Welcome. We are pleased to present you with information about Lyme disease and other tick-borne diseases.

This slide presentation and script is part of a public education initiative that is occurring in Minnesota.

It was funded by the Centers for Disease Control and Prevention, and was developed by the Minnesota Department of Health.

Permission was granted from various sources to use photographs.
Our goal for Lyme disease prevention is:

“Minnesota residents and visitors will take action to prevent exposure to ticks which may carry *Borrelia burgdorferi*; will know the signs and symptoms of Lyme disease and other tick-borne diseases; and if present, will seek early diagnosis and treatment.”

1995 Minnesota Lyme Disease Public Education Plan
Goals of presentation

• Be aware of Lyme disease and other tick-borne diseases
• Recognize basic signs and symptoms
• Seek early diagnosis and treatment
• Know whether you live, work or play in endemic areas
• Practice prevention activities
• Know whom to contact for more information

By the end of this presentation, you will:
• Be aware of Lyme disease and other tick-borne diseases,
• Recognize basic signs and symptoms,
• Know to seek early diagnosis and treatment,
• Know if you live, work or play in an area that has deer ticks,
• Practice preventive actions, and
• Know who to contact for more information.
Lyme disease is the most common tick-borne disease in the United States. *Borrelia burgdorferi* is the agent of Lyme disease. The bacteria have a flexible helical shape and are called spirochetes.
Lyme disease was named in 1975, when a group of children in Connecticut were reported to have juvenile arthritis.


During the 1980s, the Minnesota Department of Natural Resources, Metropolitan Mosquito Control District and other organizations were also participating in Lyme disease activities.

From 1986 to 2006, 7,438 confirmed cases of Lyme disease have been reported in Minnesota.
The signs and symptoms of Lyme disease can vary among individuals. Three to 30 days after a bite from an infected deer tick, look for:

- A distinctive rash (“bulls-eye” or erythema migrans)
- Fever
- Chills
- Headache
- Muscle and joint pain
- Fatigue

A person may not have all of these symptoms. People often feel like they have the “flu.”
The most common early sign of Lyme disease is a skin rash that has a “bull’s eye” appearance. It begins as a reddened area near the tick bite. As the rash increases in size, it clears in the middle and develops a red ring around the outside.

This rash:
• May expand to a very large size,
• Is usually not painful or itchy, and
• Often appears on the thighs, groin, trunk, armpit, or back.

The rash has been reported in about 60 to 80 percent of adults and 50 percent of children.
The classic rash has central clearing as shown here, but not all rashes have this presentation.
• Sometimes the rash does not have a bull’s eye appearance. It may appear as a reddened area without an outer ring.
• Lyme disease is not transmitted from person to person.
• Not everyone gets a rash with Lyme disease.

The early signs and symptoms of Lyme disease (fever, chills, headache, muscle/joint pain and fatigue) are similar to other ailments. Therefore, it may be difficult to diagnose Lyme disease if a person does not have the rash.
Lyme Disease Signs & Symptoms

Days to weeks after illness onset

- Multiple rashes
- Facial paralysis on one side
- Fever, stiff neck, headache
- Weakness, numbness, arm/leg pain
- Irregular heart beat
- Persistent weakness and fatigue

If the early stage is absent, undetected, or undiagnosed, one or more of these signs and symptoms may occur days to weeks after onset of illness:

- Multiple rashes (result of spirochetal dissemination, not multiple tick bites)
- Facial paralysis on one side of the face (Bell’s Palsy)
- Fever, stiff neck, headache
- Weakness, numbness or pain in arms or legs
- Irregular heart beat (heart block)
- Persistent weakness and fatigue
A person may experience multiple rashes, such as you see here. The rash is not caused from multiple tick bites, but occurs as a reaction when the bacteria move through the body.
Multiple Rashes

• This is another example of a multiple rash.

This is another example of a multiple rash.
If earlier stages of Lyme disease are undetected or undiagnosed, these signs or symptoms may appear weeks to months after onset of illness:

- Arthritis involving joint swelling in one or more joints, usually a large joint such as the knees
- Problems with the nervous system (subtle encephalitis resulting in memory problems)
- Persistent weakness and fatigue
- Individual reactions to Lyme disease will vary with the individual

Lyme disease can be difficult to diagnose and treat at this stage. Any stage of Lyme disease that doesn’t involve a classic rash can be difficult to differentiate from other diseases or conditions with similar symptoms.
This is an example of Lyme arthritis in the knee. Joints may become red, swollen, and painful. Lyme arthritis is generally periodic, but may become chronic in about 10 percent of people.
If a person suspects Lyme disease, he or she should contact a doctor immediately. Diagnosis includes:

• Physical examination
• History of possible exposure to deer ticks
• Blood tests may be performed
  – A screening test is done first, followed by a confirmatory test for antibodies to Lyme disease bacteria

A thorough physical examination and history of exposure are required for proper diagnosis and treatment. A blood test alone is not diagnostic of Lyme disease.
Remember, early recognition of signs and symptoms of Lyme disease is very important for prompt diagnosis and treatment.

Early diagnosis and treatment can reduce the time a person is ill and the severity of the disease.
Here are a few general statements about the treatment of Lyme disease:

• The disease is treated with antibiotics.
• Antibiotics are very effective in killing the bacteria.
• Treatment is most effective early in the course of Lyme disease.
• Lyme disease detected later may be more difficult to treat.

Specific questions about treatment should be discussed with your health care provider.
If you have questions about the diagnosis and treatment of Lyme disease, call your health care provider or the Minnesota Department of Health at 651-201-5414.
The tick that carries Lyme disease is called the blacklegged tick. It is also commonly known as the deer tick. You may also hear it called the bear tick. They are all the same tick. The scientific name is *Ixodes scapularis*.

Now we’re going to describe the blacklegged tick, its life cycle, habitat, transmission of the bacteria and specific actions you can take to reduce your risk of exposure to blacklegged ticks.

The deer tick is much smaller than the wood (or dog) tick. On the left of this slide is the adult male blacklegged tick (deer tick), which is dark in color. In the middle is the adult female, which is red and dark brown. On the right is a wood tick. Notice the wood tick’s white markings, which are not present on the blacklegged tick.
Blacklegged ticks live for two years and have three blood meals. The life cycle begins when the female lays eggs. As the eggs mature, they develop into a larva (bottom), then a nymph (left) and finally, adult male or female (adult female shown on right).
Larval blacklegged tick

From May through September, eggs hatch into larvae (plural). The larva (singular):
• is the size of a period at end of sentence
• initially does not have Lyme disease bacteria
• may get the bacteria during its first meal from a host that carries the bacteria
• Molts into a nymph after the first blood meal and goes dormant
Lyme disease researchers often live-trap small mammals to collect blacklegged ticks. Here is a small mammal trap set up in the woods.
Larvae first feed on white-footed mice or other small mammals. Notice the ticks on this mouse’s ear.

If the mouse is infected with the bacteria that causes Lyme disease, the larva will become infected and transmit the bacteria during its second feeding. The tick may also feed on a small mammal or bird that is not infected, so the tick will not get the bacteria at this time. After this feeding, the larvae become inactive until the following spring.
In the spring and summer of the tick’s second year, primarily from May through August, the nymph becomes active and takes its second feeding from a mammal. If the tick received the bacteria from its first feeding in the larva stage, it can transmit the bacteria during this second feeding.

Nymph stage ticks often look like a speck of dirt or a freckle on a person’s skin.
The nymph is about the size of a poppy seed.

Ticks in the nymph stage are mainly responsible for transmitting infections to humans or domestic mammals because they are difficult to detect.
In the fall of the second year, nymphs molt into the reddish female (shown on the left) or the smaller male adult tick. These ticks are next to a common pin.

Male ticks attach, but do not feed. Because the males do not take a blood meal, they do not transmit Lyme disease.
A third feeding generally occurs in late fall. As ticks feed over the course of several days, their bodies slowly enlarge with blood.

Male ticks attach, but do not feed. Because the males do not take a blood meal, they do not transmit disease agents.
The adult ticks feed and mate on large animals in the fall or early spring. The female lays her eggs, then dies.

If the ticks did not get a blood meal in the fall, they go dormant over winter and seek a meal in the spring. Remember, a frost does not kill deer ticks.
To summarize, in the spring of year one, eggs hatch into larvae, have one feeding, molt into nymphs, and go dormant. In year 2, nymphs take their second feeding. At this time, the nymph may transmit bacteria to humans, or to wild or domestic mammals.

In the fall, nymphs molt into adult male and female ticks. The females feed, mate, lay eggs, and die.
Where do we find blacklegged ticks?

Blacklegged ticks live in wooded areas and/or along the fringe of grass and woods. They are most common in woods with broadleaf trees (oaks, maples, elms, etc) and less common in coniferous (pine, spruce, etc) forests.

White-tailed deer live throughout Minnesota, but blacklegged ticks (“deer ticks”) are not found everywhere that deer live. Therefore, it is important to know when you are in a county where blacklegged ticks have been found.
Blacklegged ticks live in wooded, brushy areas that provide food and cover for white-footed mice, deer and other small or large mammals.

Exposure to ticks may be greatest in the woods (especially along trails) and the fringe area between the woods and border.
Blacklegged ticks search from the tips of low-growing vegetation, generally climbing onto a person or animal near ground level.

Blacklegged ticks search for a host from the tips of low-growing vegetation, not from trees. Generally, ticks climb onto a person or animal near ground level.

Blacklegged ticks crawl, they do not jump or fly.

They grab onto people or animals who brush against vegetation they are sitting on and crawl upward.
Blacklegged ticks feed on blood by inserting their mouth parts into the skin.

They are slow feeders and will feed for 3-5 days.

If the blacklegged tick is infected, it must be attached for 24-48 hours before it transmits the bacteria.
To Get Lyme Disease

- Blacklegged tick must be infected with Lyme disease bacteria
- Only the nymphs and adult females can transmit the Lyme disease bacteria
- Tick must be attached 24 - 48 hours before it passes bacteria to host

In order to get Lyme disease, a person must be bitten by a blacklegged tick that is infected with the Lyme disease bacteria.

Remember– not all blacklegged ticks are infected with the bacteria, so not all deer ticks transmit disease. The tick must be attached for at least 24-48 hours to transmit the bacteria.

The chance of getting Lyme disease increases the longer the tick is attached.
In 2002, nearly 24,000 cases of Lyme disease were reported to the Centers for Disease Control and Prevention. While dated, it continues to represent current distribution of cases on a national level.

This map shows reported cases by state of residence – that is, where people live who have this disease. The map does not necessarily demonstrate where people were exposed to blacklegged ticks, since some people are exposed to ticks when they travel.

Lyme disease occurs primarily in three regions of the United States:
• in the Northeast (from Massachusetts to Maryland),
• in the Midwest (Wisconsin and Minnesota), and
• in the West (northern California and Oregon).

Lyme disease is also widespread throughout much of Eurasia.
Lyme disease is endemic in northern central Minnesota and in counties bordering the Mississippi and St Croix rivers, in wooded or brushy areas. Some of the endemic areas have expanded in recent years, especially in northern Minnesota. It is important to know if you live, work or play in an area known to have blacklegged ticks, so you can take preventive measures.

In recent years, three quarters of cases were exposed to a blacklegged tick in the shaded areas of this map. Around twenty percent of Minnesota Lyme disease cases were exposed to deer ticks in western Wisconsin or other states. The remaining cases were exposed to deer ticks in several other Minnesota counties.
This bar graph shows reported cases of Lyme disease since the Minnesota Department of Health first began systematically counting cases in 1986.

Since about 2000, the incidence of Lyme disease in Minnesota has increased dramatically. The frequency of reported cases in recent years is triple that of the late 1990s. MDH surveillance efforts have not changed since 1994, suggesting that other reasons account for this large increase.

The number of cases decreased in 2003 compared to surrounding years. This may have been due to a relatively hot, dry July compared to previous years.
This bar graph shows reported cases of Lyme disease by area of residence over the past decade. The blue bars show residents of the Twin Cities Metropolitan Area, and the green bars show people who live in greater Minnesota.

About one-half of the Lyme disease cases occurred in people who live in the Twin Cities metropolitan area. Most of the metro residents, however, were exposed to blacklegged ticks in Greater Minnesota.
From 1998 to 2007, 469 reported cases who were able to identify a single county of exposure were likely exposed to infected deer ticks and Lyme disease in the Twin Cities Metropolitan Area. Anoka County has the highest number of exposures, followed by parts of Washington and Ramsey counties.

<table>
<thead>
<tr>
<th>County</th>
<th>No. of Cases</th>
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<tbody>
<tr>
<td>Anoka</td>
<td>187</td>
</tr>
<tr>
<td>Washington</td>
<td>183</td>
</tr>
<tr>
<td>Ramsey</td>
<td>38</td>
</tr>
<tr>
<td>Dakota</td>
<td>32</td>
</tr>
<tr>
<td>Hennepin</td>
<td>18</td>
</tr>
<tr>
<td>Scott</td>
<td>6</td>
</tr>
<tr>
<td>Carver</td>
<td>5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>469</strong></td>
</tr>
</tbody>
</table>
From 1998 to 2007, the majority of people with Lyme disease who reported one likely county of exposure were likely exposed to an infected blacklegged tick and Lyme disease in Greater Minnesota or the northern metro. Most people are exposed to ticks while visiting recreational property in east-central, north-central, or southeast Minnesota or western Wisconsin.
Exposure to blacklegged ticks and Lyme disease occurs in Minnesota primarily from March to November. The majority of cases occur in June, July and August, when people are outdoors and ticks are actively feeding. However, people also get Lyme disease in the later months of the year.

Onset of disease peaks just after the mid-May to mid-July time period when the nymphal deer tick is feeding. This lag is due to 3 to 30 days when signs and symptoms of Lyme disease first occur.
People of any age can get Lyme disease. People diagnosed with Lyme disease in Minnesota range in age from less than one year old to 98 years of age. We see an especially high percentage of cases in children 12 years and younger.
More males (61%) than females (39%) were reported to have Lyme disease in Minnesota from 1998 to 2007.

<table>
<thead>
<tr>
<th></th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
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<tbody>
<tr>
<td></td>
<td>4,219 (61%)</td>
<td>2,686 (39%)</td>
<td>6,905</td>
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Earlier, we mentioned the blacklegged tick (deer tick) can also cause two other diseases—human anaplasmosis (previously known as human granulocytic ehrlichiosis) and babesiosis. Both diseases appear to be less common than Lyme disease.

Human anaplasmosis was first described in the early 1990s in patients from Minnesota and Wisconsin. The signs and symptoms of human anaplasmosis may include:

- Fever (over 102°)
- Severe headache
- Muscle aches
- Chills and shaking

If human anaplasmosis is suspected, see your doctor immediately. Human anaplasmosis is treated with antibiotics.
During 2007, a record number of 322 cases of human anaplasmosis were reported.
Most human anaplasmosis cases are over 40 years of age.
More males (64%) than females (36%) were reported with human anaplasmosis from 1998 to 2007, similar to the distribution of Lyme disease.
Most human anaplasmosis transmission in Minnesota occurs from May through August. This corresponds to the peak activity of the nymph stage of the deer tick.
From 1995 to 2007, the majority of human anaplasmosis cases were exposed to an infected deer tick in north-central and east-central Minnesota. This is consistent with the area of highest risk for Lyme disease, since the two diseases are spread by the same tick species, the blacklegged tick (deer tick).
Babesiosis is a protozoan infection. Signs and symptoms may include:
- High fever
- Chills
- Headache
- Muscle aches
- Fatigue
- Loss of appetite

Signs and symptoms may go away without treatment, but some cases may be severe. If babesiosis is suspected, see your doctor immediately. Babesiosis is treated with antimicrobial drugs.

Some people may be infected with two or more tick-borne infections at the same time, which can make diagnosis and treatment difficult.
Lyme disease is the most common of three tick-borne diseases in Minnesota, with 6,905 confirmed cases reported in the decade from 1998 to 2007, followed by human anaplasmosis with 1,286 confirmed and probable cases. Babesiosis remains rare in Minnesota, with only 79 cases reported from 1998-2007.
Now we’ll focus on ways to prevent exposure to blacklegged ticks (deer ticks) and tick-borne diseases.

You should know whether you live, work or play in an area that has blacklegged ticks. Some people have been exposed to a blacklegged tick in their yard. Campers, hunters, farmers, and people in outdoor occupations may be at risk in the counties known to have blacklegged ticks. People in these counties who live in or adjacent to the woods may also be at risk.

Be aware of tick habitat, especially from May through July in Minnesota, when ticks are most actively feeding. But also remember that adult blacklegged ticks may feed as early as March and as late as November. Remember that deer ticks are most often found in thick woods or brush.

Preventing exposure to blacklegged ticks requires diligence.
The Lyme disease vaccine for humans was discontinued in February 2002. We do not expect any other Lyme disease vaccines for humans in the near future.
Take preventive actions to protect yourself from tick bites, especially from May through July in Minnesota.

• Wear long pants and long-sleeved shirts.
• Tuck pants into boots or socks and shirt into pants to create a barrier to ticks.
• Wear light-colored pants and shirt so ticks can be easily seen.

We also recommend the use of repellents containing DEET (up to 30% for children and adults) or permethrin.
Check thoroughly for attached ticks after you’ve been in a wooded area. Ticks can attach anywhere on the body, but are often found in areas such as behind knees, between legs, around the waist, and under arms.
A vaccine to prevent Lyme disease is available for dogs. However, the vaccine will not stop your dog from bringing ticks into the home.

Check your dog or cat for ticks before allowing them inside.

Check often for ticks on yourself, children, and pets.
Avoid Deer Tick Bites

• Be aware of high-risk times and places

• Walk in the center of trails to avoid picking up ticks from brush and low-growing vegetation.

• Wear long pants and repellent

Walk in the center of the trail to avoid picking up ticks from grass and brush.

Carefully use repellents and other chemicals on your body, clothes or property. Use repellents according to instructions on the container. DEET and permethrin are the most effective products currently available. Since ticks usually climb onto people at or near ground level, you concentrate repellent use from knee-height down.
If you live in an area with blacklegged ticks (deer ticks):

• You may be exposed to blacklegged ticks in your own yard. Typically, ticks are located along the fringe of your yard and a wooded area.
• Keep your lawn mowed short.
• Remove leaves and clear the brush around your house and at the edges of the yard.
• Create a landscape barrier between your lawn and the woods; for example, a 3-foot wide border of wood chips.
Prompt tick removal is important. First of all, if you find a deer tick on you, another person or your pet, don’t panic.

Notice the barbed mouth part on this tick.
The earlier you remove the tick, the less likely it can transmit the Lyme disease bacteria, if it has the bacteria.
To Remove a Deer Tick

• Use tick forceps or tweezers
• Grasp the tick close to the skin
• Pull outward S-L-O-W-L-Y, gently, and steadily
• Do not squeeze the tick
• Use an antiseptic on the bite

Use these steps to remove a tick:
• Use forceps or tweezers,
• Grasp the tick close to the skin,
• Pull the tick outward slowly, gently and steadily,
• Do not squeeze the tick, and
• Use an antiseptic on the bite.

Do not use Vaseline to smother the tick; you can’t smother ticks that way. Also, don’t try to burn the tick with a match; this will not cause the tick to pull out and you could get burned.
Important Messages

- Know whether you live, work or play in an area that has deer ticks
- Take preventive actions
- Seek early diagnosis and treatment

Know if you live, work or play in an area with deer ticks.

Take preventive measures.

Seek early diagnosis and treatment.
For more information about:

Signs and symptoms, diagnosis, treatment and prevention of Lyme disease, human anaplasmosis and babesiosis, call the Minnesota Department of Health at (651) 201-5414.

Blacklegged ticks in the Twin Cities Metropolitan Area, call the Metropolitan Mosquito Control District (MMCD) at (651) 645-9149. MMCD can also provide homeowner consultations to reduce ticks at your home property.
Minnesota Department of Health’s Lyme Disease Web Site

www.health.state.mn.us

Scroll down to “Diseases and Conditions” and click on “Diseases A to Z”

Click on “Lyme Disease”