

Lyme Disease: Knowledge, Beliefs, and Practices of Physicians in a Low Endemic Area

Dr. Bonnie Henry, British Columbia Centre for Disease Control

A Webber Training Teleclass

BC Centre for Disease Control
 LYME DISEASE: KNOWLEDGE, BELIEFS, AND PRACTICES OF PHYSICIANS IN A LOW ENDEMIC AREA

Lyme Disease: Knowledge, Beliefs, and Practices of Physicians in a Low Endemic Area

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 Medical Director, Communicable Disease Control
 British Columbia Centre for Disease Control

Hosted by Jim Gauthier
 Providence Care
 Kingston, Canada

www.webbertraining.com December 12, 2013

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Outline

- Intro and history
- Lab testing
- Ecological niche model
- Surveillance review
- Physician awareness survey
 - Part I
 - Part II
- Field study
- Prevention messages

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Lyme Disease



Discovered in the early 80's in Connecticut
 #1 vector-borne disease in North America

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Background



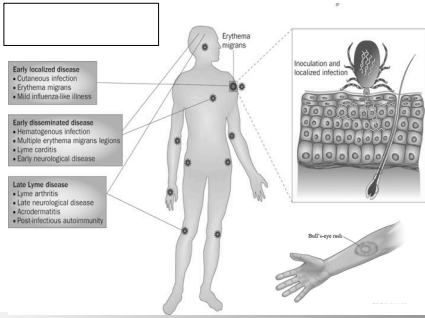
6 persons infected here could be 'tip of iceberg'

The tick TIMEBOMB

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Lyme Disease



Early localized disease

- Cutaneous infection
- Erythema migrans
- Mild influenza like illness

Early disseminated disease

- Hematogenous infection
- Multiple erythema migrans lesions
- Lyme carditis
- Early neurological disease

Late Lyme disease

- Lyme arthritis
- Late neurological disease
- Acrodermatitis
- Post-infectious autoimmunity

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Controversy



Intense conflict between mainstream medical/scientific community and Lyme Disease support/advocacy groups over "chronic Lyme disease"

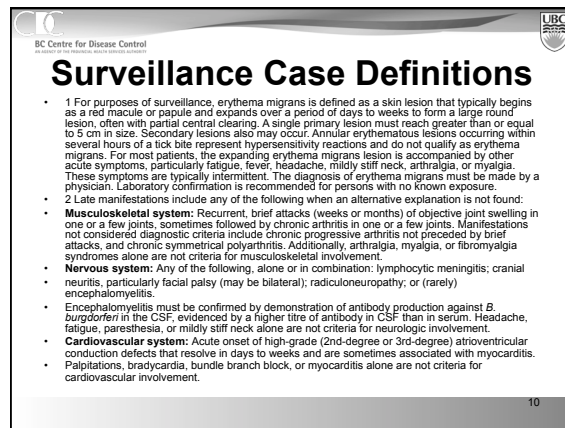
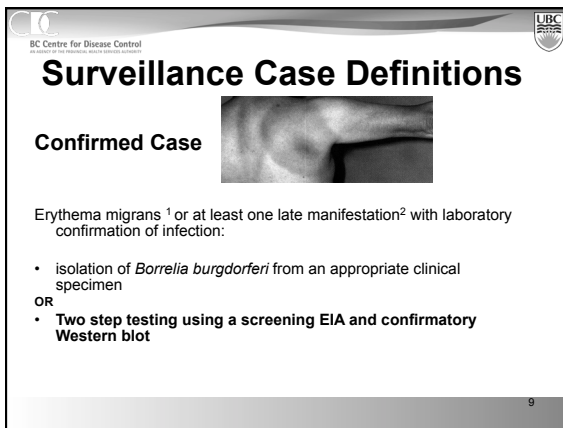
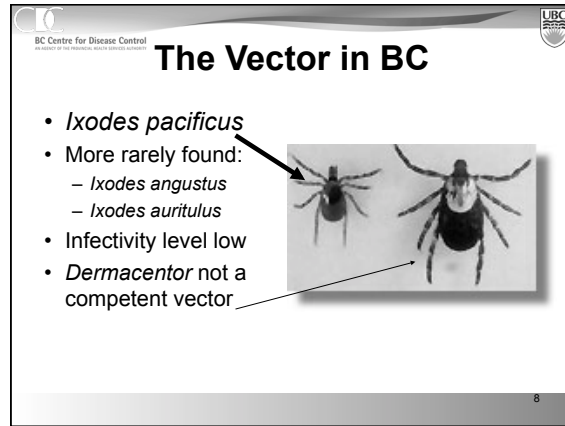
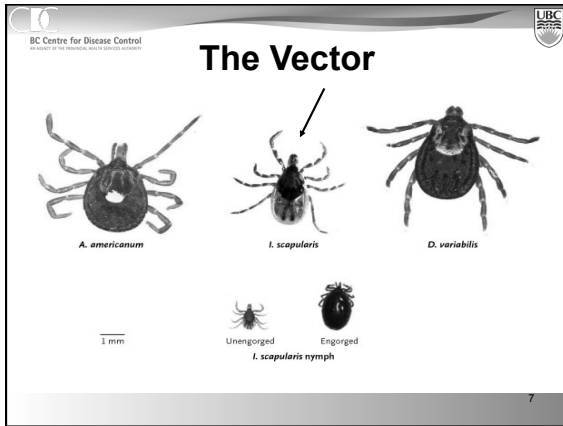
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Isolation and/or Detection of *Borrelia burgdorferi* from Tick and Mice Populations in B.C. (1993 – 1996)

Year	Tick		Mice	
	Culture Positive	Total	Culture Positive	Total
1993	21	3218	2	321
1994	12	2543	16	1360
1995	5	3178	7	888
1996	2	1117	0	197
	40	10056	25	2766
	0.40 %		0.90 %	

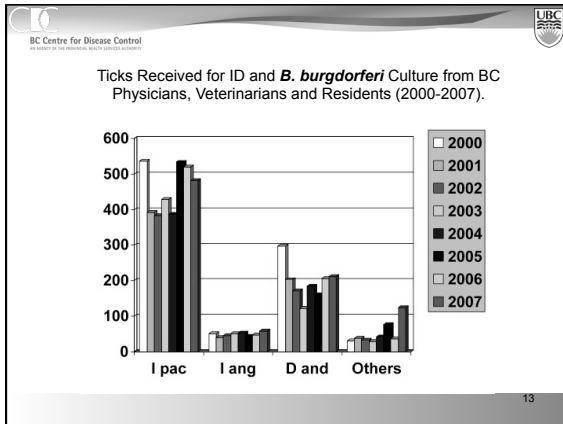
Isolation and/or Detection of *Borrelia burgdorferi* from Tick and Mice Populations in B.C. (1997 – 2007)

Year	Tick		Mice	
	Culture Positive	Total	Culture Positive	Total
1997	3	1491	3	309
1998	3	1509	2	268
1999	2	808	0	0
2000	3	611	0	0
2001	1	511	0	0
2002	3	430	0	0
2003	1	436	0	0
2004	7	1219	0	92
2005	5	733	0	126
2006	1	336	0	0
2007	1	518	0	38
	30	8602	5	833
	0.35 %		0.60 %	

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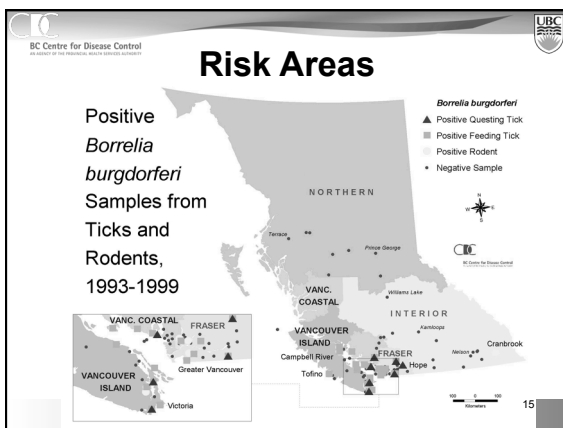


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Anti-borrelia Serology Tests on Deer Mice in BC

Year	Total Mice Sera Tested	IFA Positive	WB Positive
2005	33	5	0
2005	34	4	1
2005	34	8	3
2005	17	2	1
2007	46	15	1
3.66%	164	34	6

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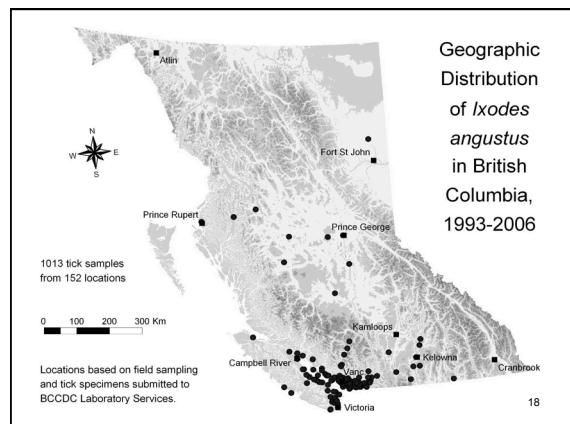
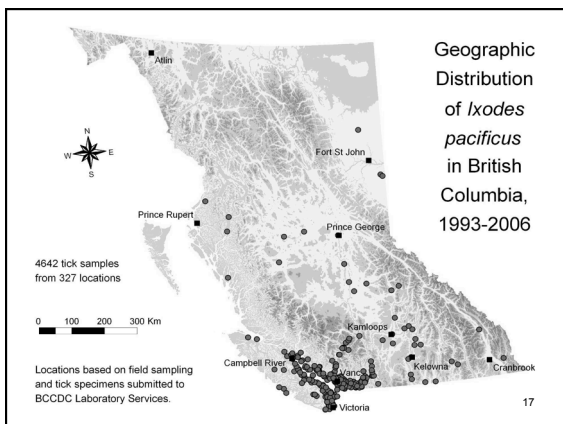


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Landscape Epidemiology

- Explores the relationship between the ecology and epidemiology of infectious diseases to identify geographical areas where disease transmission occurs
- → Ecological Niche Modeling
- Ecological niche: the total range of environmental conditions that are suitable for a species existence and maintenance of populations

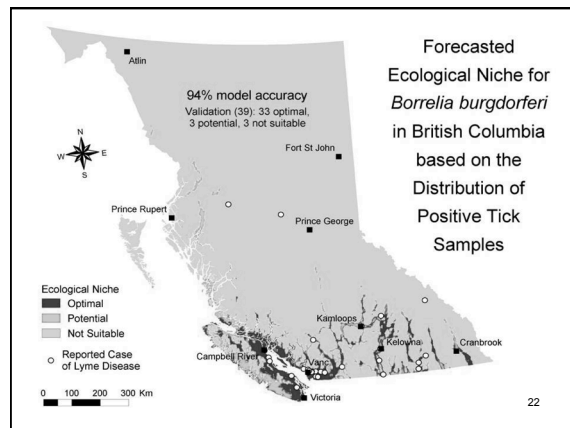
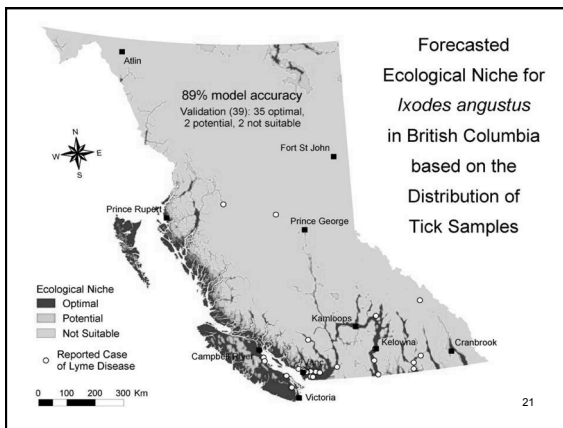
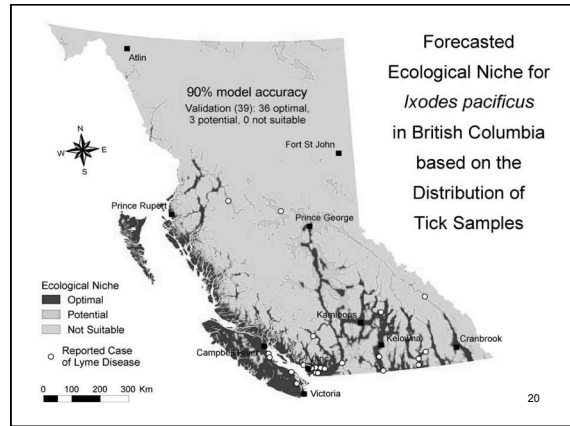
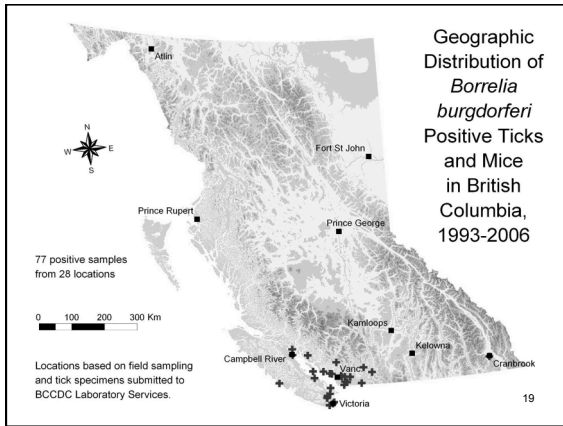
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Lyme Surveillance Review

- Reviewed all data from iPHIS, laboratory and enhanced surveillance databases
- From Jan 1, 1997 to Dec 31, 2008
- Compared annual rates with Washington and with high endemic states
- Capture-recapture methodology

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Results

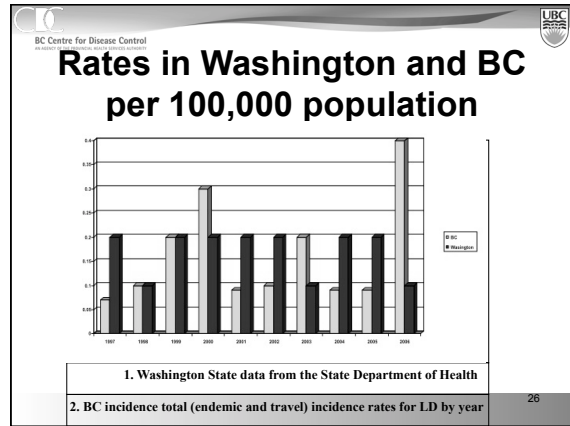
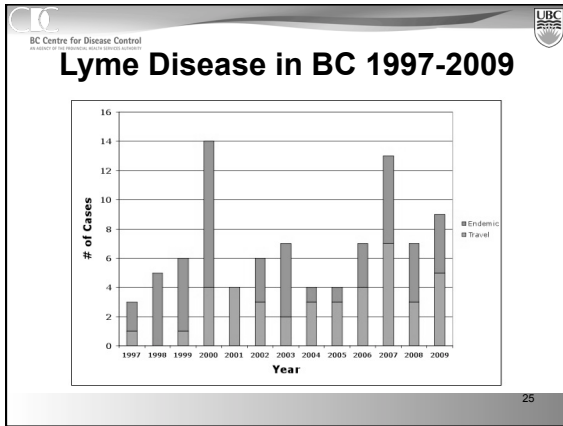
- 81 confirmed cases
- 44.1% male and 55.9% female
- Average age 48.7 and median age 52.5 years
- Range 4-88 years
- 42% were infected outside of BC
 - Primarily Europe and Eastern USA

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Capture-Recapture results

- Yielded an estimate of 120 (95%CI: 95 – 193) as the true number of LD cases in BC from 1997-2008
- Rates ranging from 0.33/100,000 to a maximum of 1.91/100,000
- High endemic states of the US rates: 29.2/100,000 population

Comparison to high and low endemic areas

Year	British Columbia		Washington State		California		Connecticut	
	Cases	Rate*	Cases	Rate*	Cases	Rate*	Cases	Rate*
1997	3	0.1	10	0.2	-	0.5	2297	70
1998	6	0.2	7	0.1	-	0.4	3434	104
1999	5	0.1	14	0.2	-	0.4	3213	98
2000	14	0.3	9	0.2	-	0.3	3773	111
2001	6	0.1	9	0.2	95	0.3	3597	106
2002	6	0.1	12	0.2	97	0.3	4631	136
2003	7	0.2	7	0.1	86	0.2	1403	41
2004	4	0.1	14	0.2	48	0.1	1348	40
2005	4	0.1	13	0.2	95	0.3	1810	53
2006	14	0.3	8	0.1	85	0.2	1788	53
2007	15	0.3	12	0.2	75	0.2	3058	90
2008	9	0.2	23	0.3	74	0.2	3896	114
	Avg. Rate	0.19	Avg. Rate	0.19	Avg. Rate	0.26	Avg. Rate	84.43

* all rates are per 100,000 population

Discussion

- Annual incidence rates low and stable over last 12 years
- Lyme is underreported in BC
 - Underreporting is common for rare diseases
 - Is this because cases are being missed or because they are not being reported?

Physicians Awareness Survey 2008

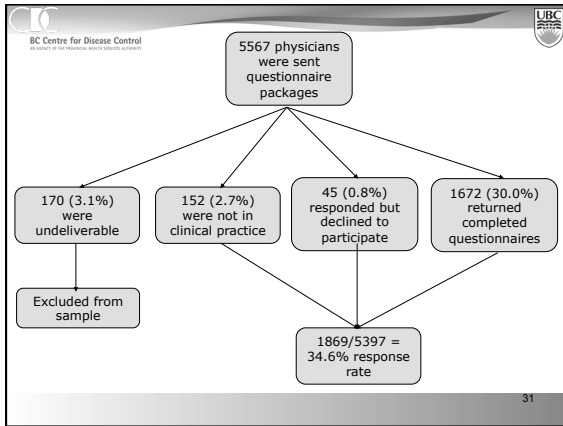
- Sent out to all family physicians and pediatricians, internal medicine specialists with a practice address in BC
- 81% of respondents were Family Physicians
- In practice for an average 21 years and saw average 122 patients/week
- Geographically representative of MDs in BC

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Results

- 148 respondents recalled diagnosing 221 cases of LD in 2007 (range 0-5)
- Only 13 cases were reported to public health in 2007
- Overall knowledge score: 73% (8.7/12) for FD and 75% (9.0/12) specialists

LD Knowledge

		Family Physicians	Specialists
EM rash is diagnosed in < 60% of patients	True	60.9%	54.4%
	False	25.4%	28.2%
	Don't know	13.8%	17.4%
The physical-exam finding of EM alone is enough to diagnose Lyme disease	True	26.1%	28.3%
	False	64.0%	58.6%
	Don't know	9.8%	13.2%
What is the name of the infectious agent that causes Lyme disease?	<i>Ixodes pacificus</i>	1.8%	0.7%
	<i>Borrelia burgdorferi</i>	98.2%	99.0%
	<i>Treponema pallidum</i>	0.0%	0.0%
	<i>Babesia microti</i>	0.0%	0.3%
What is the incubation period from tick bite to EM rash?	1-12 days	17.3%	20.4%
	3-30 days	64.8%	56.5%
	10-65 days	17.9%	23.1%

LD Knowledge

		Family Physicians	Specialists
Which one of the following diseases may be transmitted concurrently with Lyme disease?	Rocky Mountain Spotted Fever	62.9%	54.4%
	Anaplasmosis	10.1%	15.2%
	Chagas Disease	0.9%	1.7%
	Tickborne Relapsing Fever	26.2%	28.7%
Is Lyme disease a reportable disease in BC?	Yes	58.5%	65.8%
	No	6.3%	5.3%
	Don't know	35.1%	28.9%
When is testing for Lyme disease most appropriate?	When patient presents with EM	37.1%	32.8%
	When patient has a history of tick bite but is asymptomatic	9.0%	4.7%
	On initial presentation with follow up testing in 2 weeks	50.0%	57.3%
	Testing is not necessary	3.9%	5.1%
If a patient presents with EM and the initial lab test is negative, should they be retested 2 weeks later?	Yes	79.0%	76.6%
	No	6.8%	8.9%
	Not sure	14.2%	14.5%

Clinical Case 1

- 35 y.o. male presents with a rash
- History of hiking in the woods in South Vancouver Island
- Doesn't recall a tick bite
- No laboratory testing

Clinical Case 1

What would you do:

1. Treat with an antibiotic for Lyme Disease at this time
2. Reassure and educate the patient, with no further follow up
3. No treatment or testing now, but see patient back for follow up
4. Send patient for a test for LD
5. Refer patient to a specialist

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Case Scenario 1

- A patient with erythema migrans and no laboratory testing performed to date

Action	Family Physicians (%)	Specialists (%)
Antibiotic now	58	55
Pressure and educate	2	2
Follow-up	2	5
Test for Lyme disease	35	35
Refer to specialist	5	5

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Case 1: answer

- Correct answer: 1
- Physician diagnosed Erythema Migrans is sufficient to establish a diagnosis of Lyme Disease (given potential exposure history and area of exposure);
- Serologic confirmation is not necessary and could lead to delays in diagnosis and treatment due to false-negative EIA in early LD

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Case Scenario #2

- A patient with a known tick bite, no symptoms, no laboratory testing performed to date, and a normal exam

Action	Family Physicians (%)	Specialists (%)
Antibiotic now	8	4
Pressure and educate	52	62
Test for Lyme disease	40	32
Refer to specialist	2	5

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Case Scenario #3

- A patient with recurrent, asymmetric arthritis that began 3 months ago, no history of EM, and multiple negative Western blot tests for Lyme disease

Action	Family Physicians (%)	Specialists (%)
Antibiotic now	12	9
Pressure and educate	42	48
Follow-up	2	3
Test for Lyme disease	6	8
Refer to specialist	42	35

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LD Survey I

- Over 90% recognized there was a risk of LD in BC
- Level of risk highly correlated with geographic risk (statistically significant)
- 31% FD and 12% specialists had treated someone for LD due to patient concern despite believing they did not have LD
- 30% didn't know LD is reportable to PH

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LD Survey I

- What does 'diagnosed' mean?
- Are people being diagnosed by more than one doctor?
- Why are people not reporting?
- Led to Lyme II study

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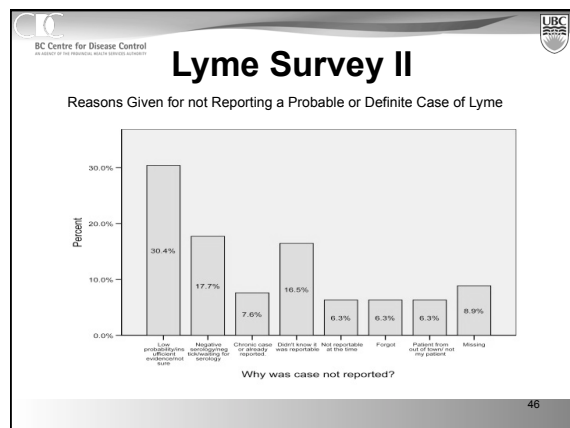
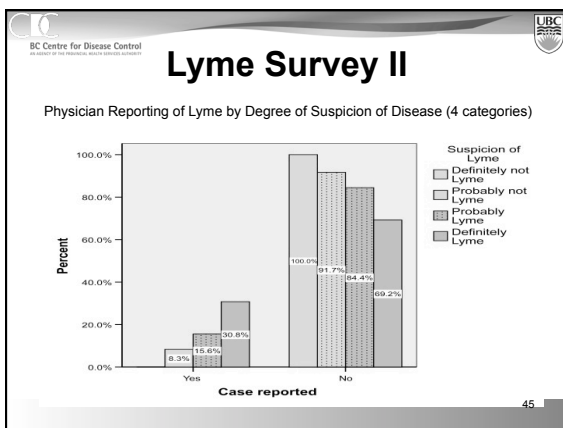
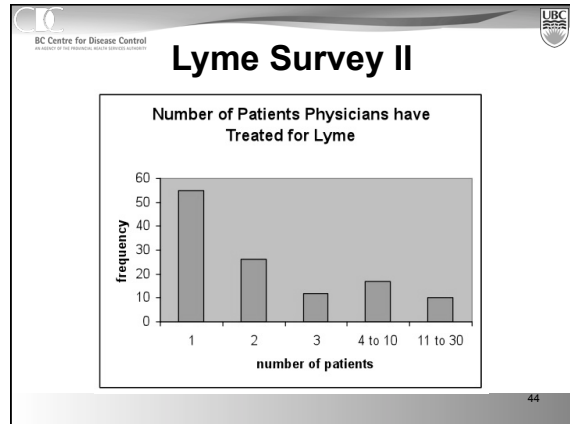
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Lyme Survey II

- Sample of 1500 physicians sent survey
- 424 responded (29.9%)
- Years in practice: mean 17.4 years (range 1-60)
- 28.3% (120/424) indicated they had treated at least 1 patient for Lyme
- Average number treated 3.02 (range 1-30)

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Need for Field Study

- Field tick surveillance is necessary to assess the risk of contracting Lyme disease in different regions of BC
- No field surveillance carried out since 2007 (research)
- Some studies in eastern Canada show the Lyme disease carrying tick population increasing (climate change)

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Goal of Study

- Update current status of tick surveillance data
- Share data with provincial health authorities
- Field data driven public health policies and programs for prevention of Lyme disease in BC
- Update GIS map of ticks and Lyme disease positive areas
- Determine if tick population is expanding (climate change)
- Metagenomic analyses for novel pathogens in ticks

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Field Work

11 sites

Location > risk area

Time > suitable temperature

80% model accuracy
Western US, BC coastal, temperate, and subarctic

Ecological Niche
 ☐ Coastal
 ☐ Plateau
 ☐ Wet Slopes
 ☐ Mountain
 ☐ Dry Slopes

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- May to September 2013 weekly (break for 3 weeks in August due to Temp)
- Around 3 to 4 days per trip
- Work hours range from 8 to 12 hours
- Need 2 days to autoclave, clean, and replenish supplies

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- Finished field work in early September 2013
- Full time lab work since then
- Currently finished the ID and PCR parts of the study

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Results

Mice (n=238)

- ID individually
- Tick collection
- Dissection (x6)
- Extraction (x2)
- Real-time PCR (x2)
- IFA (+ > WB)

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Results

Species	Male	Female
<i>Peromyscus maniculatus</i>	114	99
<i>Perognathus parvus</i>	3	8
<i>Reithrodontomys megalotis</i>	5	8

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Results

Ticks (n=467)

All from mice, none from flagging

- ID individually
- Pooled by stages
- Extraction
- Real-time PCR

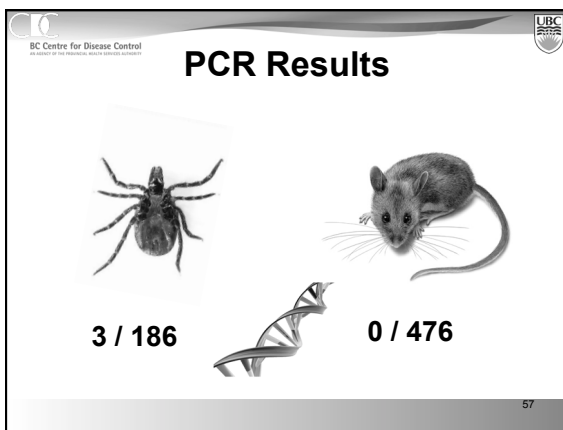
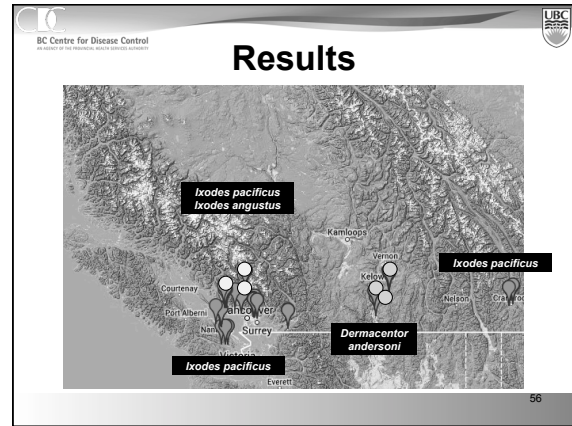
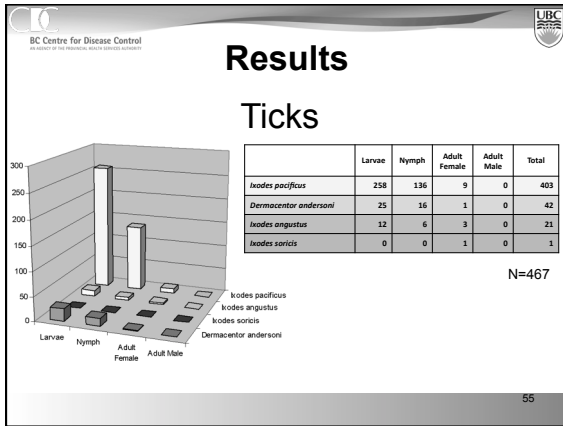
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- ## Summary
- The mouse / tick population is similar to our previous studies (need further analysis)
 - Three *Ixodes pacificus* ticks were PCR positive
 - The three tick positive sites are repeat positives from previous BC study
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- ## Summary
- Mouse serology testing is ongoing.
 - Metagenomics study has yet to be done.
 - The field study will be performed in 2014 at the same locations.
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- ## Public Health Action
- There is a clear but low risk of Lyme Disease in BC
 - Laboratory results need to be taken in context of risk
 - Monitoring of trends and geographic distribution helps with risk assessment
 - No specific **public health** intervention
 - Risk assessment allows tailored messages for prevention: **no tick bite=no Lyme disease**
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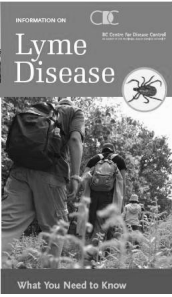
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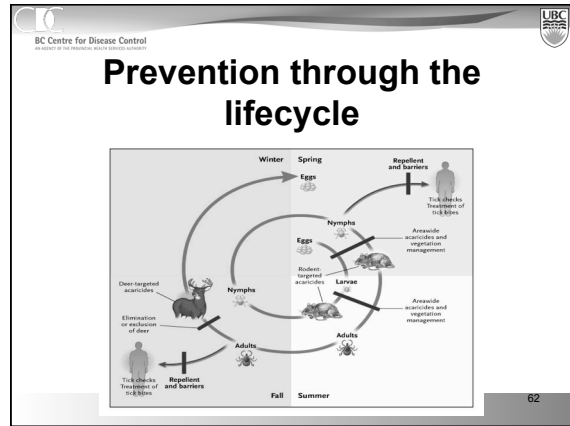
Prevention is key

- To prevent tick bites the following measures are strongly recommended:
 - Walk on cleared trails;
 - Wear a hat, long sleeves and pants and light coloured clothing;
 - Tuck pant legs into socks or boots;
 - Use an insect repellent containing DEET on clothing and exposed skin



What You Need to Know


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Knowledge Translation

- Pamphlets for parents at parks etc
- Mailings and articles for physicians
- Messages in media
- BUT




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Tick talk

- Partnered with UBC

http://www.bccdc.ca/dis-cond/a-z/_/LymeDisease/ticktalk/default.htm



<http://www.youtube.com/watch?v=ACu5mliVAus>

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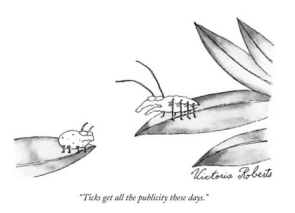
Aknowledgements

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- Sophie Li
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- Anne- Marie Nicol

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Thank you



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Coming Soon

18 December *(EBEE - WHO Teleclass - Europe)*
CONTROL OF MULTI-DRUG RESISTANT ORGANISMS IN THE NURSING HOME SETTING
Prof. Andreas Voss, Nijmegen University, Netherlands

19 December **IS THERE VALIDITY TO VRE TESTING AND SCREENING?**
Dr. Michelle Alpha, University of Winnipeg

21 January *(EBEE - British Teleclass)*
HUMAN ERROR THEORY - CAN IT HELP US UNDERSTAND AND MINIMIZE THE INCIDENCE AND IMPACT OF OUTBREAKS?
Dr. Evonne Curran, Glasgow University, Scotland

23 January **HAND HYGIENE OVER THE DECADE: 2004-2014**
Dr. Elaine Larson, Columbia University

30 January **UNIVERSAL MRSA SCREENING - IS IT WORTHWHILE, AND FOR WHOM?**
Dr. Barry Cookson, London School of Hygiene and Tropical Medicine

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