technician
 - confusion, high fever, headache and neck pain
 - No pre-existing conditions other than obesity & gastroesophageal reflux disease
 - blood culture positive for G- negative rods identified as *Capnocytophaga* spp; species identification never completed
 - Reported drinking 5 - 6 drinks on weekends



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Capnocytophaga canimorsus

- Patient from Denver area- who survived
 - patient treated with IV antibiotics & was discharged home after 8 days
 - Theory: dog/cat saliva contact with pre-existing abrasions or mucous membranes



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Capnocytophaga canimorsus

- Fatal case from Mesa County
- admitted to an ICU in Mesa County with sepsis
- 3 days after onset of fever, vomiting, diarrhea, and "vision problems"
- Patient rapidly developed purpura fulminans & DIC
- Chest x-rays demonstrated some interstitial changes; no buboes where observed



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Capnocytophaga canimorsus

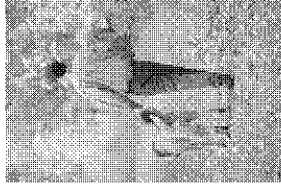
- Report from hospital of blood smear with numerous Gram negative rods (no isolate); attending healthcare providers concerned plague
- Blood specimen forwarded to CDPHE- inconclusive on PCR
- Forwarded to CDC over weekend- negative for plague



Communicable Disease Epidemiology Program

Capnocytophaga canimorsus

- MCHD conducted environmental assessment & interviews of family
- Hx:
 - walking his dog daily in area with history of plague in rodents
 - close intimate contact with his dog ("kissing dog on mouth")
 - possible exposure to feral cats at sister's house



Communicable Disease Epidemiology Program

Literature review

- retrospective study in Netherlands
- 32 cases of *C. canimorsus* documented over 3 years: 3 cases included a history of "dog licked wound", while 13 patients had a history of dog bite (3).
- One other fatal case of *C. canimorsus* without history of animal bite and misdiagnosed as plague appears in the literature (MMWR- New Mexico case)



Communicable Disease Epidemiology Program

Literature review

- can cause septicemia, meningitis, endocarditis, and rare ocular infections
- clinical course in severe infections is marked by disseminated intravascular coagulation, with a case-fatality rate of 25%
- Some experts recommend that persons with risk factors such as history of asplenia, alcoholism, or hematologic malignancy receive antibiotic prophylaxis following animal bites; susceptible to many antibiotics



Communicable Disease Epidemiology Program

REFERENCES

- Janda JM, Graves MH, Lindquist D, Probert WS. Diagnosing *Capnocytophaga canimorsus* infections. Emerg Infect Dis. 2006 Feb. Available from <http://www.cdc.gov/ncidod/EID/vol12no02/05-0783.htm>
- 2) CDC MMWR, February 05, 1993 / 42(04):72-73. *Capnocytophaga canimorsus* Sepsis Misdiagnosed as Plague -- New Mexico, 1992. Available from <http://www.cdc.gov/mmwr/preview/mmwrhtml/00019514.htm>
- 3) A. P. van Dam, and A. Jansz. *Capnocytophaga canimorsus* infections in The Netherlands: a nationwide survey. Clinical Microbiology and Infectious Diseases. 10.1111/j.1469-0691.2010.03195.



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