

Tickborne Diseases in the United States

CSTE Vectorborne Diseases Subcommittee Webinar Series

April 7, 2015

3:00 – 4:00 pm Eastern



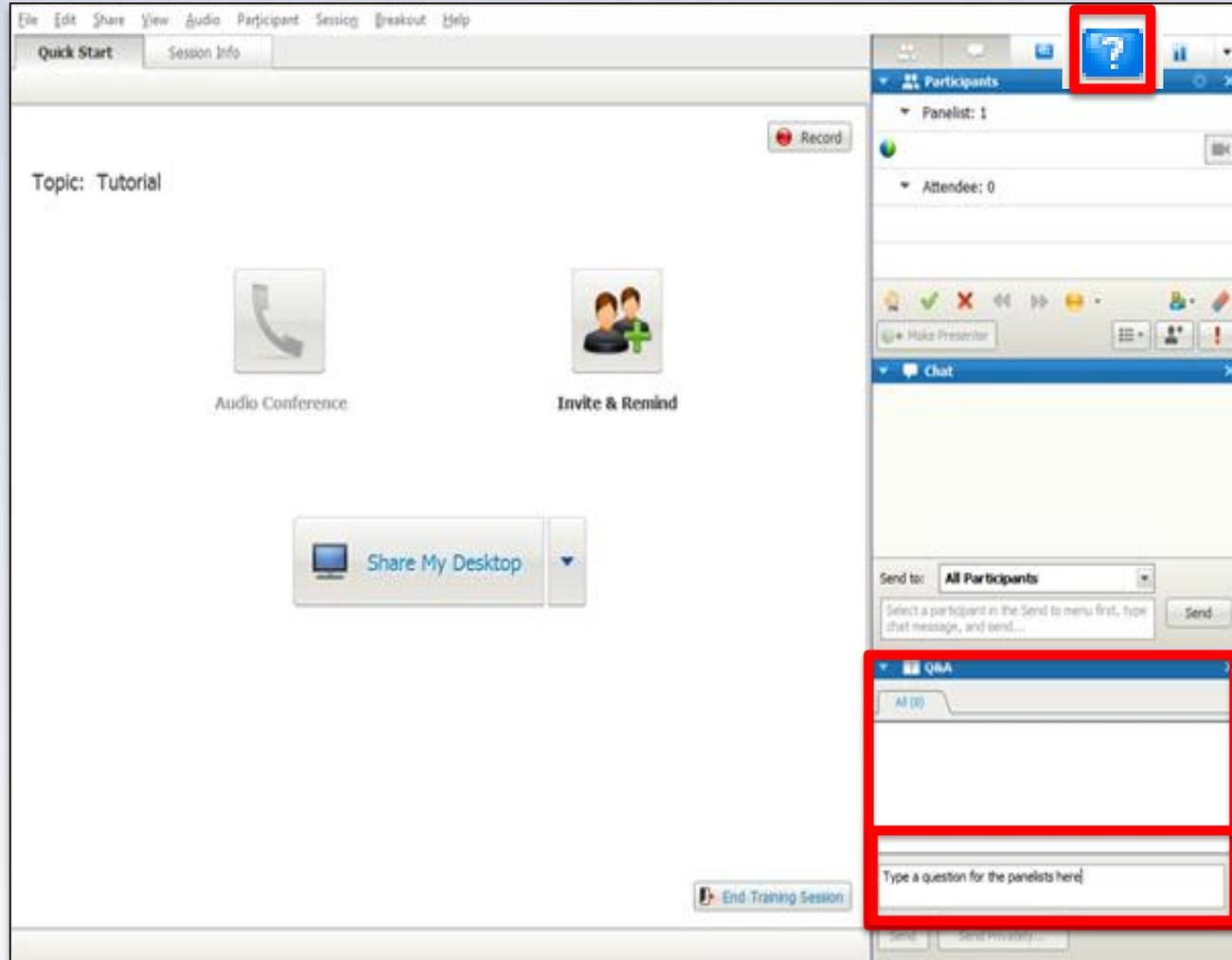
**COUNCIL OF STATE AND
TERRITORIAL EPIDEMIOLOGISTS**

Webinar Housekeeping

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- **All phone lines have been placed on mute**
- **There will be a question-and-answer session at the end of the webinar**
 - To ask a question, please use the Q&A box on the right side of your screen

To Ask a Question

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- This will open the Q&A box on the bottom right panel on your screen
- Type a question
- Send questions to All Panelists
- Questions will be answered during the Q&A period



U.S. Healthcare Providers' Experience with Lyme and Other Tickborne Diseases



Alison Hinckley, PhD

Division of Vector-borne Diseases | Bacterial Diseases Branch

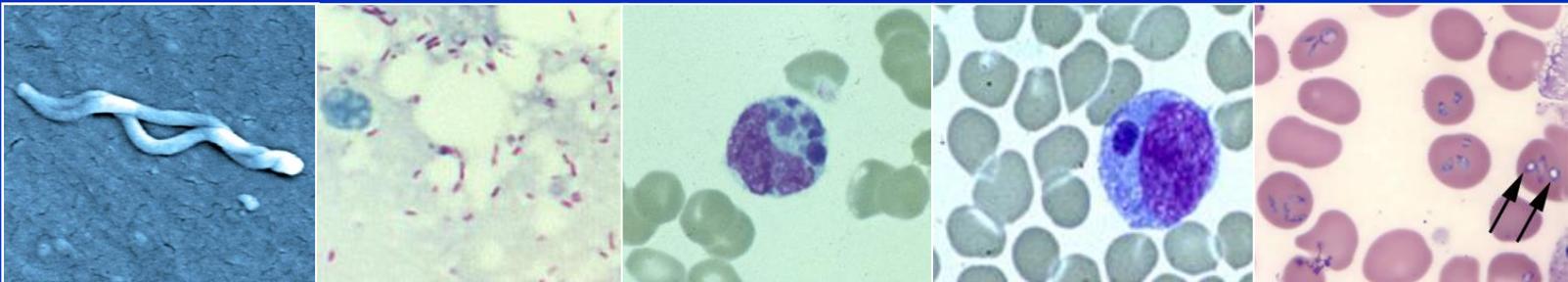
National Center for Emerging and Zoonotic Infectious Diseases

Division of Vector Borne Diseases | Bacterial Diseases Branch



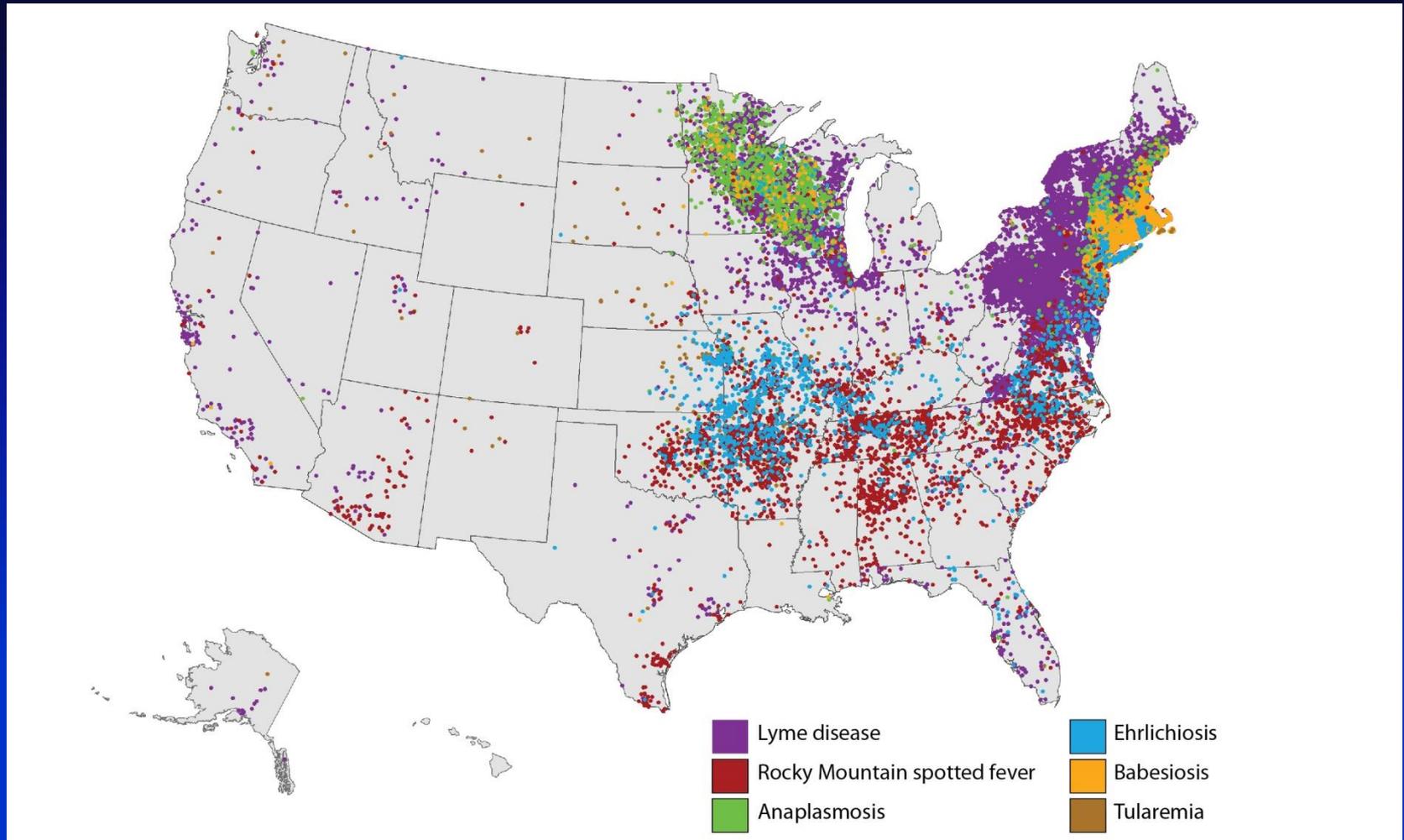
Leading Tickborne Diseases in U.S.

- ❑ Lyme disease (*Borrelia burgdorferi*)
- ❑ Rocky Mountain spotted fever (*Rickettsia rickettsii*)
- ❑ Ehrlichiosis (*Ehrlichia chaffeensis*, others)
- ❑ Anaplasmosis (*Anaplasma phagocytophilum*)
- ❑ Babesiosis (*Babesia microti*)



For information on other tickborne diseases, visit www.cdc.gov/ticks

Distribution of Key Tickborne Diseases, 2013



Diseases reported to CDC by state health departments. Each dot represents one case. The county where the disease was diagnosed is not necessarily the county where the disease was acquired.

Number of Selected Tickborne Disease Cases Reported to CDC, 2013

Lyme disease ¹	36,307
Spotted Fever Rickettsiosis ^{1,2}	3,359
Anaplasmosis	2,782
Ehrlichiosis ³	1,518
Babesiosis	1,792

Source Notifiable Diseases and Mortality Tables, **August 15, 2014 / 63(32);702-715**

¹ Confirmed and probable cases

² Includes Rocky Mountain spotted fever

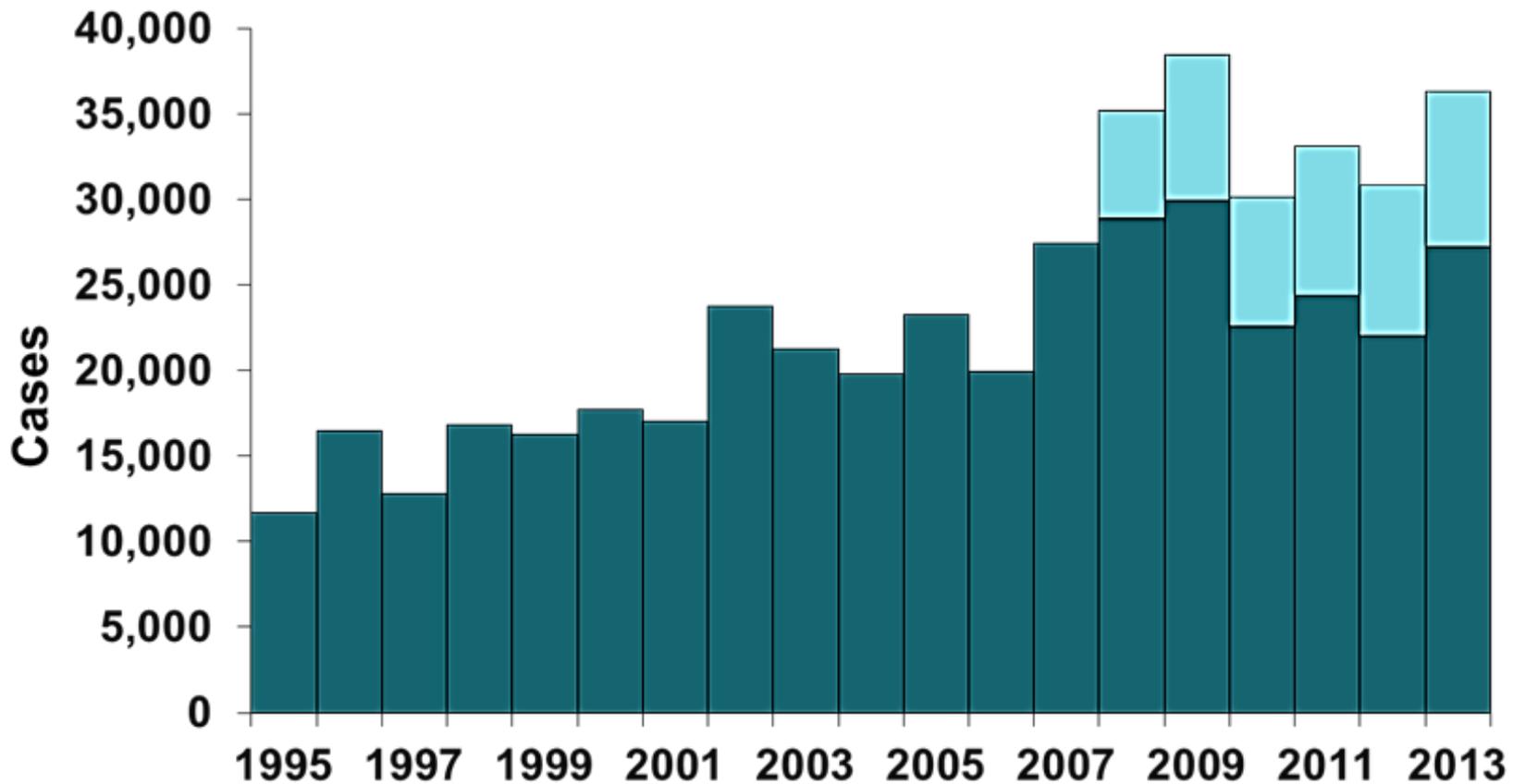
³ *Ehrlichia chaffeensis*

Top 7 Nationally Notifiable Infectious Diseases, United States, 2013

Disease	Reported Cases
1. Chlamydia	1,401,906
2. Gonorrhea	333,004
3. Syphilis	56,471
4. Salmonellosis	50,634
5. Lyme disease	36,307
6. HIV/AIDS*	35,361
7. Pertussis	28,639

* Data for 2012

Reported Lyme Disease Cases by Year, United States, 1995-2013



*National Surveillance case definition revised in 2008 to include probable cases;
details at http://www.cdc.gov/ncphi/diss/nndss/casedef/lyme_disease_2008.htm

Diagnosis and Treatment

- ❑ Early detection and appropriate treatment is crucial for reducing morbidity and mortality
- ❑ Timely diagnosis and management may be hindered due to:
 - unrecognized tick bites
 - non-specific symptoms
 - a lack of familiarity by the health care provider
- ❑ Antibiotic prophylaxis for tick bites may be useful to prevent Lyme disease; not recommended for other TBDs

Objective

To better characterize current provider experiences related to TBDs in the United States



Specific Aims

1. What providers know about diagnosis and management of TBDs
2. What their practices are with regard to post-tick bite prophylaxis
3. Where they obtain information regarding TBDs

Methods

- ❑ ***DocStyles 2009* - a web-based national survey of U.S. healthcare practitioners**
 - Quotas for specific practitioner types
 - Information about provider demographics and practice characteristics
 - 4 questions (out of 140) regarding TBD management and resources
- ❑ **Chi-squared tests used to compare practitioners**
- ❑ **Lyme disease (LD) incidence in practice area also used to compare**

Characteristics of Healthcare Providers

- ❑ Median age 43 years; 61% male
- ❑ 73% non-Hispanic
- ❑ 64% primary care providers
- ❑ Median duration in practice: 12.5 years
- ❑ Median number of patients seen per week: 101
- ❑ Geographic distribution
 - Practitioners from 49 states and the District of Columbia
 - 665 (33%) practiced in high LD incidence states

“I am knowledgeable regarding the diagnosis and clinical management of TBDs”

- Overall,
 - 1393 (69.7%) agreed or strongly agreed
 - Dermatologists (88.8%) most likely to agree
 - Nurse practitioners (63.2%) and OB/GYNs (31.6%) least likely to agree
- Characteristics
 - Practitioners in high LD incidence states more likely to agree (79% vs. 65%)
 - Practitioners with >100 patients/wk (OR = 1.3)
 - Male (OR = 1.4)
 - ≤40 years old (OR = 1.3)

“For which of the following TBDs have you treated a patient in the last year?”

Practitioner Type	n	Any TBD %	Lyme Disease %	RMSF^a %	Ehrlich. or Anaplas. %
Family/general practice (ref)	609	56.2	48.8	12.5	8.5
Internist	391	59.1	55.0	9.7	9.7
Dermatologist	250	59.6	57.6	8.4	4.4
Nurse Practitioner	250	48.8	44.8	10.0	4.4
Obstetrician/Gynecologist	250	19.2	18.0	1.2	0.8
Pediatrician	250	53.2	49.2	8.4	7.2

High Incidence vs. Low Incidence Differences: TBD Treatment



Lyme disease

- ❑ 74% in high incidence vs. 33% in low incidence states
- ❑ No difference in provider characteristics

RMSF

- ❑ 54% of practitioners from southeastern states
- ❑ Characteristics
 - Male (OR = 1.4)
 - Have >100 patients/wk (OR = 1.5)
 - Practice in the South (OR 2.6)
- ❑ 52% also diagnosed at least one case of LD



Tick Bite Prophylaxis

- Overall,
 - 31% prescribed for 1+ patients in past year
 - Dermatologists (41.2%), family practitioners (39.7%) most often
 - Pediatricians (22.8%) and OB/GYNs (12%) least often
- Characteristics
 - Practitioners in high LD incidence states more likely (OR = 2.0)
 - Practitioners with >100 patients/wk (OR = 1.5)
 - Practicing for >10 years (OR = 1.3)
 - Practitioners in individual practices (OR = 1.5)

Tick Bite Prophylaxis – cont.

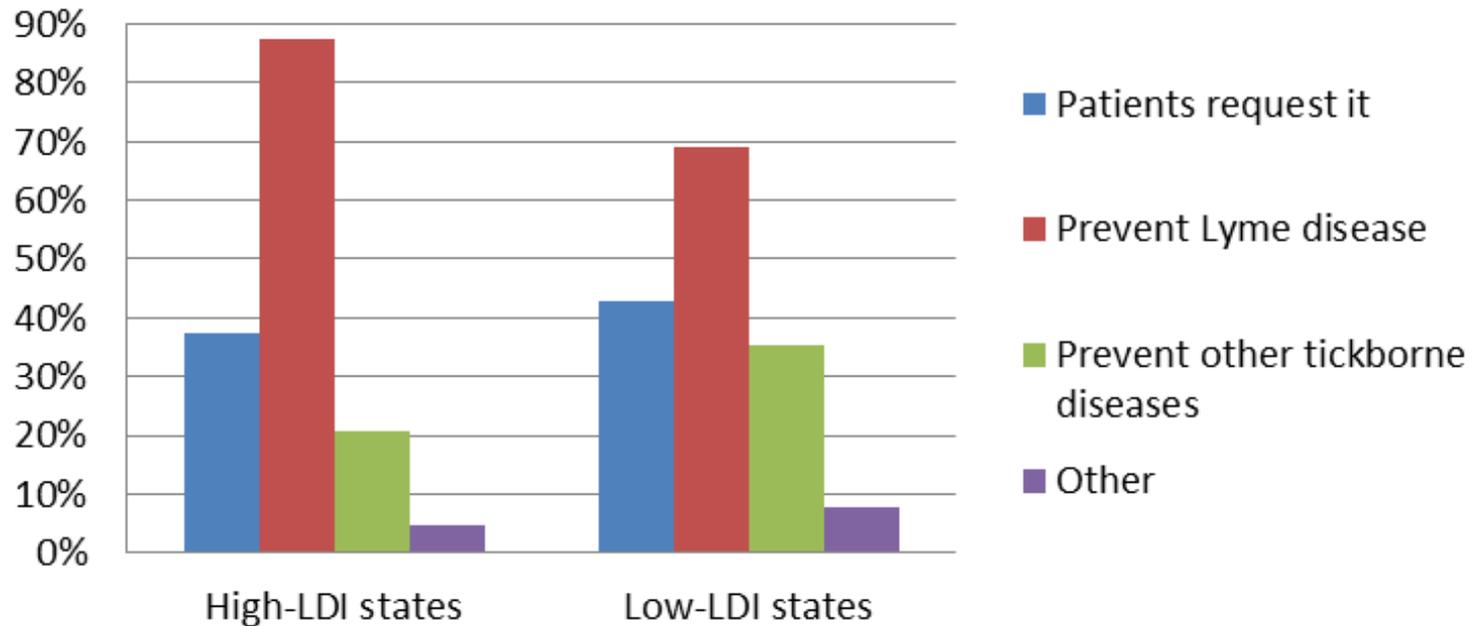
- ❑ 43.8% of practitioners who treated patients for LD also prescribed tick bite prophylaxis that year

Vs.

- ❑ 44.2% of practitioners who only treated other tickborne diseases prescribed tick bite prophylaxis that year

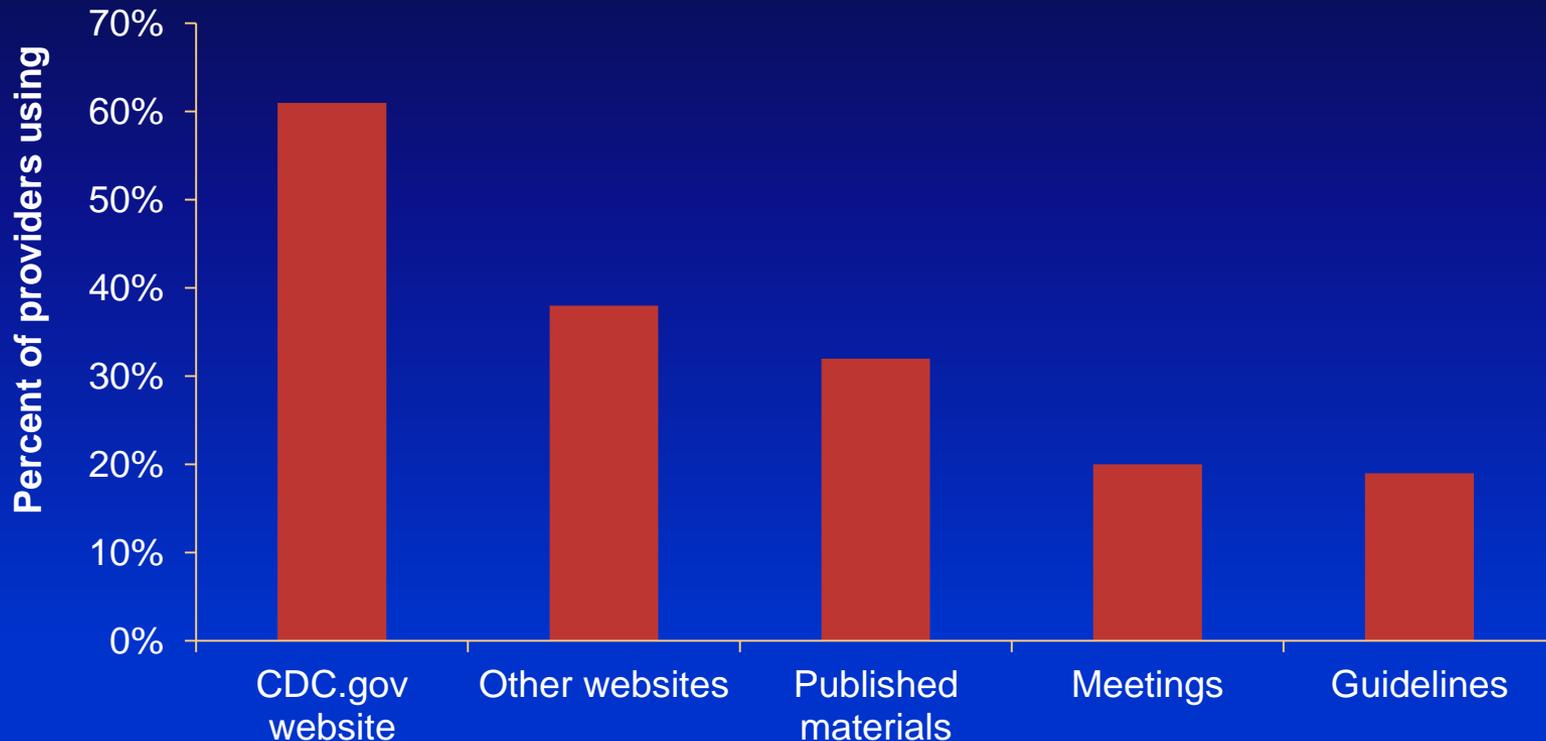
Why prescribe prophylaxis for tick bites?

Reasons for prescribing prophylaxis by region



*Participants could choose more than 1 response; totals may exceed 100%

“From which of the following sources do you get information on the management of TBD?”



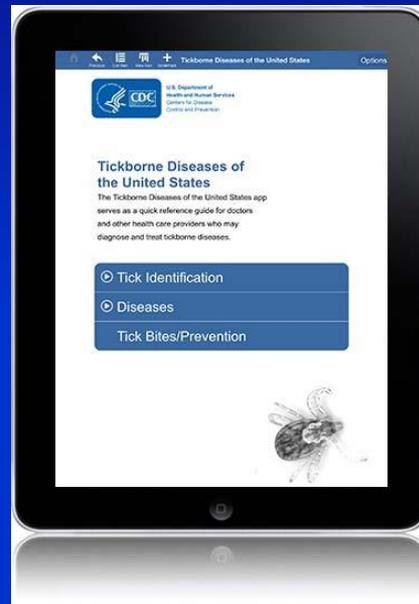
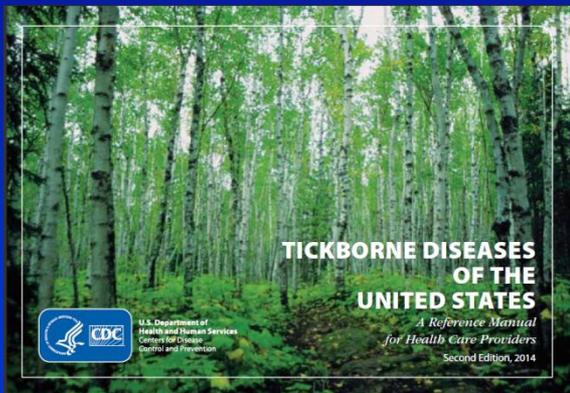
*Websites were used most commonly by OB/GYNs (93.2%) and least often by dermatologists(69.6%). There were no differences among website users by work setting, age, number of patients per week, or years of practice.

Summary

- ❑ Nearly half of surveyed practitioners reported treating at least one patient for TBDs in the past year
- ❑ OB/GYNs feel less knowledgeable and reported treating patients with TBDs less frequently
- ❑ 1/3 practitioners in low incidence states reported treating a patient for LD
- ❑ Tick bite prophylaxis is prescribed frequently by all providers; this includes practitioners in low incidence states
- ❑ Websites are an excellent way to communicate to practitioners

Tickborne Diseases of the United States: A Reference Manual for Healthcare Providers

- View pdf online at www.cdc.gov/Lyme
- Order hard copies at www.cdc.gov/pubs/
- [Download the iOS app](#) (Android version coming soon!)



Includes:

- Tick ID
- Disease maps
- Symptoms
- Lab diagnostics
- Treatment
- References
- Prevention

Other Educational Opportunities

See <http://www.cdc.gov/lyme/healthcare/clinicians.html>

- CME Case Study Course on the Clinical Assessment, Treatment, and Prevention of Lyme Disease.
 - Free, interactive course consists of a series of case studies designed to educate clinicians regarding the proper diagnosis and treatment of Lyme disease. Each case is accredited for .25 CME credits, for a maximum of 1.5 CME.
- Tick-borne Illness: Prevention, Assessment and Care
 - The National Association of School Nurses presents an online course that focuses on clinical care of tickborne diseases in school and camp settings. CNE is available.
- Tickborne Diseases: A Springtime Review of Diagnosis, Treatment and Prevention
 - Free, CDC-sponsored Clinician Outreach and Communication Activity (COCA) to help providers properly identify and treat tickborne diseases. CME/CNE/CECH available.



Thank you!

For more information:

Brett ME, Hinckley AF, Zielinski-Gutierrez EC, Mead PS. U.S. healthcare providers' experience with Lyme and other tick-borne diseases. *Ticks and Tick-Borne Diseases*. 2014 Jun;5(4):404-8.

Perea AE, Hinckley AF, Mead PS. Tick Bite Prophylaxis: Results From a 2012 Survey of Healthcare Providers. *Zoonoses Public Health*. 2014 Sep.

Disclaimer: The findings and conclusions in this presentation are those of the authors and do not necessarily represent the views of the Centers for Disease Control and Prevention.

Spotted Fever Group Rickettsiosis and *Amblyomma americanum*

Scott Dahlgren
Epidemiologist

CSTE VPD Subcommittee Webinar
April 7, 2015

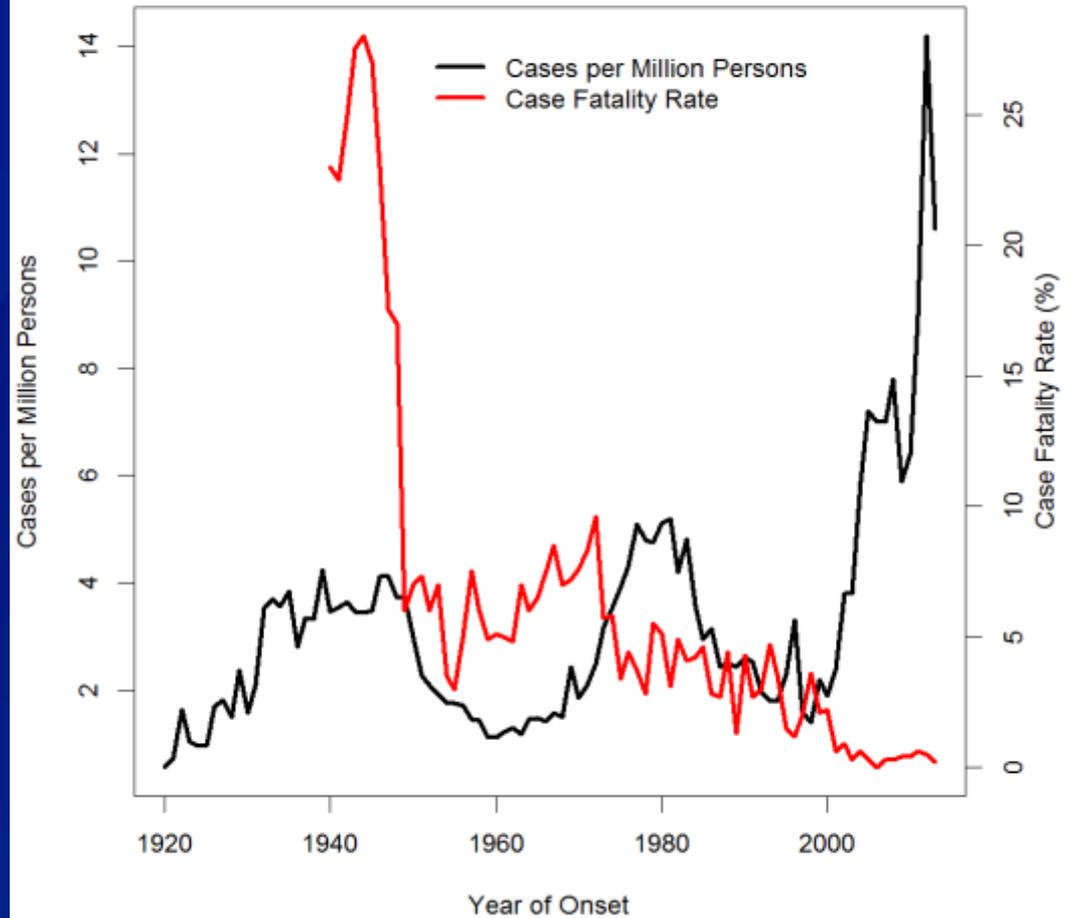
Spotted fever group rickettsiosis

- **Rocky Mountain spotted fever (RMSF) is the most severe spotted fever group (SFG) rickettsiosis.**
 - Vectors: *Dermacentor* ticks and *Rhipicephalus sanguineus*
 - Non-specific presentation: fever, headache, rash
 - Early treatment with doxycycline leads to fast recovery
 - >20% case fatality rate in pre-antibiotic era
- **Other SFG rickettsiosis are less severe**
 - Vectored by a variety of ticks and arthropods
 - Clinically indistinguishable from RMSF
 - Treated with doxycycline
 - Very low case fatality rate



Changes in epidemiology of SFG rickettsiosis

How much of the increased incidence of SFG rickettsiosis is attributable to an increased incidence of RMSF?



Amblyomma americanum

- ***Amblyomma americanum* (lone star tick)**
 - is an aggressive biter
 - vectors known human pathogens
 - *Ehrlichia chaffeensis*,
 - *Ehrlichia ewingii*, and
 - *Francisella tularensis*.
 - often harbors *Rickettsia amblyommii*.
 - >10% of *A. americanum* infected with *R. amblyommii*, while
 - <1% of tick vectors for RMSF are infected with *Rickettsia rickettsii*

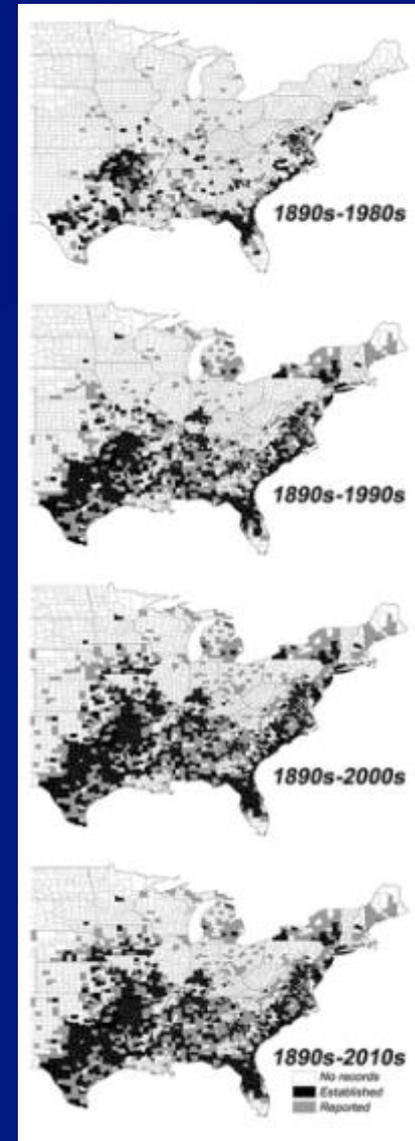


Introduction

A contemporaneous expansion of the lone star tick (*Amblyomma americanum*).



Spatial distribution of counties in the continental United States with records of occurrence of *Amblyomma americanum*. Springer YP, Eisen L, Beati L, James AM, and Eisen RJ. *J Med Entomol* 2014(51):342



Hypothesis

- Changes in reported epidemiology of SFG rickettsiosis are due to changes in epidemiology of less severe rickettsioses.



Methods

- **Springer and others created a comprehensive database of *Amblyomma americanum* for counties in the United States from 1898–2013.**
 - Classified counties as “Established” if a study reported
 - 6 more or more ticks or
 - 2 or more life stages
 - Classified counties as “Reported” if a study reported 1–5 ticks of a single life stage.
 - Classified counties as “Absent” if a no qualifying reports.
 - Time resolution at decade, for this study 1980s–2010s

Methods

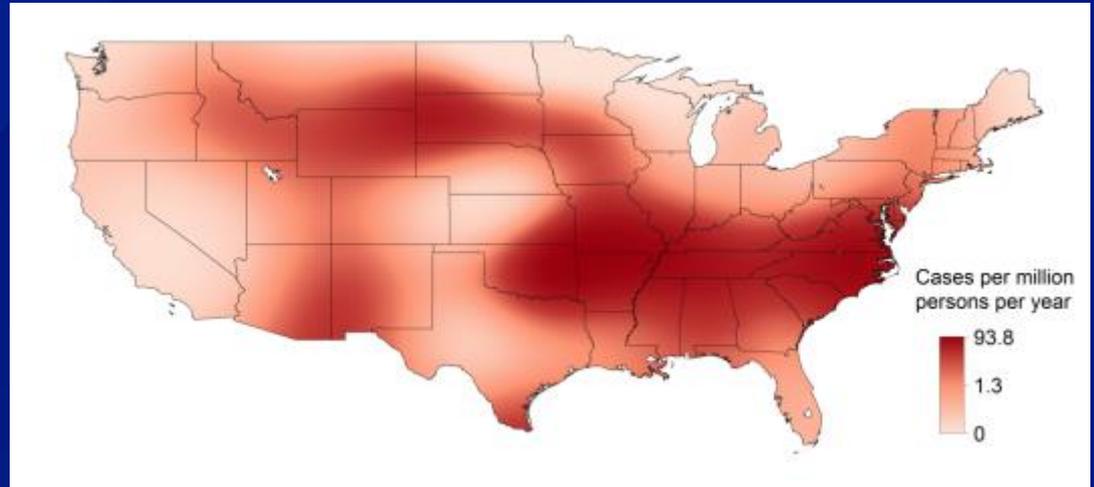
- **The CDC collects case reports of spotted fever group rickettsiosis (formerly known as RMSF) using two passive surveillance systems**
 - Paper case report forms sent directly to the Rickettsial Zoonoses Branch: since 1981
 - County of residence
 - Hospitalization
 - Survival
 - Case reports sent to the Nationally Notifiable Disease Surveillance System:
 - County of residence since 1993

Methods

- **Build generalized additive model (GAM) for counties and decades regressed on status of *Amblyomma americanum* and decade for**
 - Incidence rate from the 1990s–2010s
 - Hospitalization rate from the 1980s–2010s
 - Case fatality rate from the 1980s–2010s

Results*

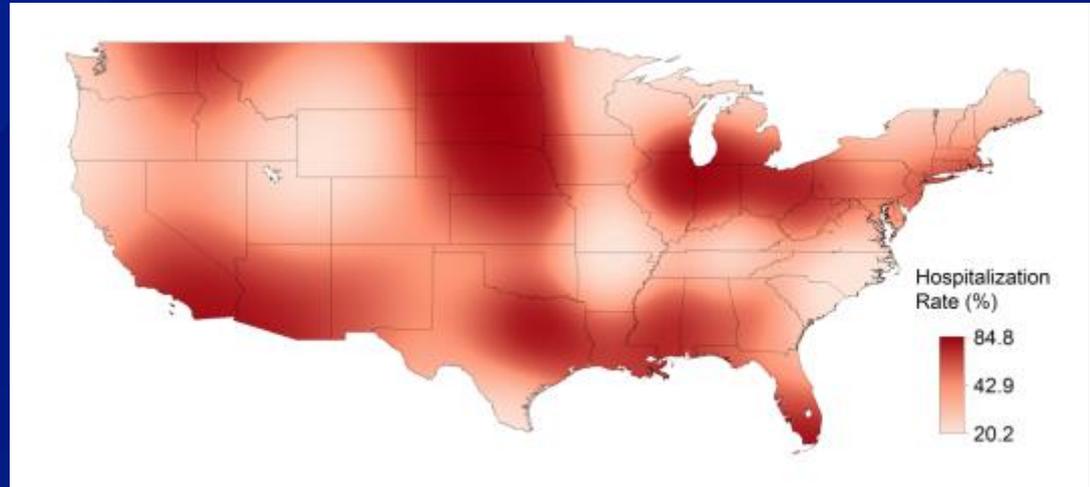
A map of the incidence rate of RMSF, 1993–2013. Results are from a GAM containing only a thin plate spline.



*Preliminary data, subject to change

Results*

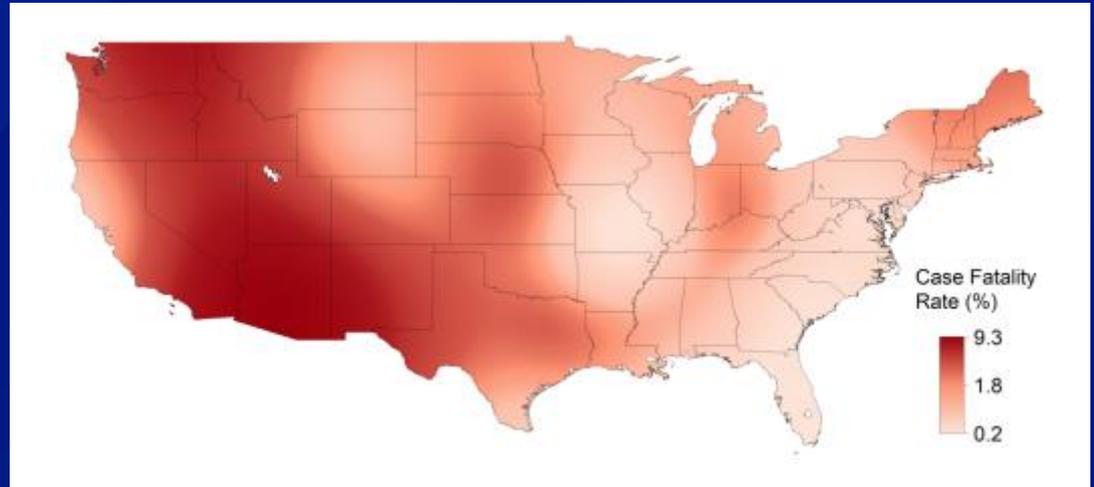
A map of hospitalization rate of RMSF, 1981–2013. Results are from a GAM containing only a thin plate spline.



*Preliminary data, subject to change

Results*

A map of case fatality rate of RMSF, 1981–2013. Results are from a GAM containing only a thin plate spline.



*Preliminary data, subject to change

Results*

Crude summary statistics of human surveillance data.

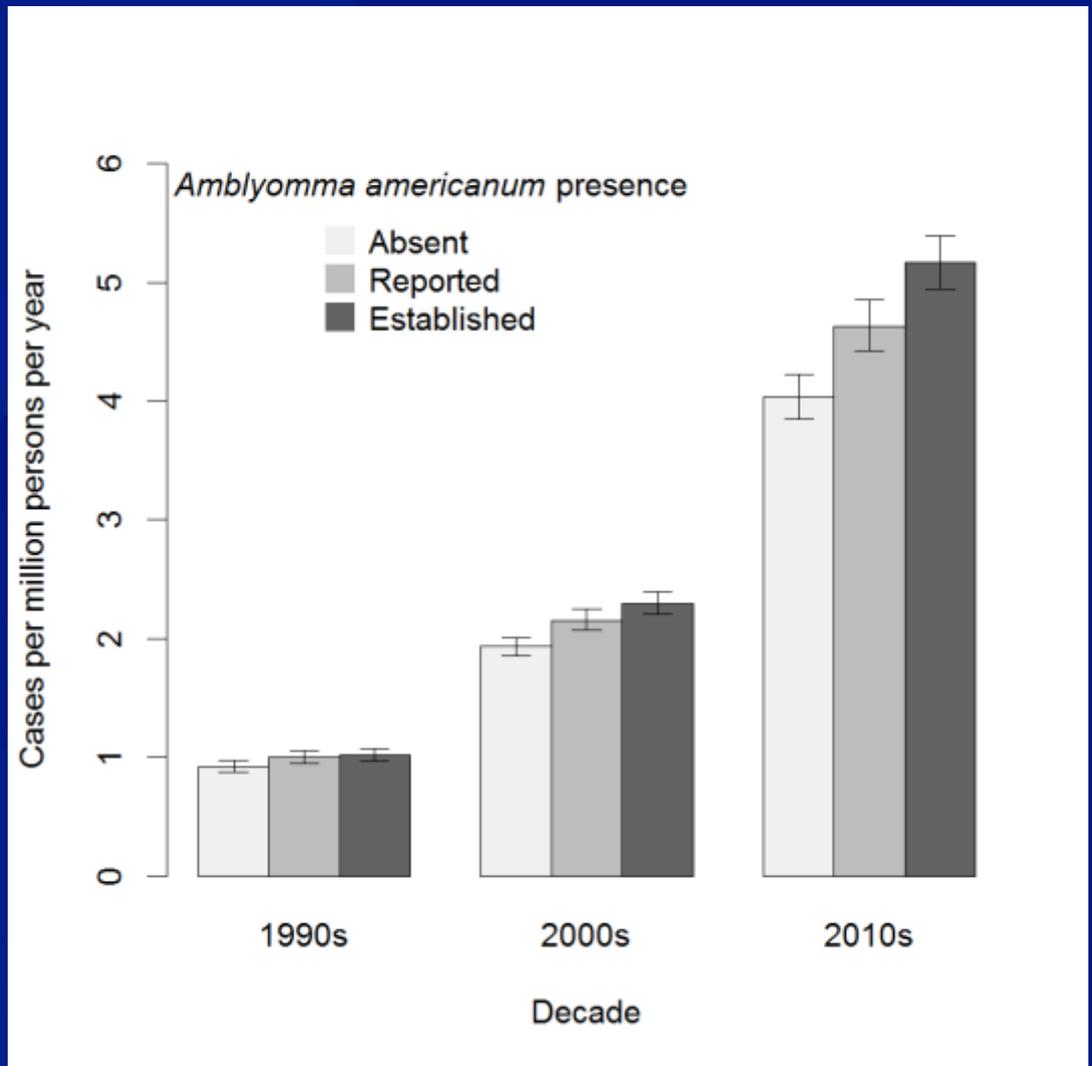
As *A. amblyomma* expands, more counties have the tick reported and established. Multivariate analysis may tease out whether time or the tick is responsible for the changes.

	Incidence rate	Hospitalization Rate (%)	Case Fatality Rate (%)
Amblyomma americanum presence			
absent	2.28	48.6	1.68
reported	6.07	33.2	0.74
established	10.3	27.8	0.65
Decade of onset of symptoms			
1980s	--	72.0	2.80
1990s	1.68	51.0	2.03
2000s	5.38	24.4	0.43
2010s	10.0	27.3	0.47

*Preliminary data, subject to change

Results*

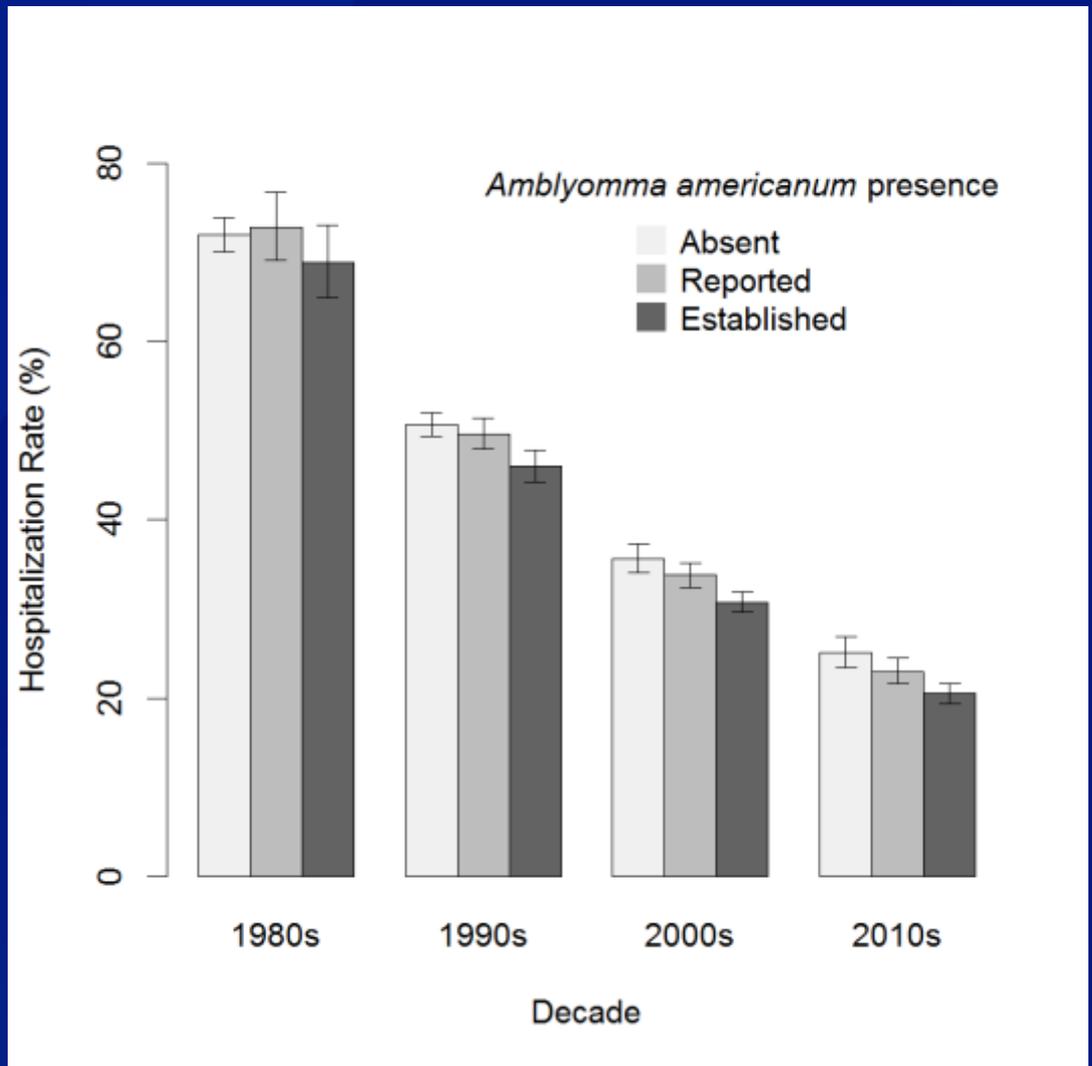
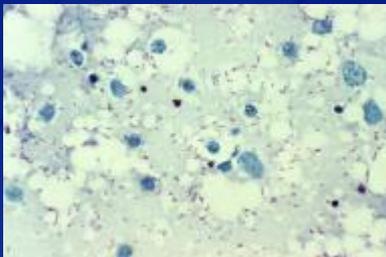
A chart of the incidence rate of RMSF by decade of onset of symptoms by the reported status of *A. americanum*. Results are from the GAM.



*Preliminary data, subject to change

Results*

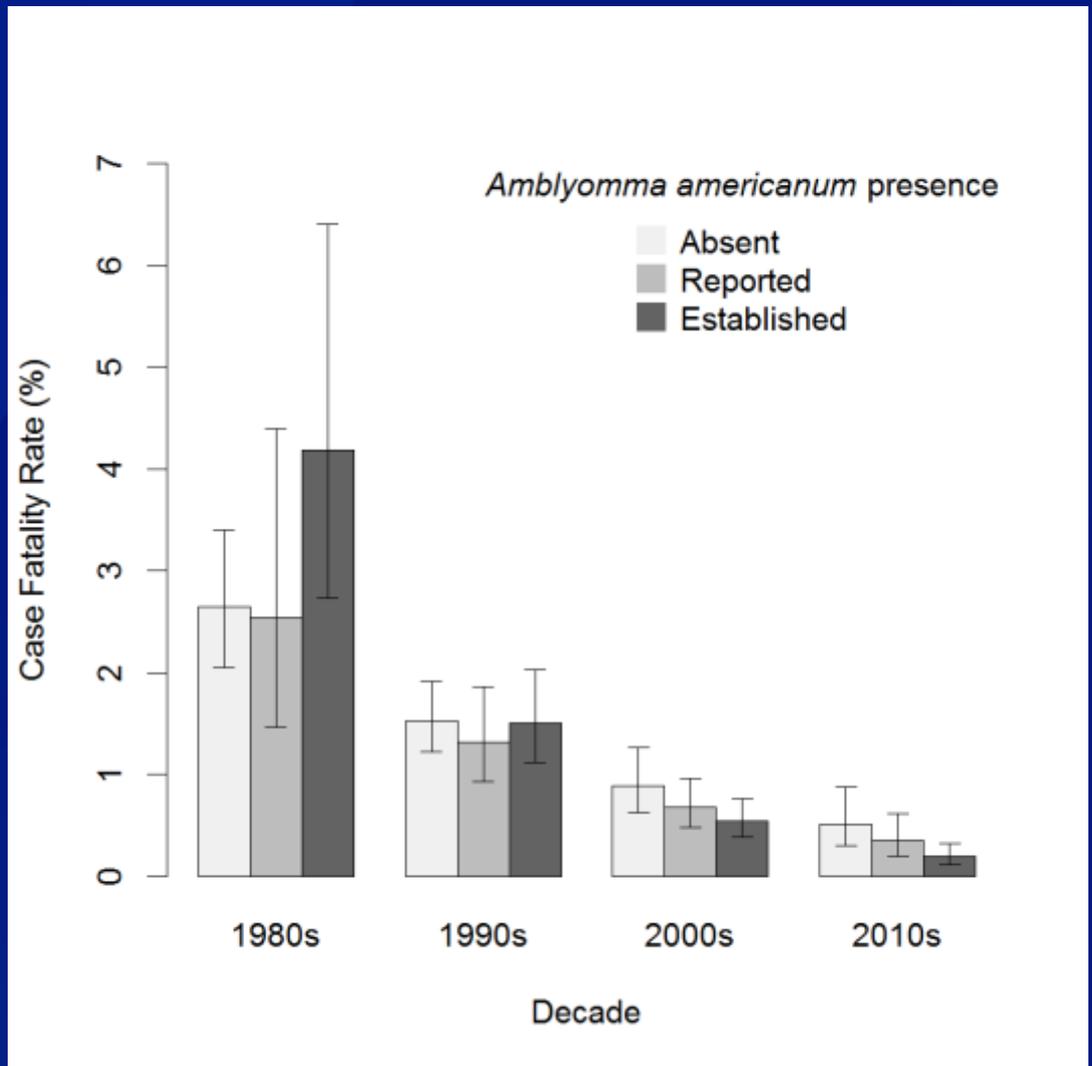
A chart of the hospitalization rate by decade by reported status of *A. americanum*. Results are from the GAM.



*Preliminary data, subject to change

Results*

A chart of the case fatality rate of RMSF by decade and reported status of *A. americanum*. Results are from the GAM.



*Preliminary data, subject to change

Discussion

- The presence of *A. americanum* in a county is associated with increased incidence, decreased hospitalization rate, and decreased case fatality rate of RMSF.
- The majority of the changes in the epidemiology of RMSF are independent of *A. americanum*.
- Complete and timely reporting of surveillance data improve understanding of the dynamic epidemiology of spotted fever group rickettsiosis.

Limitations

- Tick data are for a county: results are subject to the ecological fallacy.
- Tick and human data are incomplete, probably biased.
- GAMs may overfit data, resulting in bias towards the null for parametric results.

RZB EDUCATIONAL MATERIALS

- **Bookmarks**
- **Trails signs**
- **RMSF trifolds (pamphlets)**
- **Physician pocket cards**
- **Doxycycline for suspected RMSF for all ages**

ROCKY MOUNTAIN SPOTTED FEVER

CAN CAUSE SERIOUS ILLNESS



PROTECT YOURSELF!

- ✓ Check for ticks daily
- ✓ Treat your dogs for ticks
- ✓ Wear insect repellent
- ✓ Treat your home and yard for ticks
- ✓ Call your doctor if you get a fever or rash

For more information:
www.cdc.gov/rmsf



How to check for ticks

Check yourself for ticks every day, especially when you have been outside.



If you find a tick, remove it as soon as possible.

KIDS: ask an adult for help!

CS16029A

LA FIEBRE MANCHADA DE LAS MONTAÑAS ROCOSAS PUEDE CAUSAR UNA ENFERMEDAD MUY GRAVE.



¡PROTÉJASE!

- ✓ Revise todos los días si tiene garrapatas
- ✓ Trate a sus perros contra las garrapatas
- ✓ Use repelente de insectos
- ✓ Trate a su hogar y su jardín contra las garrapatas
- ✓ Llame a su médico si tiene fiebre o sarpullido

Para más información:
www.cdc.gov/rmsf



Cómo revisar para encontrar garrapatas

Revise todos los días si tiene garrapatas, especialmente cuando haya estado en exteriores.



Si encuentra una garrapata, sáquela lo más pronto posible.

NIÑOS: ¡Pídanle ayuda a un adulto!

MIS - 250256 CS16029A



PREVENT TICK BITES!

- WEAR REPELLENT
- CHECK FOR TICKS DAILY
- SHOWER SOON AFTER BEING OUTDOORS
- CALL YOUR DOCTOR IF YOU GET A FEVER OR RASH



For more information:
www.cdc.gov



PREVENT TICK BITES!

- PUT TICK COLLARS ON DOGS
- TREAT YARDS FOR TICKS
- CHECK YOUR BODY FOR TICKS EVERY DAY
- CALL YOUR DOCTOR IF YOU GET A FEVER OR RASH



For more information:
www.cdc.gov/rmsf



What are the symptoms of RMSF?

SYMPTOMS MAY INCLUDE:

- Fever
- Headache
- Muscle aches
- Cough
- Shortness of breath
- Nausea/vomiting
- Stomach pain
- Rash
(may not occur in all patients).



← Late-stage rash in patient with Rocky Mountain Spotted Fever (RMSF)

RMSF usually starts within 2-14 days of being bitten by an infected tick.

Never wait for a rash to develop before seeing your doctor.

Can RMSF be treated?

RMSF can be treated with antibiotics, but treatment is most effective if started soon after symptoms start. See your doctor right away if you think you may have RMSF.

How can I protect myself and my family from RMSF?

No vaccine or medicine can prevent RMSF. Protect yourself, your family, and your pets from RMSF by preventing tick bites.

REMEMBER

ROCKY MOUNTAIN SPOTTED FEVER CAN BE VERY SERIOUS AND EVEN DEADLY IF NOT TREATED EARLY.

To Prevent RMSF:

- ✓ Check for ticks daily
- ✓ Treat your dogs to prevent ticks
- ✓ Use insect repellent containing 20-30% DEET when outside
- ✓ Treat your home and yard for ticks

If you get a fever or rash within 2 weeks of being around ticks, see your doctor right away.

FOR MORE INFORMATION

Contact your local health department:

or the Centers for Disease Control and Prevention, Rickettsial Zoonoses Branch: (404) 639-1075
For urgent calls available 24/7: (770) 488-7100
Visit our website at: www.cdc.gov/rmsf

DON'T GET SICK FROM A TICK!

Prevent Rocky Mountain Spotted Fever (RMSF) in the southwestern United States & Mexico



Centers for Disease Control and Prevention
National Center for Emerging and Zoonotic Infectious Diseases

¿Qué es la fiebre manchada de las Montañas Rocosas (FMRR)?

La fiebre manchada de las Montañas Rocosas (FMRR) es una enfermedad que se propaga por la picadura de una garrapata infectada. La FMRR puede ser grave y hasta mortal si no se trata pronto.



G Garrapata café del perro

Los casos de FMRR se han vuelto más comunes recientemente en el suroeste de los Estados Unidos y las zonas de la frontera con México. En estas zonas, la garrapata café del perro es portadora de la FMRR.

A las garrapatas café del perro les gusta alimentarse de los perros. En dondequiera que estén o hayan estado perros, se puede encontrar garrapatas.



P Perro con garrapatas café del perro en la oreja

¿Quién tiene riesgo de contraer FMRR?



G Garrapatas café del perro en cada etapa de su vida

Todo aquel que viva o pase tiempo en zonas en que haya garrapatas o perros tiene riesgo de contraer la FMRR. Estas garrapatas a menudo se alimentan de los perros, o sea que pasar tiempo con perros que tengan garrapatas puede ponerlo a usted en riesgo. Las garrapatas pueden ser muy pequeñas y sus picaduras generalmente no duelen.

Es posible que usted ni siquiera sepa que lo picaron.

Manténgase y mantenga a su familia libres de las garrapatas:

- Revise todos los días que no tengan garrapatas. Aquí le decimos cómo:



Si encuentra una garrapata, sáquela tan pronto como sea posible.

NIÑOS: ¡Pidánle ayuda a un adulto!

Esta es la mejor manera de sacar una garrapata:



- 1** Use una pinza y protéjase las manos con guantes o guantes desechables, si es posible.



- 2** Agarre la garrapata completa lo más cerca de la piel.



- 3** Con cuidado, sáquela derecho hasta que todas las partes de la garrapata estén afuera.



- 4** Lave la zona de la picadura con agua y jabón.

- Use repelente contra insectos que contenga entre 20 a 30 % de DEET cuando esté en exteriores. Siempre siga las instrucciones del producto.
- Dúchese o báñese lo más pronto posible después de pasar tiempo con perros o en áreas donde puedan vivir las garrapatas.

Mantenga a sus perros sin garrapatas:

- Las garrapatas pueden picar a los perros y traerlas a su casa o su jardín. Los perros también pueden enfermarse de FMRR.
- Revise seguido a su perro por si tiene garrapatas. A estas les gusta ocultarse en las orejas, las axilas y entre los dedos de las patas de los perros. Si les encuentra garrapatas, sáqueselas de la misma manera en que lo hace con las personas.

Para prevenir que las garrapatas piquen a sus perros:

- Use productos de control de garrapatas, como collares, champús o tratamientos de aplicación localizada que contengan un medicamento que las mate. Aplique de nuevo el tratamiento contra las garrapatas según indique la etiqueta del producto.
- No todos los productos son seguros para los cachorritos o los gatos. Asegúrese de leer la etiqueta cuidadosamente. Llame a la oficina local de control de animales o al veterinario si tiene preguntas acerca del control de las garrapatas en las mascotas.



P Perrito al que se le está poniendo un collar contra garrapatas

Mantenga su hogar y jardín libres de garrapatas:

- Mantenga el césped podado y los jardines sin objetos desechados como colchones o sofás, en que puedan ocultarse las garrapatas.
- Fumigue su jardín con pesticidas para matar garrapatas. Algunos productos pueden ser aplicados por cualquier persona, pero otros requieren un servicio profesional de control de plagas.

Rocky Mountain spotted fever (RMSF)



- Symptoms: fever, rash, headache, thrombocytopenia, hyponatremia, elevated hepatic transaminases.
- Rapidly fatal if not treated within the first 5 days.
- Rash occurs in 80% of cases, but may occur late in illness. Never wait for a rash to begin treatment.
- RMSF is transmitted by the bite of an infected tick. However, only 60% of cases report history of tick bite.
- Serologic titers for RMSF are often negative in the first 7-10 days of illness, convalescent titers 2-4 weeks later are required for confirmation.



Antibiotic therapy for suspected RMSF

Age category	Drug	Dosage
Adults and children ≥45 kg	Doxycycline	100 mg twice per day
Children <45 kg*	Doxycycline	2.2 mg/kg twice per day

In cases of pregnant women or persons with life-threatening tetracycline allergies, consult an infectious disease physician.

*The dose and duration of doxycycline used to treat suspected RMSF has NOT been shown to cause dental staining in children. This dose is recommended by the AAP and CDC to safely treat children of any age .

For more information please visit our website at www.cdc.gov/rmsf

Fiebre manchada y otras rickettsiosis

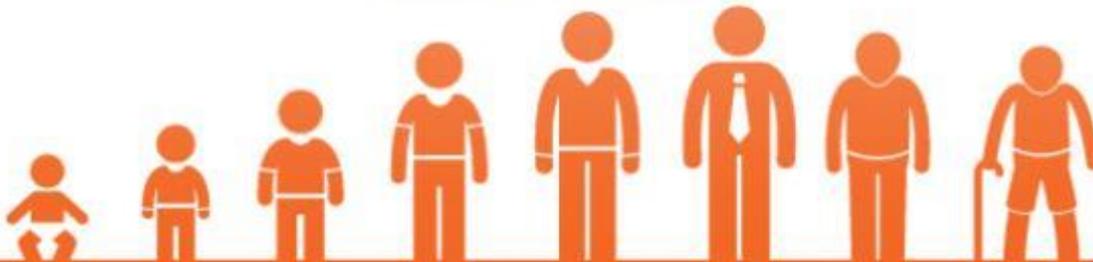
- Síntomas: fiebre, erupción cutánea, dolor de cabeza, malestar general, trombocitopenia, hiponatremia, transaminasas hepáticas elevadas.
- A menudo rápidamente mortal si no es tratada dentro de los primeros cinco días.
- Erupción cutánea se produce en el 80% de los casos, pero puede ocurrir hasta finales de la enfermedad. Nunca espere una erupción para comenzar el tratamiento.
- Fiebre manchada se transmite por la mordedura de una garrapata infectada.
- La doxiciclina es el tratamiento más eficaz para la rickettsia, pero si doxiciclina no está disponible, se puede utilizar cloranfenicol.

Antibióticos para las rickettsias

Grupo de edad	Farmaco	Dosis
Adultos y niños ≥45 kg	Doxiciclina	100 mg dos veces por día
	Cloranfenicol	12.5 mg/kg cada seis horas
Niños <45 kg	Doxiciclina	2.2 mg/kg dos veces por día
	Cloranfenicol	6.25 mg/kg cada seis horas

Para preparar la doxiciclina líquida para niños: medir 100 mL de agua limpia. Agregue el polvo (500 mg) y cerrar el frasco. Agitar durante unos 15 segundos. Una vez mezclado, la medicina se puede utilizar durante 14 días si se refrigera.

Doxycycline saves lives!



Use it to treat suspected rickettsial infections in patients of all ages.

New research shows **NO** evidence of pediatric dental staining when used in short courses.

[Click to learn more.](#)



Todd SR, Dahlgren FS, Traeger MS, Bletrán-Aguilar ED, Marianos DW, Charlene H, McQuiston JH, and Regan JJ. No visible dental staining in children treated with doxycycline for suspected RMSF. *J Pediatr*. Online ahead of print.

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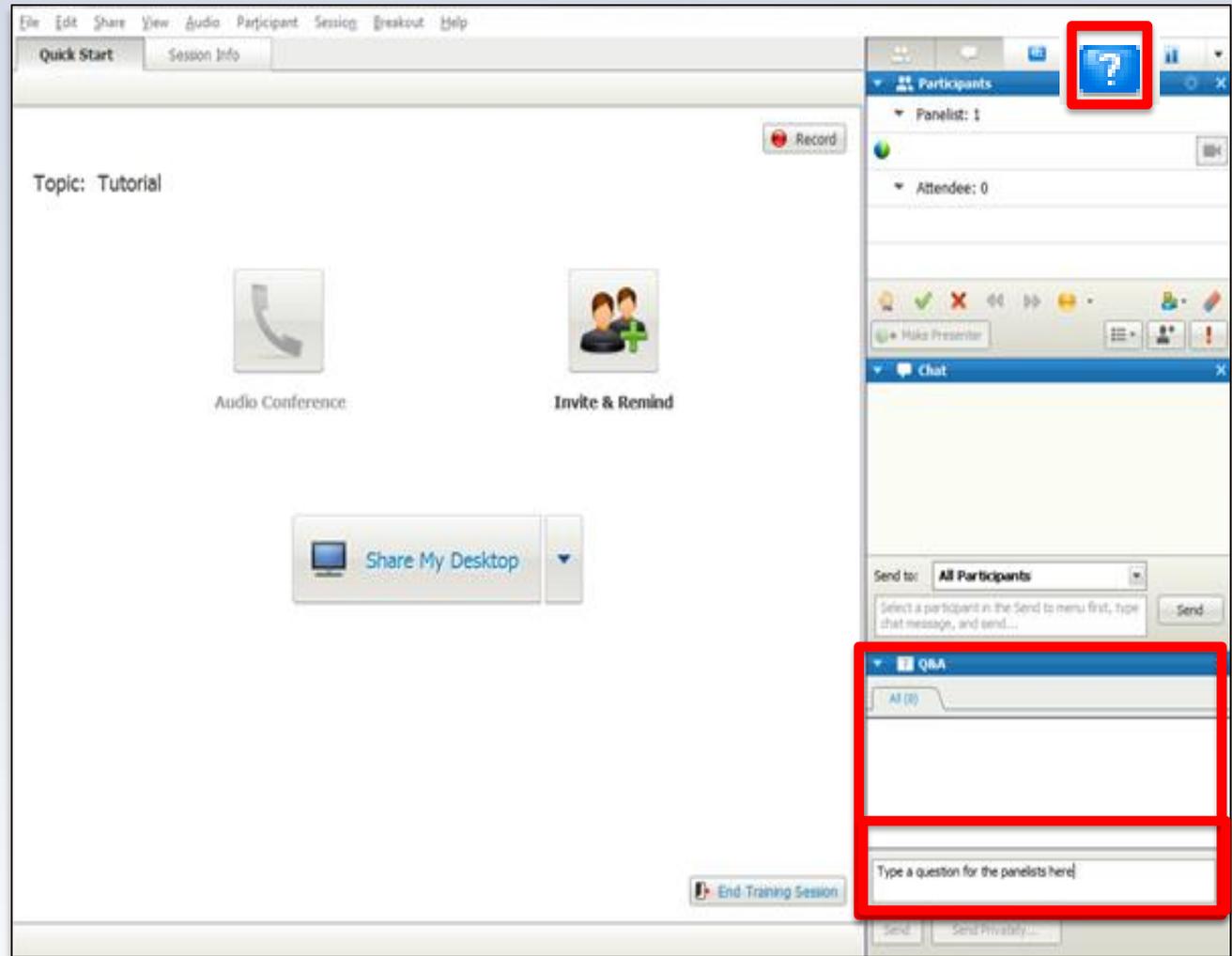
**Rickettsial Zoonoses Branch,
Division of Vector-Borne
Diseases, CDC**

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.



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