Tick-borne Diseases in Connecticut

Presented by
The Brookfield Health Department
Vector-borne Diseases

Introduction to tick-borne illness

- An organism that carries a disease and can transmit it to another organism
- Ticks can be “vectors” of disease
- Biting is the mechanism of transmission
- Transmission is potentially the beginning of human infection
Tick Species

Three primary tick species

- Lone Star Tick
- Deer tick
- Dog tick

Photo: Department of Entomology, University of Nebraska-Lincoln - Jim Kalisch, UNL Entomology
Tick Species

Tick 2-year life cycle

Spring
1. Engorged female lays eggs.

Winter
7. Adults remain active on warm winter days with peak of activity in Spring.

Fall
6. Adults attach and feed on larger mammals (mainly deer).

Summer
2. Larvae hatch and feed on small mammal.

Fall
3. Larvae molt into nymphs.

Summer
5. Nymphs attach and feed on small mammals and birds.

Spring
Number of Deer Ticks Collected by Life Stage
Tick-borne Disease

Found in Connecticut

- There are 4 primary tick-borne diseases found in CT transmitted by 2 tick species:
  - Lyme disease
  - Human granulocytic anaplasmosis
  - Babesiosis
  - Rocky Mountain spotted fever
Tick-borne Disease

Transmitted by ‘deer ticks’

- 3 diseases are transmitted through the bite of infected black-legged ticks (deer ticks), *Ixodes scapularis*
  - Lyme disease
  - Human granulocytic anaplasmosis
  - Babesiosis
- These diseases can be transmitted simultaneously through one bite
Tick-borne Disease

Transmitted by American dog ticks

- RMSF is transmitted through the bite of infected American dog ticks, *Dermacentor variabilis*
Tick Species

Deer tick (Ixodes scapularis)

Notice the tear drop shape of the body.

Photos: All life stages- Iowa State University / Female laying eggs – CAES, Kirby Stafford, III
Tick Species

Deer tick (*Ixodes scapularis*)

Photo: Scott Bauer, USDA

ALDF

Photo: Scott Bauer, USDA
Lyme Disease

Introduction

- First recognized in Lyme, CT in 1975
- Symptoms mimic many other illnesses
- Can attack various organ systems
  - Musculoskeletal
  - Neurologic
  - Cardiac
Lyme Disease

Introduction

- A bacterial infection caused by *Borrelia burgdorferi*
Lyme Disease

Symptoms of early infection

- Erythema migrans (expanding red rash)
- Fatigue, headache, stiff neck
- Pain or stiffness in muscles or joints
- Fever
- Swollen glands
Lyme Disease

Early localized infection

CDC
S. Luger
John Hopkins University
Multiple EM
Bull’s eye
Deer tick

Bull’s eye

Multiple EM

John Hopkins University
Lyme Disease

Symptoms of disseminated infection

- Lyme arthritis
- Bell’s palsy, radiculoneuropathy, lymphocytic meningitis, or encephalitis
- 2nd or 3rd degree AV block
- Multiple EM rashes
Lyme Disease

Disseminated infection

Lyme arthritis

Swollen knee

Photo: National Library of Medicine
Lyme Disease

*Disseminated infection*

Neurologic

Bell’s palsy

CDC

Deer tick
Lyme Disease

Disseminated infection

Cardiac

2nd degree AV block
Lyme Disease

Other information

- EM occurs in the majority of those infected
- EM appears generally within 3-30 days after the bite
- About 60% of those infected who have not been treated experience arthritis several months after the bite
- Few of the untreated patients may develop chronic neurological complaints months to years after infection
Lyme Disease

Other information

- Lyme disease symptoms may be more severe in patients who are co-infected with other tick-borne diseases
- Most cases can be cured with early antibiotic treatment
- Some patients may experience symptoms for months to years after delayed treatment
- Most cases are thought to be acquired in their own back yard
Lyme Disease Cases Statewide Connecticut, 1984 – 2006*

* Reduction in cases after 2002 is due to a change in surveillance.
Lyme Disease Rates* (Cases) Connecticut, 2006

- Litchfield: 195.9 (357)
- Hartford: 15.4 (132)
- Tolland: 140.1 (191)
- Windham: 134.7 (147)
- Fairfield: 40.2 (355)
- New Haven: 18.4 (152)
- Middlesex: 67.7 (105)
- New London: 122.4 (317)

* Per 100,000 population
Lyme Disease Rates by Town
Connecticut, 2006

Rate per 100,000 population

- 0
- 1 - 25
- 26 - 99
- 100 - 499
- 500 - 999
- 1000+

[Image of a map showing Lyme disease rates by town in Connecticut, 2006]
Human granulocytic anaplasmosis

Introduction

- Formerly known as Human granulocytic ehrlichiosis (HGE)
- Illness ranges from mild to severe
- Affects white blood cells (neutrophils)
Human granulocytic anaplasmosis

Introduction

- A bacterial infection caused by *Anaplasma phagocytophilum*

Morulae *A. phagocytophilum* in cytoplasm of neutrophil
Human granulocytic anaplasmosis

Symptoms of infection

- Sudden high fever
- Severe headache
- Weakness
- Muscle pains
- Rash
- Chills
Human granulocytic anaplasmosis

Severe cases may result in:

- Low white blood cell count
- Low platelet count
- Hemorrhages
- Renal failure
- Meningitis
Symptoms typically occur 7-14 days after an infected tick bite.

The disease is more severe in patients who are elderly, and/or immunocompromised.

Serology, PCR, or blood smear are used to diagnose HGA.

Treatment includes tetracycline antibiotics (Doxycycline).
Confirmed Anaplasmosis Cases Connecticut, 1999* – 2006

Number of Cases

Year

1999 2000 2001 2002 2003 2004 2005 2006

* Increase in cases due to special study.
Babesiosis

Introduction

- Most infections do not result in symptoms
- Some infections can be severe and sometimes fatal
- Affects red blood cells
Babesiosis

Introduction

- Malaria-like illness caused by infection with a protozoan parasite

* Babesia microti infecting human erythrocytes.
Babesiosis

Symptoms of infection

- Many infections are asymptomatic.
- Early symptoms may include: fatigue, loss of appetite, weakness.
- Late symptoms may include: fever, chills, drenching sweats, muscle aches, headache, enlargement of the liver, or hemolytic anemia.
Babesiosis

Other information

- Initial symptoms may occur 1 to 8 weeks after an infected tick bite.
- Serology, PCR, or blood smear are used to diagnose babesiosis.
- Renewed symptoms may occur months to years after initial exposure.
- The disease is more severe in patients who are elderly, immunosuppressed, splenectomized, and those with co-infection with Lyme disease.
## Confirmed Babesiosis Cases

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Cases</th>
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<tbody>
<tr>
<td>1991</td>
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<tr>
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<td>120</td>
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<td>2005</td>
<td>280</td>
</tr>
<tr>
<td>2006</td>
<td>300</td>
</tr>
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</table>
Tick Species

American Dog tick (*Dermacentor variabilis*)

Notice the body resembles a watermelon seed.

Photo: Iowa State University
Rocky Mountain Spotted Fever

Introduction

- First recognized in 1896.
- Originally called “black measles”
- Can be fatal without prompt and appropriate treatment
- Grows in the cytoplasm or in the nucleus of the host cell
RMSF

Introduction

- A bacterial infection caused by *Rickettsia rickettsii*

*Rickettsia rickettsii*, the causative agent of Rocky Mountain spotted fever.
RMSF

Initial symptoms of infection

- Symptoms begin 5-10 days after the tick bite
- Non-specific, resembling many other diseases
- Sudden onset of fever
- Nausea
- Vomiting
- Severe headache
- Muscle pain
RMSF

Later signs and symptoms

- Rash occurs 4-5 days after onset, generally appears on palms and soles
- Abdominal pain
- Joint pain
- Diarrhea
RMSF

Other information

- One infection may leave lasting immunity
- Can be life-threatening
- Majority of patients hospitalized
RMSF

Other information

- Treatment includes tetracycline antibiotic (Doxycycline); chloramphenicol may only be used when an absolute contraindication for using tetracyclines exists.

Number of Cases

Year

1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006

0
1
2
3
4
5
6
7
8
9
10
Tick Species

*Lone Star tick (Amblyomma americanum)*

Notice the body is rounder than other ticks.

Photo: Department of Entomology, University of Nebraska-Lincoln - Jim Kalisch, Wayne Kramer, UNL Entomology
**Tick-borne Disease**

*Transmitted by Lone Star ticks*

- *Borrelia lonestari*, the causative agent of Southern Tick-Associated Rash Illness (STARI)
- Can cause a rash similar to that found for Lyme disease

*(not reportable in CT)*
# Cases and Rate of Tick-borne Diseases, Connecticut, 2006

<table>
<thead>
<tr>
<th>Disease</th>
<th>Cases</th>
<th>Rate*</th>
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<td>Lyme disease</td>
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<td>52.5</td>
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<tr>
<td>Babesiosis</td>
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<td>3.0</td>
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<td>Anaplasmosis</td>
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<td>1.1</td>
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<tr>
<td>RMSF</td>
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* Rate per 100,000 population.
# Cases of Tick-borne Diseases, Connecticut, 2000 - 2006

<table>
<thead>
<tr>
<th></th>
<th>2000</th>
<th>2001</th>
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<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
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<td>3,774</td>
<td>3,597</td>
<td>4,631</td>
<td>1,403*</td>
<td>1,348*</td>
<td>1,810*</td>
<td>1,788*</td>
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<tr>
<td>Babesiosis</td>
<td>52</td>
<td>56</td>
<td>69</td>
<td>79</td>
<td>40</td>
<td>136</td>
<td>102</td>
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<tr>
<td>Anaplasmosis</td>
<td>110†</td>
<td>46</td>
<td>49</td>
<td>29</td>
<td>34</td>
<td>30</td>
<td>37</td>
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<tr>
<td>RMSF</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>0</td>
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* Reduction in cases is due to surveillance change.
† Increase in cases is due to a special study.
Cases of Tick-borne Diseases by County, Connecticut, 2006

<table>
<thead>
<tr>
<th>County</th>
<th>Lyme Disease</th>
<th>Babesiosis</th>
<th>Anaplasmosis</th>
<th>RMSF</th>
<th>Total</th>
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<tbody>
<tr>
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<td>Hartford</td>
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<td>139</td>
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<td>Litchfield</td>
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<td>3</td>
<td>14</td>
<td>0</td>
<td>374</td>
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<tr>
<td>Middlesex</td>
<td>105</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>111</td>
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<tr>
<td>New Haven</td>
<td>152</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>155</td>
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<tr>
<td>New London</td>
<td>317</td>
<td>52</td>
<td>4</td>
<td>0</td>
<td>373</td>
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<td>Tolland</td>
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<td>7</td>
<td>0</td>
<td>0</td>
<td>198</td>
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<tr>
<td>Windham</td>
<td>147</td>
<td>14</td>
<td>7</td>
<td>0</td>
<td>168</td>
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<tr>
<td>Unknown</td>
<td>32</td>
<td>4</td>
<td>2</td>
<td>0</td>
<td>38</td>
</tr>
<tr>
<td>Total</td>
<td>1788</td>
<td>102</td>
<td>37</td>
<td>0</td>
<td>1927</td>
</tr>
</tbody>
</table>
Prevention Methods

When in Wooded or Grassy Areas

- Wear light colored clothing to spot ticks easier for faster removal
- Wear long pants
- Tuck pant leg into sock
- Wear closed toe shoes
Prevention Methods

*When in Wooded or Grassy Areas*

- Use tick repellants containing DEET or permethrin (on clothing only)
- Protect your pets, ask your vet
Prevention Methods

DEET – Use with caution

- DEET (N,N-diethyl-m-toluamide) is absorbed through the skin
- Use products with 30-40% DEET to be effective against tick bites
- Use according to label instructions
- Use sparingly
- Avoid prolonged and excessive use
Prevention Methods

DEET – Use with caution, cont.

- Use on clothing when possible instead of skin
- Avoid inhaling or ingesting DEET
- Keep repellant out of eyes
- Avoid use on damaged skin (sunburn, cuts)
- After returning indoors, wash treated skin with soap and water
Prevention Methods

Upon Returning Indoors

- Check for ticks
- Inspect your body, your children, and pets
- Search through hair, around hairline
- Inspect body folds
- Remove ticks as soon as possible

(ALDF)
Tick Removal

- Do not use petroleum, hot match heads, nail polish, kerosene, or any other substance
- Use thin-tipped tweezers
- Grasp tick as close to the skin as possible

Photo: www.ventanawild.org/news/fe03/tick_tweeze.jpg
Tick Removal

- Pull straight upward, slowly and steadily, do not tug or twist
- Avoid rupturing the tick body
- Wash and disinfect bite area

CDC
After Removing Tick

- On calendar, record the date and location of tick bite
- Check bite area daily for rash for a month
- Watch for other early symptoms
Tick Control Measures
For Your Yard - Maintenance

- Mow the lawn regularly
- Remove leaves and brush from yard and lawn edge
- Reduce groundcover
- Move bird feeders away from house

S. Perlotto
CAES
Tick Control Measures
For Your Yard - Maintenance

- Move potential mouse nesting sites (rock walls, wood piles) away from the house

Wood pile near home

Wood pile away from home
Tick Control Measures
For Your Yard - Maintenance

- Relocate swing sets and picnic tables
- Surround with mulch
Tick Control Measures

For Your Yard – Barrier block

- Create a minimum 3 foot barrier
- Reduces ticks on lawn
- Reminder of tick safety zone
Tick Control Measures

Reasons for barrier block

- 0-1 m: 68%
- 1-3 m: 13.8%
- > 3 m: 18.2%

- 81.8%
Tick Control Measures

For Your Yard – Barrier block

Example of complete landscape modification.
Tick Control Measures

For Your Yard – Ground cover

- Try not to use ground cover around the home
- Avoid the use of ivy, myrtle or pachysandra near entryways or outdoor faucets.
Tick Control Measures

For Your Yard – Deer resistant plants

- Don’t invite deer onto your property, use deer resistant plantings like daffodils

S. Perlotto
# Tick Control Measures

**For Your Yard – Deer resistant plants**

## Annuals:
- Alyssum
- Dusty Miller
- Forget-me-not
- Marigold
- Nasturtium
- Pansy
- Sage
- Spiderflower
- Verbena

## Perennials:
- Beebalm
- Bleeding Heart
- Catmint
- Columbine
- Foxglove
- Goldenrod
- Lady’s Mantle
- Lamb’s Ears
- Lavender
- Lily of the Valley
- Mayapple
- Mint
- Monkshood
- Oregano
- Poppy
- Rhubarb
- Russian Sage
- Silvermound
- Thyme
- Yarrow

## Vines:
- Wisteria
- Virginia creeper

## Shrubs and Trees:
- Andromeda
- Barberry
- Boxwood
- Butterfly bush
- Cotoneaster
- Leucothoes Spruce
- Weigela

## Bulbs, Corms, and Other Plants:
- Daffodil (Narcissus)
- Hens & chicks
- Hyacinths
- Iris
- Ornamental chives
- Snowdrops
Tick Control Measures
For Your Yard - Pesticides

- Selectively use insecticides and pesticides

http://www.caes.state.ct.us
Pesticides and Tick Control

A Word About Pesticides

- Acaricides are insecticides or pesticides used for tick and mite control
- Pesticides can be harmful
- The toxic impact affects life species differently
- Insecticides can provide 85-90% or better tick control
Pesticides and Tick Control

Types of Pesticides

- Biologically-based pesticides, (i.e. pheromones, microbial pesticides)
- Pyrethrins and Other Natural Insecticides
- Synthetic insecticides
Pesticides and Tick Control

Pesticide Controls

- All pesticides must be registered with federal and state environmental protection programs.
- The decision to use pesticides on your property is up to you.
Selecting a Tick Control Service

- Select 3 services that are registered with the Department of Environmental Protection
- Ask DEP for any violations filed against the business
- Get a written estimate, understand what the job entails
- Contact the BBB
Selecting a Tick Control Service

- Ask the business for a certificate of liability insurance
- Ask to see the license of the employees spraying for ticks
- Ask for references
Questions to Ask the Applicator

- Will signs be posted around the property after application?
- Will the equipment used be safe and up-to-date?
- Will a written pest control plan be provided?

http://www.gemplers.com/safety/labels/lawnturf/CT5X5PK.html
Questions to Ask the Applicator

- Will the plan state exactly what pesticides will be used
- Will information be supplied about various non-chemical landscaping techniques
When Should Pesticides Be Applied

- To protect against ticks, spraying in the Spring will control larvae and nymphs.
- An application in October will control the adult ticks.

S. Perlotto
Where Should Pesticides Be Applied

- Spray the perimeter of the areas that are most used by the family; garden, playscapes, picnic table.
A person is more likely to practice preventive measures if he or she believes:

- The disease is serious;
- He or she is at high risk for acquiring the disease;
- Some course of action will be effective in reducing the risk.

Rosenstock, 1960

Health Education Belief Model
Being aware of the dangers of tick-borne diseases and following the precautions recommended can greatly reduce your chances of becoming infected with Lyme disease, babesiosis, anaplasmosis, or Rocky Mountain spotted fever!
Remember

Tick-borne disease prevention check list.

- Prevent tick bites
- Do daily tick checks
- Know all the symptoms of tick-borne diseases
- Learn to recognize the EM rash
- Modify your yard as necessary
Remember

Stay away from tick infested areas

- When hiking, stay on trails, do not bushwhack
- Avoid fields with tall grass
- Stay clear of the transition area between the lawn and woodland edge
Remember

Tick-borne disease treatment.

- Call your doctor and seek early diagnosis and treatment
- You may need to be tested for several tick-borne diseases for an accurate diagnosis
- Take all medications prescribed
Remember

Tick Activity

- Ticks are most active in spring and summer
- Most people are bitten during the spring or summer
- Ticks can feed during any season
- Check for ticks and watch for symptoms ALL YEAR
Tick-borne Disease & Pets

Tick-borne illnesses can affect your pets

- Fever
- One or more swollen, hot, painful joints
- Severe pain and/or reluctance to move
- Intermittent lameness
- Poor appetite
Lyme Disease History
A Connecticut Perspective

- 1975 - Unusual arthritis cases reported in Lyme, CT
- 1977 - First 51 cases of Lyme arthritis described
- 1977 - The deer tick, linked to transmission of Lyme disease
- 1982 - *Borrelia burgdorferi*, the spirochete (bacterium) that causes Lyme disease, discovered
Lyme Disease History
A Connecticut Perspective

- 1984 - Lyme disease serologic testing becomes widely available in Connecticut
- 1987 - Lyme disease becomes a reportable disease in Connecticut
- 1991 - Federal funding for Lyme disease becomes available
Sources of Information

Pesticide Information

United States Environmental Protection Agency
www.epa.gov/pesticides

Connecticut Department of Environmental Protection
www.ct.gov/dep/cwp/view.asp?a=2710&q=324262

Connecticut Agricultural Experiment Station
Sources of Information

Tick-borne Disease: Symptoms, Treatment, Prevention

American Lyme Disease Foundation, Inc
www.aldf.com

Centers for Disease Control and Prevention
www.cdc.gov

Connecticut Agricultural Experiment Station
www.ct.gov/caes/

Connecticut Department of Health
www.ct.gov/dph/
Sources of Information

Tick-borne Disease: Symptoms, Treatment, Prevention

Ledge Light Health District
www.ledgelighthd.org/programs/lyme_prev.html

Torrington Area Health District
www.tahd.org/lyme_disease.htm

Westport Weston Health District
www.wwhd.org/target_lyme_disease.htm

Tick Identification

Connecticut Agricultural Experiment Station
www.ct.gov/caes/cwp/view.asp?a=2837&q=378212
Sources of Information

Deer Resistant Plants

Connecticut Agricultural Experiment Station:
Limiting Deer Browse Damage to Landscape Plants
(Jeffrey S. Ward)


Cornell University: Deer Defenses

www.gardening.cornell.edu/factsheets/deerdef/index.html

Torrington Area Health District

www.tahd.org/lymedeerrresist.htm
Sources of Information

Deer Resistant Plants

Carey Institute
www.ecostudies.org/lma_deer_resistant_woodies.html

University of Connecticut
www.hort.uconn.edu/Plants/

Westport Weston Health District

Woodstock Conservation Commission
www.woodstockconservation.org/deer_resistant_plants.htm
Sources of Information

Deer Exclusion Methods and Other Deer Concerns

Connecticut Agricultural Experiment Station

University of Connecticut
www.hort.uconn.edu/lpm/homegrnd/htms/11deer.htm

University of Maryland
Sources of Information

Tick Photographs/Illustrations

American Lyme Disease Foundation
www.aldf.org

Connecticut Agricultural Experiment Station
www.ct.gov/caes

Centers for Disease Control and Prevention
www.cdc.gov

Department of Entomology, University of Nebraska-Lincoln
http://entomology.unl.edu/images/ticks/ticks.htm

Torrington Area Health District
www.tahd.org/lymeyardimprove.htm
Sources of Information
Tick Photographs/Illustrations

Google Images
www.google.com/imghp

Iowa State University
www.ent.iastate.edu/imagegal/ticks

Torrington Area Health District
www.tahd.org/lyme_disease.htm

Westport Weston Health District
www.wwhd.org/target_lyme_disease.htm
Local Resources

For additional information concerning tick-borne diseases in Connecticut, please can contact the following:

Local Health Department

Connecticut Department of Public Health (860) 509-7994

For tick information contact:

Connecticut Agricultural Experiment Station (203) 974-8500
Toll-free outside New Haven 1-(877) 855-2237
"We're thinking of moving to another part of the country—somewhere between Lyme disease and killer bees."