

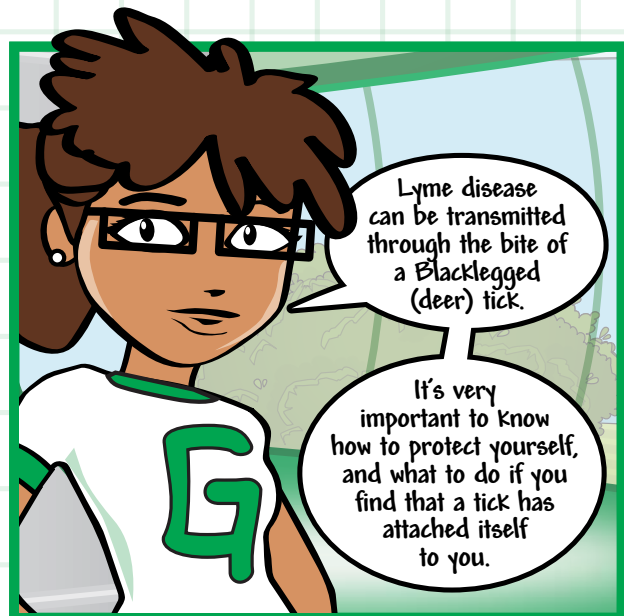
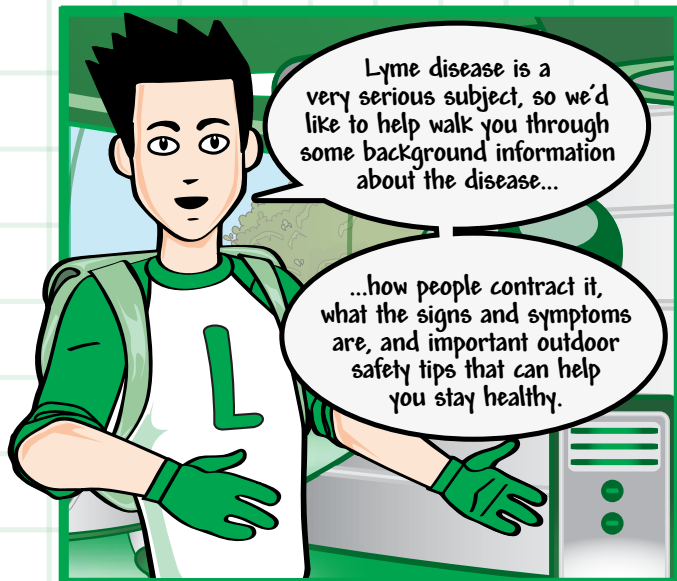
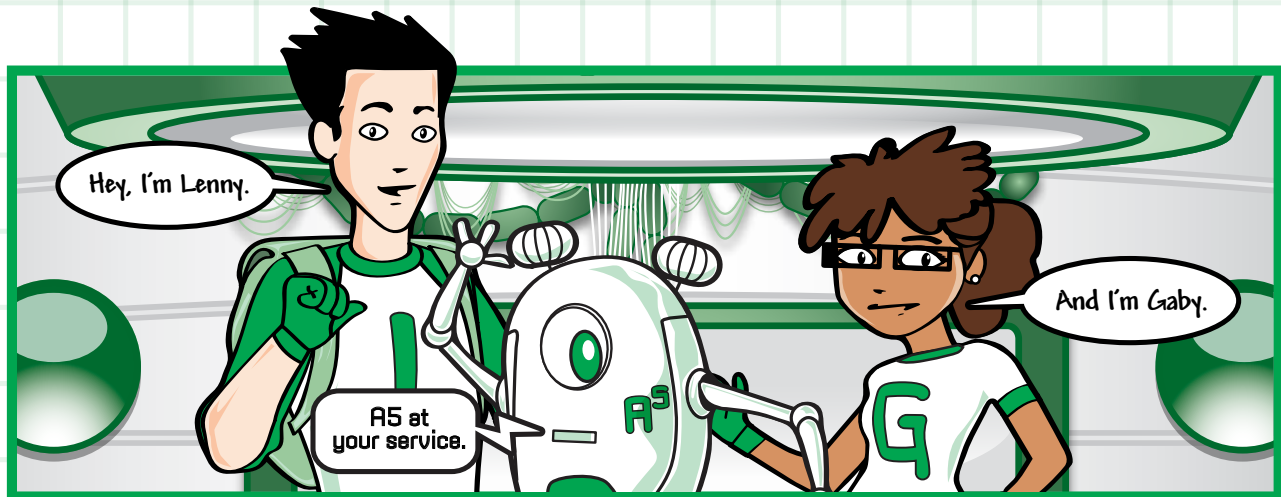


NAME: _____ date: _____



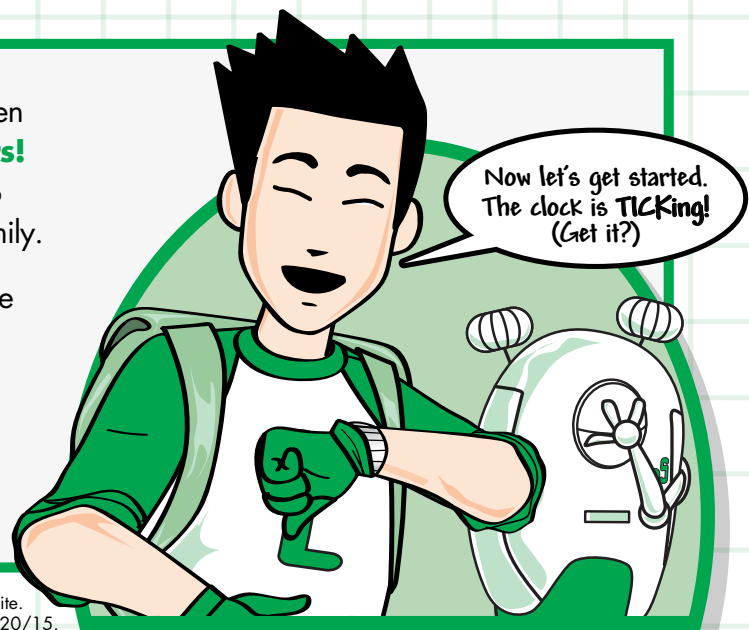
GLOBAL LYME ALLIANCE
Conquering Tick-borne Disease through Research & Education

www.GloballymeAlliance.org

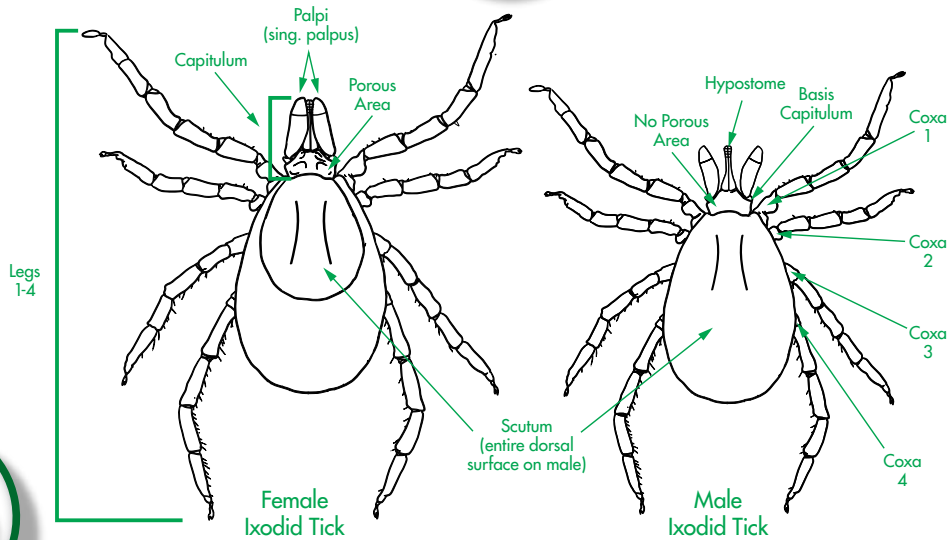


Ticks are fascinating creatures. They have been crawling the earth for **for millions of years!** Did you know that a female tick can lay up to **3,000 eggs** in her lifetime? That's a big family.

There are about **900 species of ticks** in the world, and over **90 of those live in the continental U.S.*** They may be tiny, but certain types of ticks can cause big problems. However, it's important to note that **not all ticks cause Lyme disease.**



*Purdue University program in Vector Biology and Vector-Borne Diseases website. <http://extension.entm.purdue.edu/publichealth/insects/tick.html>. Accessed 7/20/15.



Anatomy of a Tick

Dorsal view of *Ixodes* ticks

The body of a tick consists of a "false head" (the capitulum) and a thorax and abdomen fused into a single oval, flattened body. A larval tick has six legs, while nymphs and adults have eight legs like spiders and mites (insects have six legs).

Hard ticks get their name from a tough dorsal shield or plate called the scutum, present on all mobile stages of the tick. The scutum on the larva, nymph, and adult female tick covers 1/3 to 1/2 of the dorsal anterior; a female's scutum is reddish brown in color. By contrast, the scutum on a male tick covers almost the entire dorsal surface and is black to dark brown in color. The capitulum in hard ticks is visible dorsally in all stages.

The digestive system includes: the mouth parts (hypostome and chelicerae), foregut, midgut, and salivary glands. These structures are important because when feeding, the tick inserts its hypostome into the skin of a host until a capillary is reached and blood flow is detected. *Borrelia burgdorferi* reside in the midgut of infected ticks (*B. burgdorferi* is the corkscrew-shaped bacterium, or "spirochete," that causes Lyme disease). The salivary gland secretes anticoagulants (chemicals to prevent the blood from clotting) and digestive enzymes into the skin of the host. Cement that bonds the hypostome to the skin is secreted along with salivary gland fluids (Slansky and Rodriguez, 1987).

Here's some interesting information about the anatomy of a tick.



LONE STAR TICK
(*Amblyomma americanum*)



BROWN DOG TICK
(*Rhipicephalus sanguineus*)



AMERICAN DOG TICK
(*Dermacentor variabilis*)



Dark Brown

Reddish Orange

WESTERN BLACKLEGGED TICK
(*Ixodes pacificus*)

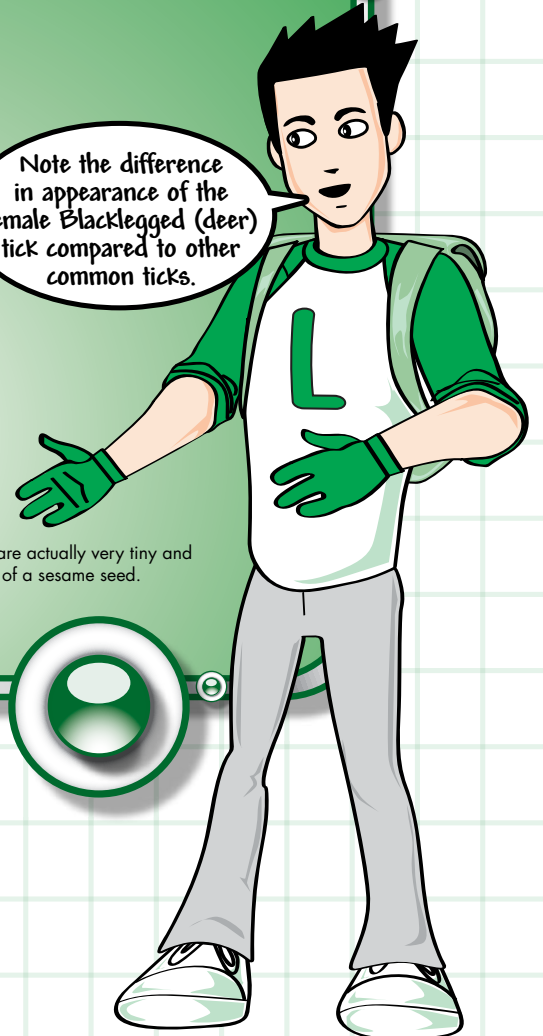
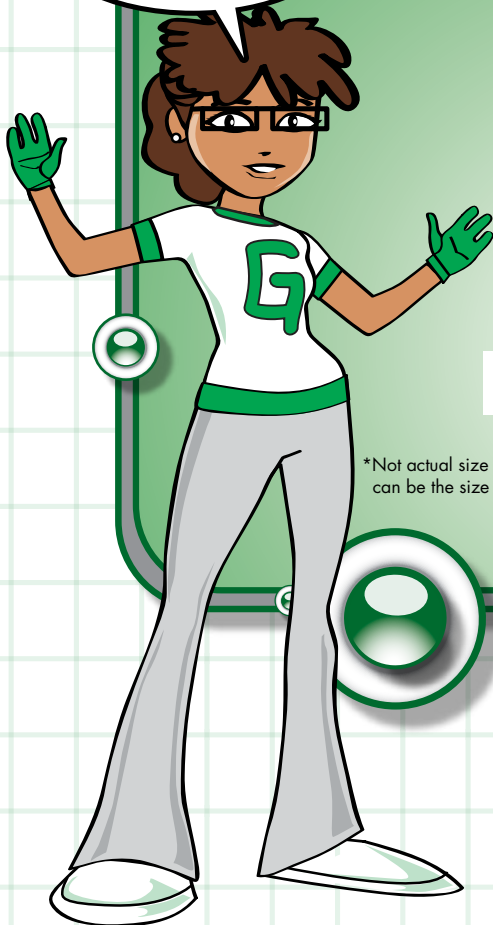


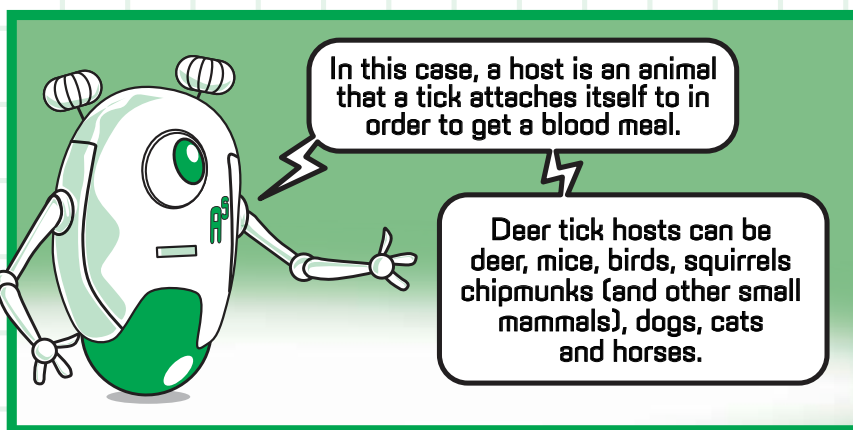
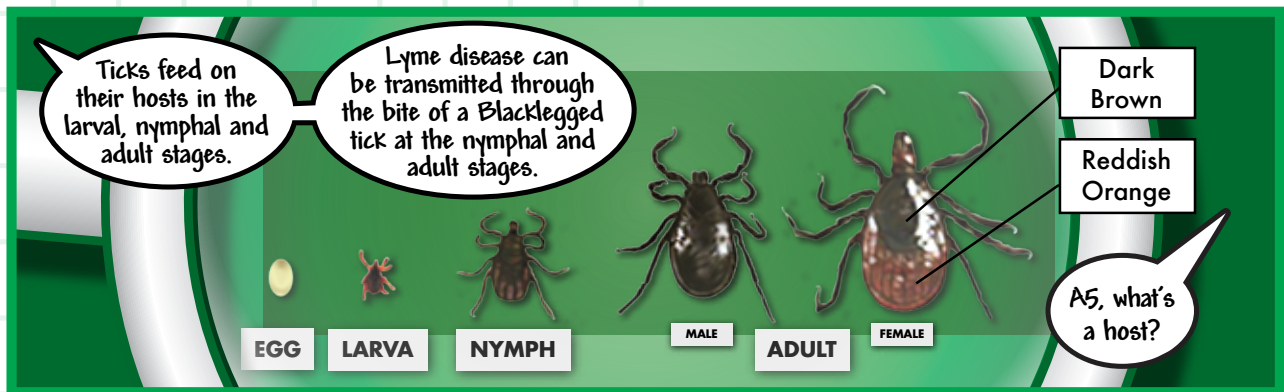
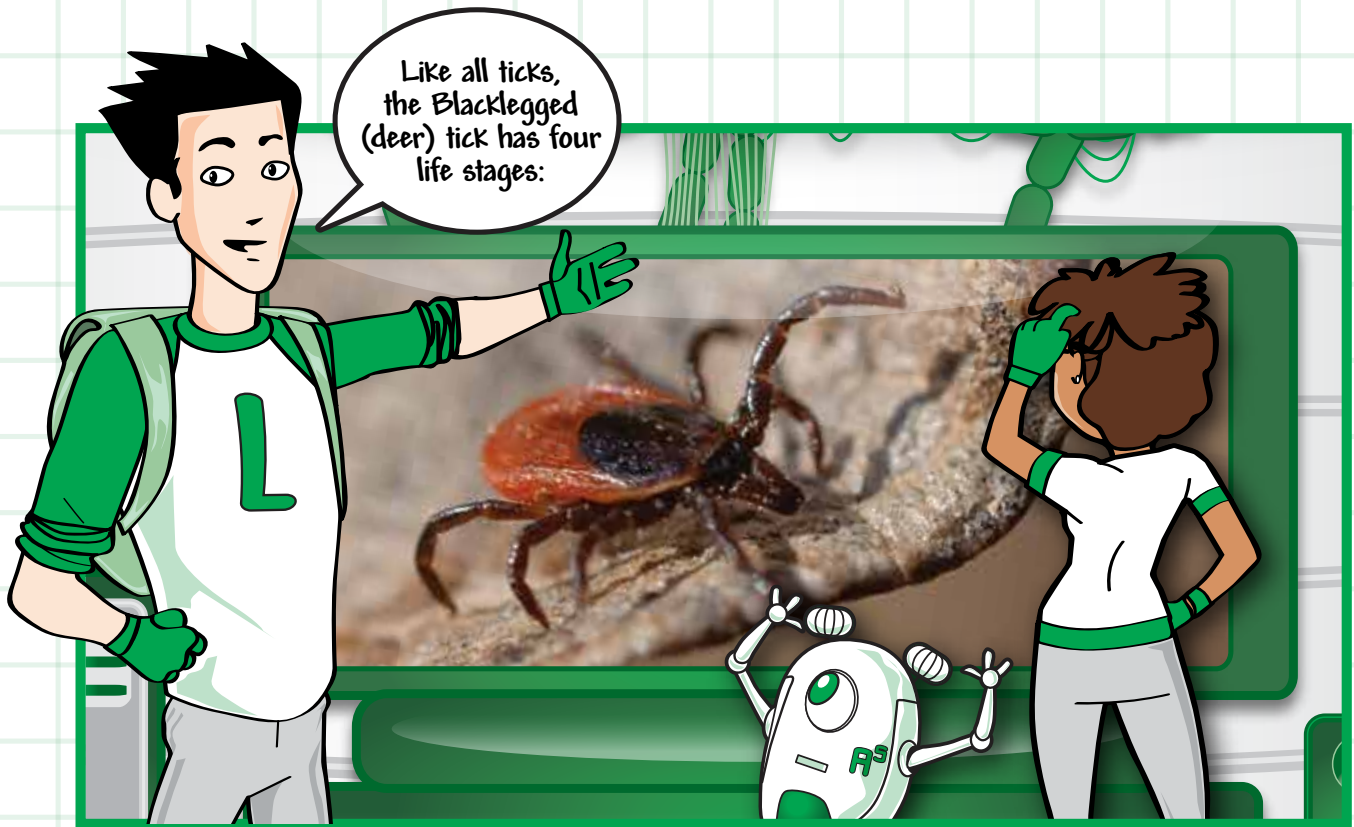
EASTERN BLACKLEGGED (DEER) TICK
(*Ixodes scapularis*)

The Blacklegged (deer) tick can cause Lyme disease in humans and animals.

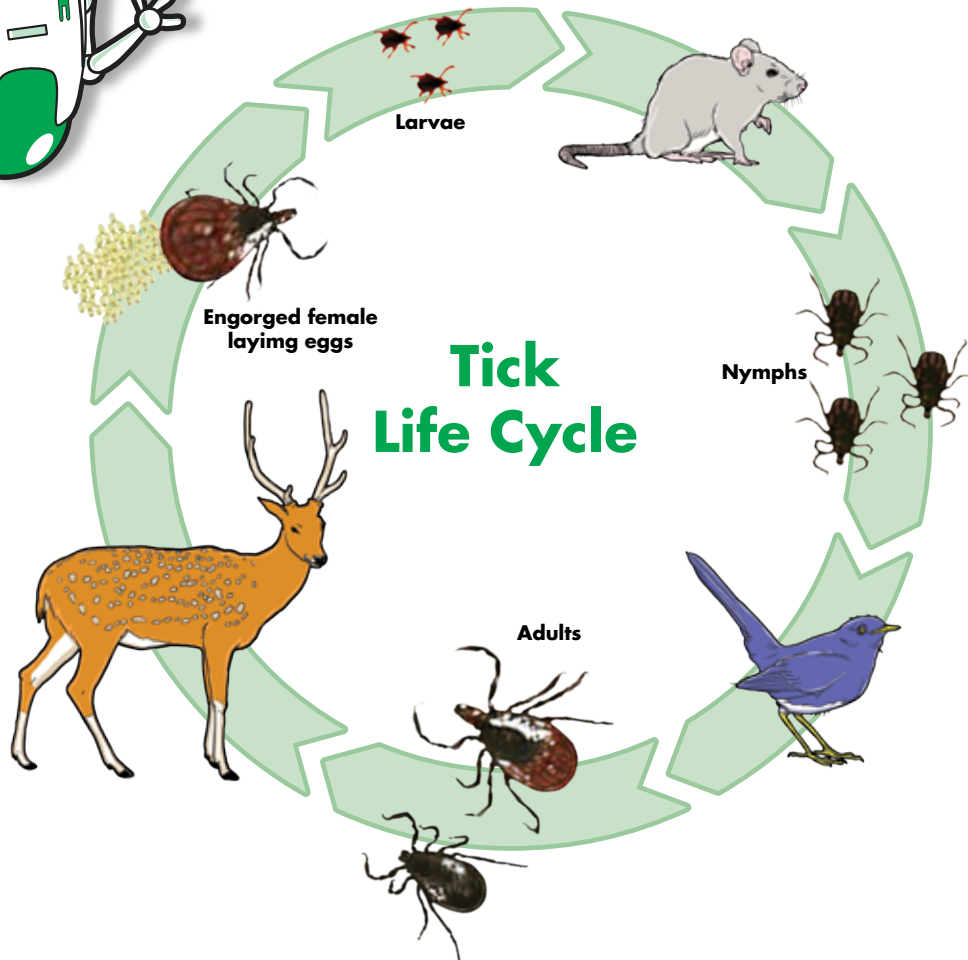
Note the difference in appearance of the female Blacklegged (deer) tick compared to other common ticks.

*Not actual size (these are enlarged photos). Nymphal ticks are actually very tiny and can be the size of a poppy seed; adult ticks can be the size of a sesame seed.





Here's some more interesting information about the tick's life cycle.



The tick has a **two-year life cycle**. The cycle begins in late July and early August with the hatching of larval ticks from **up to 3,000 eggs laid** by an engorged female tick. The larvae will disperse roughly 1 meter (3 feet) from the egg mass. Through August and September, the larvae **feed on whatever animal or human passes by**, usually a white-footed mouse, chipmunk, or bird, but also deer and humans. They drop off from the host after engorging with blood, molt, develop into nymphs with four (rather than three) pairs of legs and reappear the following summer, mainly **May through July, which is the peak period of risk for Lyme disease**. After feeding, nymphs molt to adult ticks during the summer. The adult stage, which seeks larger hosts (such as deer and humans), appears in the fall and is also active in warm days of winter and the following spring.

BE AWARE: Humans are at risk for being host to a tick at the larval, nymphal or adult stage of its life cycle.

From September through December, the tick mates while on their host. The adult male tick dies following mating and the female drops from the host, overwinters in leaf litter, under snow cover or underbrush, and later dies in the spring or early summer after laying eggs.

Head, Face and Neck:

Headache
Facial paralysis (Bell's palsy)
Tingling of nose, cheek, or face
Twitching of facial/other muscles

Respiratory/Circulatory Systems:

Heart palpitations
Heart block, murmur

Psychiatric Symptoms:

Mood swings, irritability, agitation
Anxiety
Personality changes
Feeling as though you are losing your mind

Cognitive Symptoms:

Poor school or work performance
Attention deficit problems, distractibility
Difficulty with concentration, reading, spelling
Difficulty in multitasking

Skin Problems:

Erythema migrans (rash)

Ocular:

Double or blurry vision, vision changes
Light sensitivity

Auditory:

Sound sensitivity/pain in ears

Musculoskeletal System:

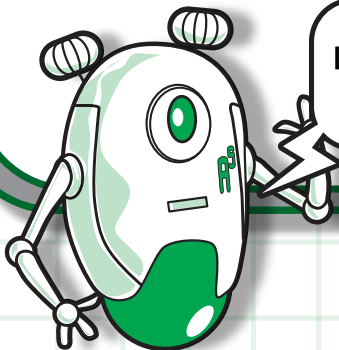
Joint pain, swelling, or stiffness
Migratory joint pains
Muscle pain or cramps

Neurologic System:

Numbness in body, tingling, pinpricks
Burning/stabbing sensations in the body
Burning in feet

General Well-being:

Extreme fatigue, exhaustion

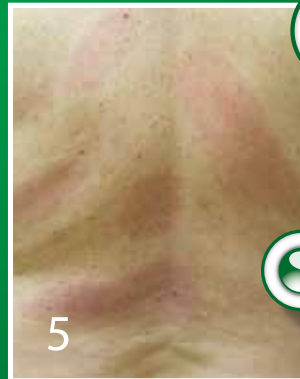


There are many signs of Lyme disease, and a hallmark of the disease is the fluctuation of symptoms.

This is a partial list – there are many possible symptoms.

Many (but not all) people who contract the disease will develop a rash called a bull's-eye or erythema migrans rash...

...but this rash can take many shapes.

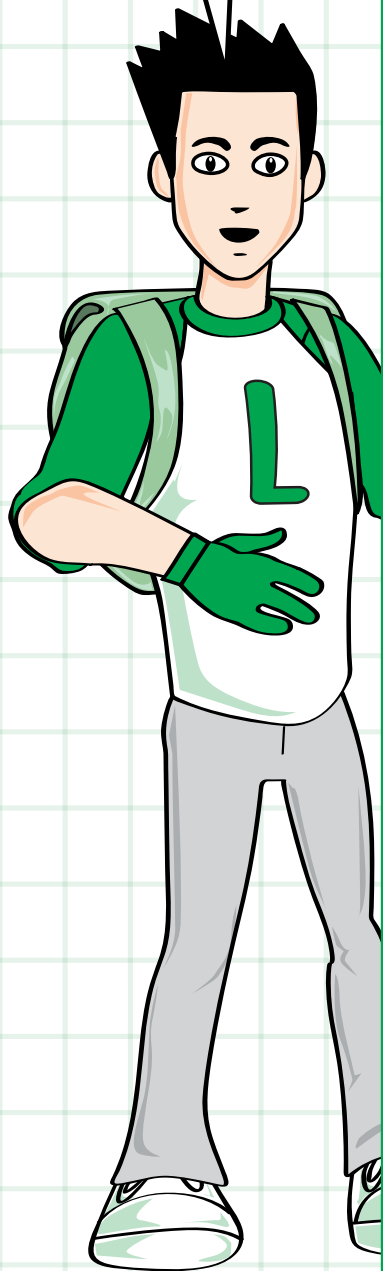


Photos of rashes 1, 3, 4 and 5 courtesy of Dr. John Aucott of Johns Hopkins University. Photo of rash 2 courtesy of James Gathany Content Providers(s): CDC/James Gathany.

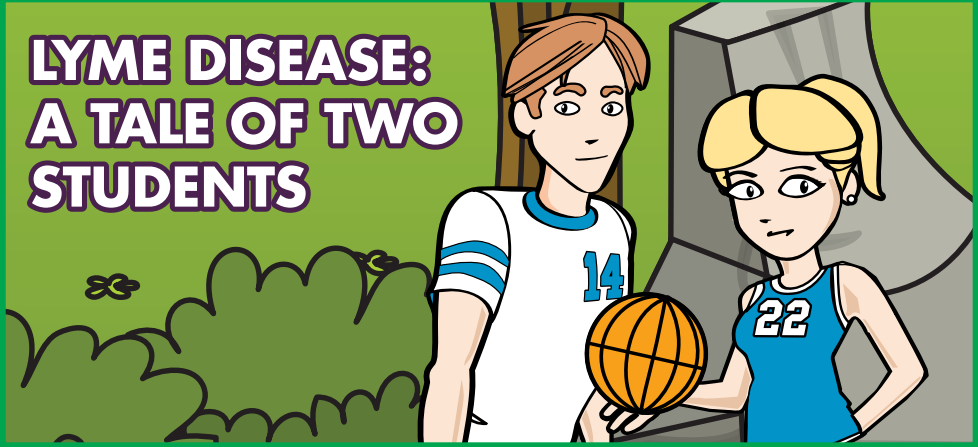
Here are some images of this rash.

Notice how varied it is in appearance.

Here's a possible scenario of two friends who've contracted Lyme disease.



LYME DISEASE: A TALE OF TWO STUDENTS

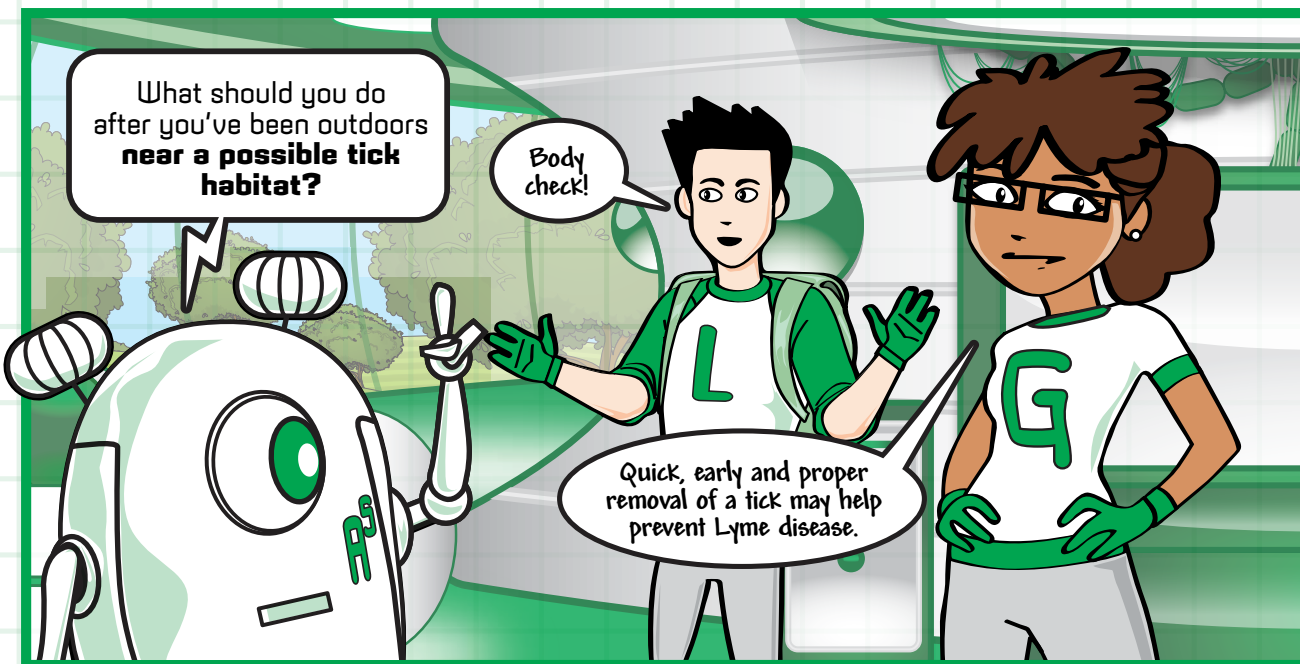


In many ways, Mike and Lori were a lot alike. Both lived in the suburbs and enjoyed sports. Lori played high school basketball and Mike played varsity soccer. Like many teens, they had numerous friends and social interests, and they enjoyed hiking in the woods. Unfortunately, Mike and Lori shared another thing in common. **Both became ill from Lyme disease, a disease that is generally difficult to diagnose and grossly under-reported.** Lyme disease is an illness caused by a spirochete, a corkscrew shaped bacterium. **People and animals, including dogs, can be infected with the bacteria through the bite of a tiny tick.**

While **neither Mike nor Lori ever noticed a tick**, they both began noticing the symptoms of Lyme disease. But this is where their stories diverge. **Mike found a 4-inch red rash on his back** one summer afternoon, and within days, the rash began to expand. **Lori never noticed a rash**, but instead developed debilitating headaches and suffered flu-like symptoms. Weeks later, she experienced fainting spells, memory problems, achy joints, and a racing heart.

After observing Mike's rash, his physician **diagnosed him with Lyme disease and prescribed antibiotics**, and soon Mike's symptoms disappeared. Lori was not as fortunate. Since **Lori's symptoms were consistent with many possible illnesses**, Lori underwent extensive testing. Eventually, **a blood test revealed that Lori was suffering from Lyme disease.** She was lucky to have had a positive blood test. Many people with Lyme disease actually **test negative due to the unreliability of currently available blood tests**, and may go years without a proper diagnosis and necessary treatment. She was eventually treated with antibiotics, and her symptoms improved, but **four years later, Lori still suffers the debilitating effects of this disease, missing many days of school and at times feeling lonely.**

Most of the people who get Lyme disease respond to antibiotic treatment and improve quickly. However, some people continue to suffer long-term symptoms, despite extended treatment. Research is being done to help prevent the spread of Lyme disease, develop more accurate blood tests, and provide effective treatments for those who continue to suffer the debilitating effects of this disease.



Here's a checklist for **proper tick removal**, and some information about **lab testing**.

- ✓ Take the time to remove the tick properly because improper removal can increase your risk of infection
- ✓ Wash hands thoroughly before and after removal
- ✓ Disinfect a pair of tweezers
- ✓ Grasp the tick close to the skin
- ✓ Pull the tick straight out
- ✓ Disinfect the site of the tick bite
- ✓ Do not panic and remove the tick with your fingers
- ✓ Do not burn or smother a tick
- ✓ Do not grasp, squeeze or twist the tick by its body
- ✓ Contact a physician for information on testing and treatment

Tick Testing

- ✓ Keep the tick alive, if possible (not necessary but helpful for testing)
- ✓ Place tick in an airtight container or zippered plastic bag
- ✓ Place a moist cotton ball or a few blades of grass in the container
- ✓ Have the tick identified and tested by a lab, health department, or veterinarian if that service is available in your area
- ✓ Visit www.GloballymeAlliance.org to find tick testing locations



What would you do in the following scenarios?

You are hiking, playing football or soccer, cheerleading, etc., and **you see there is a tick on your friend**. You're having a great time, and don't want to interrupt the game, but you know that the longer the tick is attached to your friend, the greater chance that your friend might develop Lyme disease. **What would you do?**

You are at lunch and **you see a rash on your friend's arm**. You ask about the rash and your friend tells you that it is from a bug bite. **What would you do?**

You are feeling like you have the flu and some joint pain. It seems like everyone is sick with a cold lately, so you figure it will work its way out. However, as you think about it, you realize that you were **out in the woods** about ten days ago. **What would you do?**

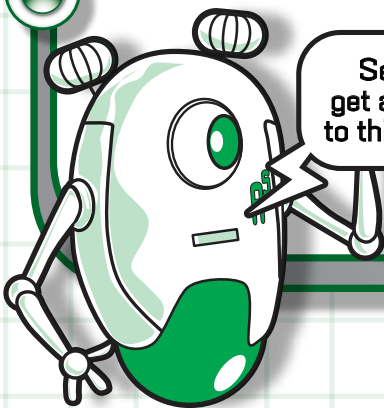
You and your friend are planning **an overnight into the woods**. What do you need to do to **prepare for your camping trip?**

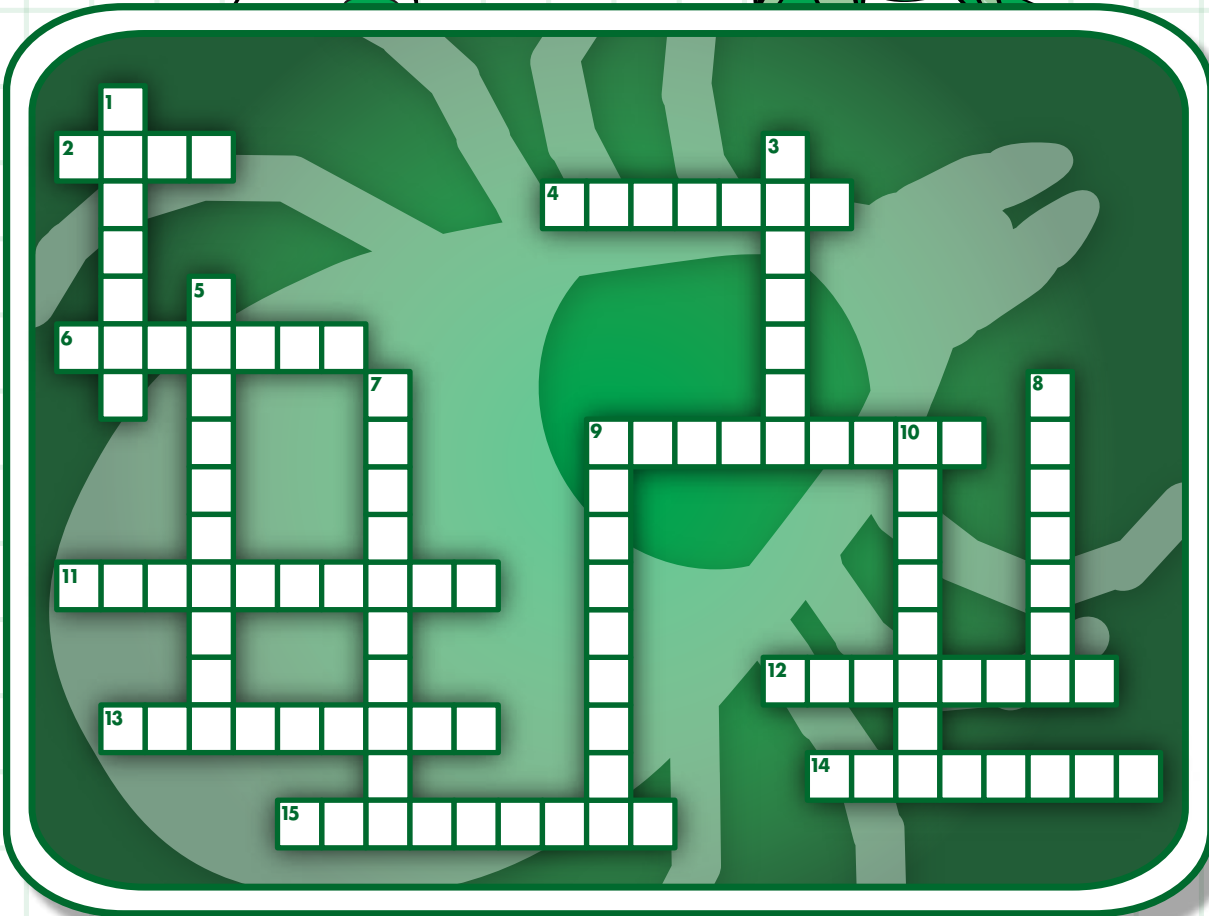
1. The bacteria that causes Lyme disease enters the body through the bite of an infected Blacklegged tick and then _____ to many parts of the body and can cause many different symptoms.
2. The corkscrew shaped bacterium that causes Lyme disease is known as a _____ (*Borrelia burgdorferi*).
3. A large, red, expanding rash is a definitive symptom of Lyme disease and means that immediate _____ care is needed.
4. Many people do not display the telltale _____ rash. This rash may be the most classic but it is not the most common.
5. Early _____ and appropriate _____ prevent later stage complications that may be costly and debilitating.
6. Common early symptoms may include _____ symptoms such as fever, stiff neck, stomachaches, headaches, swollen lymph nodes, migratory pains in joints and muscles, and fatigue.
7. The ELISA and Western Blot are the most widely used _____ but are not always reliable to make a definitive diagnosis of Lyme disease. Currently no tests can rule out Lyme disease.
8. The diagnosis of Lyme disease should be a _____ one based on signs and symptoms, tick exposure, and evaluation of tests.
9. Mild to severe _____ are a sign that Lyme disease has spread to the nervous system.
10. The main treatment for Lyme disease is the use of _____, both oral and intravenous.
11. _____ in symptoms and the severity of these symptoms from day to day are the hallmark of Lyme disease, due to both the illness itself and the response to the treatment.
12. Psychiatric problems associated with Lyme disease may include _____.
13. Sound and light _____ can make it difficult for a student with Lyme disease to tolerate the lighting and noise in most school settings.
14. Some students with Lyme disease may experience problems with school performance, especially in the areas of _____ and _____.
15. Lyme disease is a major public health threat that is grossly _____.

Word key

Antibiotics	Anxiety	Clinical
Concentration	Diagnosis	Diagnostic tests
Distractibility	Erythema migrans	Fluctuations
Flu-like	Headaches	Medical
Sensitivity	Spirochete	Spreads
Treatment	Under-reported	

See if you can
get all the answers
to this assessment.



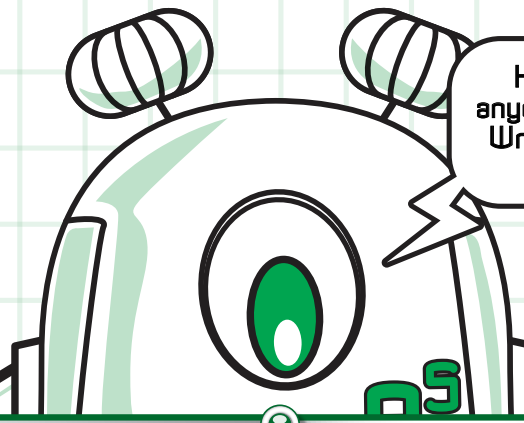


ACROSS:

- 2. ____ disease was first recognized in 1975.
- 4. Improper _____ increases risk of infection.
- 6. _____ is a symptom of Lyme disease.
- 9. Lyme disease is an infectious disease caused by a _____-shaped bacterium called a spirochete.
- 11. If tick removal occurs within several hours after _____, the risk of infection is greatly reduced, although not entirely eliminated.
- 12. The body does not develop an _____ to Lyme disease.
- 13. After removing a tick, thoroughly _____ the bite site and wash hands.
- 14. To remove an attached tick, grasp with fine-tipped _____ as close as possible to the skin and pull upward and out.
- 15. If Lyme disease is left _____, complications such as heart abnormalities and problems with attention and memory may occur.

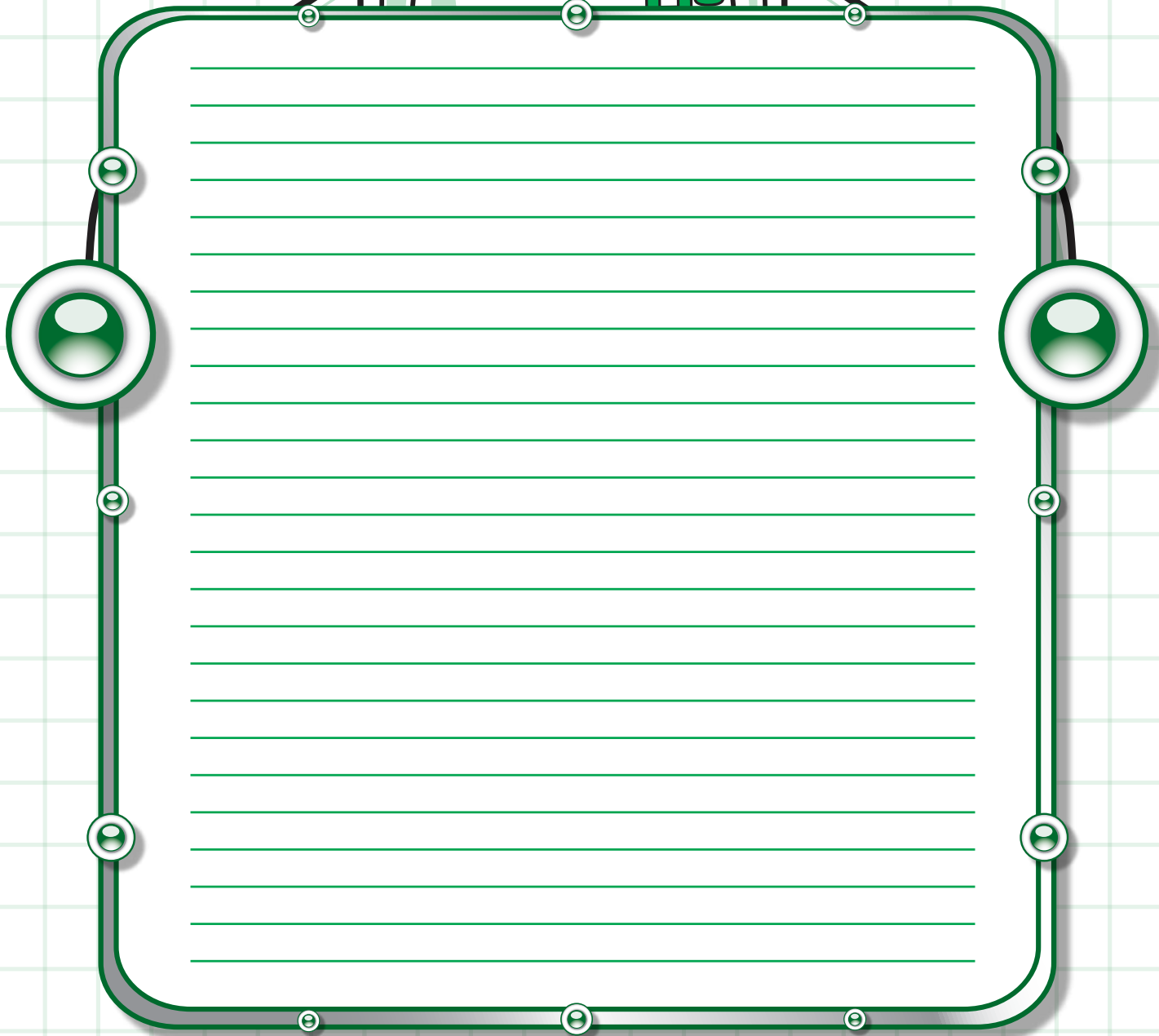
DOWN:

- 1. Most Lyme disease cases are associated with the bite of a Blacklegged tick at the _____ stage.
- 3. The eggs of a tick hatch into larvae, which feed on small _____ (rats, chipmunks, and mice) and birds.
- 5. Ticks have four _____.
- 7. Ticks may be active any day of the year when the temperature is above 36 degrees _____.
- 8. People who spend time outside in a tick-infested _____ are at increased risk for Lyme disease.
- 9. _____ problems, such as problems with attention, concentration, executive functioning, short-term memory, and word retrieval can occur with people who have been diagnosed with Lyme disease.
- 10. Symptoms may appear days, weeks, months, or even years after _____.



Have you ever known anyone with Lyme disease? Write a short essay about their experience.

If not, write about the importance of early detection of Lyme disease.



A large rectangular writing area with rounded corners, framed by a green border with circular accents. The interior contains horizontal green lines for writing.



MELY SEASIDE -----

LKGELBGAECD KICT -----

IOXDSE AARPCSSLUI -----

DIOXSE FCUIAPICS -----

MHPYN -----

RALVA -----

RHEAEYTM IMNSARG -----

LOBREIRA EGIFRDUBROR -----

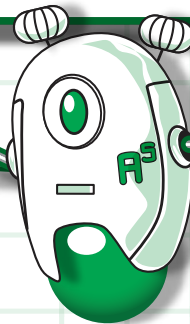
TOENRPVIEN -----

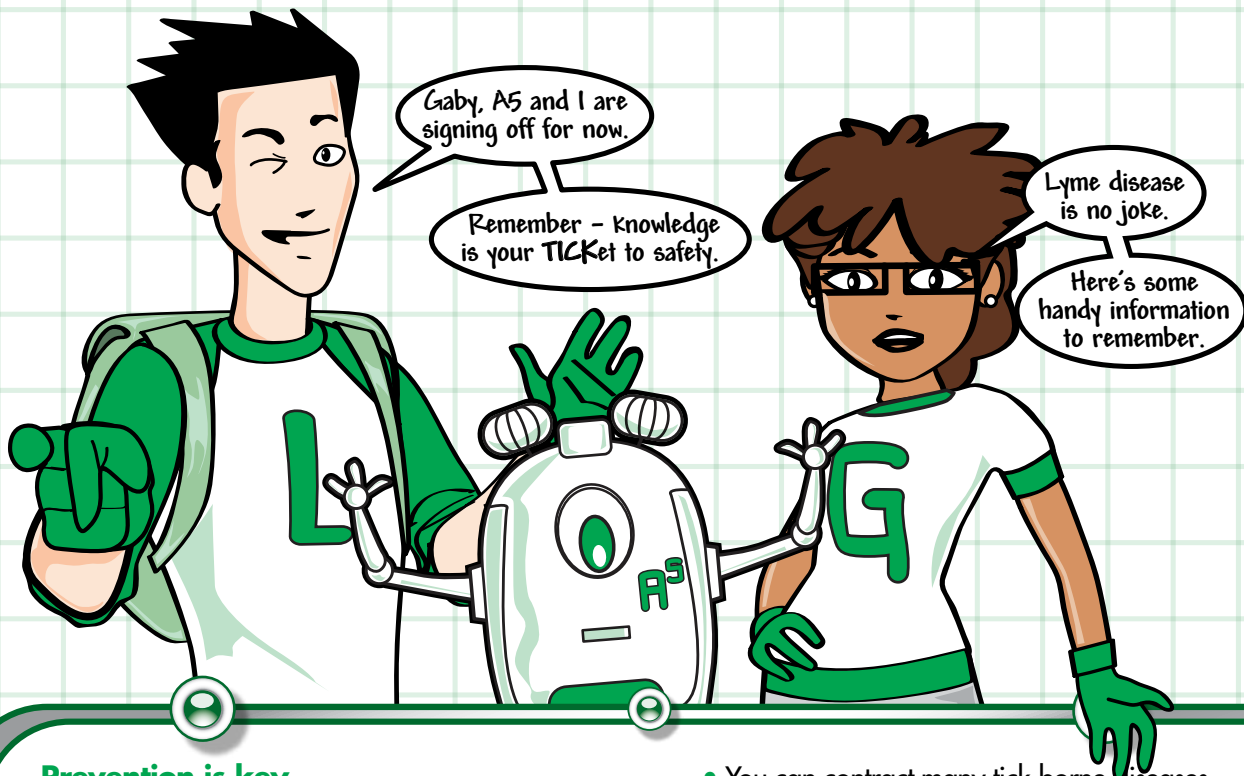
YMOSPMST -----

REYAL GOIASNIDS -----

EETARMNTT -----

ELRELPETN -----





Prevention is key

- Perform frequent and thorough tick checks; the longer the tick is attached, the greater the risk of infection
- Wear light-colored clothing
- Tuck pants into socks
- Use an appropriate tick or insect repellent on clothing and on skin, under adult supervision
- Put clothes in the dryer on high for thirty minutes to kill ticks
- An immediate shower might help remove unattached ticks

Get the Facts

- You can test negative and still have Lyme disease

- You can contract many tick-borne diseases simultaneously from the same tick bite
- If you have an erythema migrans (EM) rash, then you have Lyme disease; NOT EVERYONE infected with Lyme disease gets a rash
- Lyme disease is a clinical diagnosis, based on a patient's symptoms and history
- Lyme disease symptoms can develop within days, months or even years of a tick bite
- Once you're bitten and already diagnosed with Lyme disease, you can be re-infected a second time; this can make you more ill, even if you're still on medication

Check out our website for more fun activities!
www.GloballymeAlliance.org

OPTIONAL WORD SEARCH

K O S Y M E L L P K J E T C C S E D D O S H C Y F
 G J O G T Y G V I S O W G B W D W I Z M W S D F I
 B A U F L I M S V G X O M Q F Q S F E U F A B I I
 E F N N Q L L T B Z H J O A C T G L O J C R H J J
 Y H D U W M C I K B Q T S R R X B I U O N U T C W
 X U S M I T H C B O B E S A J O I N T P A I N E K
 Q K E B D T I L W A H A C E R J D X V F X R N P Y
 X N N N W H U G P C T T N P N V Z B I D D P V J Q
 A C S E K M W Q A P I I N M H S N A H U H A S N S
 M B I S C J F D U B F O R B M C I D R O W M H I U
 K K T S D N A K I V I V U R A O B T H E S S N A K
 R H I R M E D L C T R E C I I Z O S I E E P U P R
 R F V R H C I L A Y R T R X Y P O D J V I J W E Y
 O B I R B T F R W N O V L H X A P W I T I J I L V
 Y W T V Y A T L D P W Z X H X L Q X B N S T K C A
 J G Y J T N S S N O I S I V Y R R U L B E I Y S H
 Q H H I E R B I P B L S U O Y M Z R R N O S L U E
 S U G C P N K U H X Q Z W V R X B O C G N X S M X
 E U N U D D A Z W L D Z E A C B X Y D W E N P G B
 E O A Y U R P A H L Q D Q P Y A U Z R N F Y G W M
 C S L W Y Z Y V Z L A F F B N V C E A J X A F V M
 O V O Y M I I Z M H U U S U Z F P D K X U T A C Q
 H E A R T P A L P I T A T I O N S L Q G J X R H C
 G Y V X D U S T X Q C K A J C Y T K P W E V K I J
 T J R W W I E J L M D Q O X B S F L D M E V D G Y

Blurry vision
 Fatigue
 Headaches
 Irritability

Joint pain
 Moodiness
 Rash

Heart palpitations
 Concentration problems
 Distractibility

Light sensitivity
 Muscle pain
 Numbness
 Sound sensitivity

