



ATTACK

ILLUSTRATIONS
BY
MARK MATCHO

OF THE

Disease-carrying ticks and mosquitoes are terrors, but there are ways to stay safe. Watch the ankles, forget about bull's-eye rashes and arm yourself with this brand-new science.

BLOOD

BY
KATE ROCKWOOD

SUCKERS

AH,

summer! More sunshine, more outdoor adventures...and more mosquitoes and ticks (blech). The vampiric little buggers peak this time of year, and they're not just gross and annoying—getting bitten by the wrong one can leave you battling for your health. But that doesn't mean you have to spend the next few months under house arrest. Your manual to outsmarting these pesky pests starts here.

TOP 4 THINGS YOU NEED TO KNOW ABOUT ZIKA

A year ago, Zika wasn't on most Americans' radar. Now the World Health Organization considers the virus an international public health emergency. Ann Powers, PhD, chief of the Alphavirus Laboratory at the Centers for Disease Control and Prevention (CDC), fills us in on the latest findings.

1

Pregnant women aren't the only ones who should be worried

Yes, they're the people most at risk because of Zika's confirmed link to birth defects. And for most folks, Zika infection produces a relatively mild illness, with only one in five developing symptoms such as fever, rash, joint pain or red eyes. But the virus has now also been tied to neurological issues, most notably Guillain-Barré syndrome, which causes the immune system to damage nerve cells.

2

We're still not sure how long it lingers in men

It's believed that the body clears the virus within two weeks, then you're immune. So if you later get pregnant (the CDC suggests waiting at least eight weeks), your baby will likely be fine. But Zika may survive months longer in semen. Men returning from a Zika-infected area shouldn't have unprotected sex for at least eight weeks (six months if they've had symptoms), or for all of a partner's pregnancy.

3

The virus will almost definitely spread in the United States...

Zika is transmitted by the *Aedes aegypti* mosquito and can likely be spread by another species, *Aedes albopictus*—both found in the United States (see map). The outbreak has already begun in Puerto Rico; the CDC estimates that 20 percent of the population could be infected by year's end. In May, Puerto Rico reported the first case of microcephaly due to Zika infection acquired in the U.S.

4

...but don't pack your bags for Antarctica just yet

Consider this: The continental U.S. isn't battling the same circumstances—such as dense urban centers with high poverty, uneven access to health care and weak mosquito-control programs—as many other places where Zika is thriving. Lifestyle factors, like our widespread use of window screens and air-conditioning, should also make it easier to keep outbreaks contained in most parts of the U.S.



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MORE VIRUSES TO WATCH OUT FOR

Zika is just one reason to keep your mosquito swatter handy.

WEST NILE

WHAT IT IS A potentially fatal virus that's especially hard to stamp out because it also infects birds, which then bring the virus to new areas. West Nile has been reported in all 48 continental states.

WATCH FOR Only one in five people experience symptoms such as vomiting, diarrhea, headaches and joint pain. Fewer than 1 percent of patients have severe neurological symptoms, such as seizures, paralysis or coma, that require hospitalization.

DENGUE

WHAT IT IS A leading cause of death in the tropics and subtropics, dengue infects nearly 400 million people every year. In most of the U.S., it rarely occurs, though there have been outbreaks in Florida and Hawaii.

WATCH FOR Symptoms include a high fever and at least two of the following: severe headaches, eye pain, nosebleeds, bleeding gums, joint or bone aches and low white blood cell counts. Infection can be fatal, so if you suspect dengue, call your doctor ASAP.

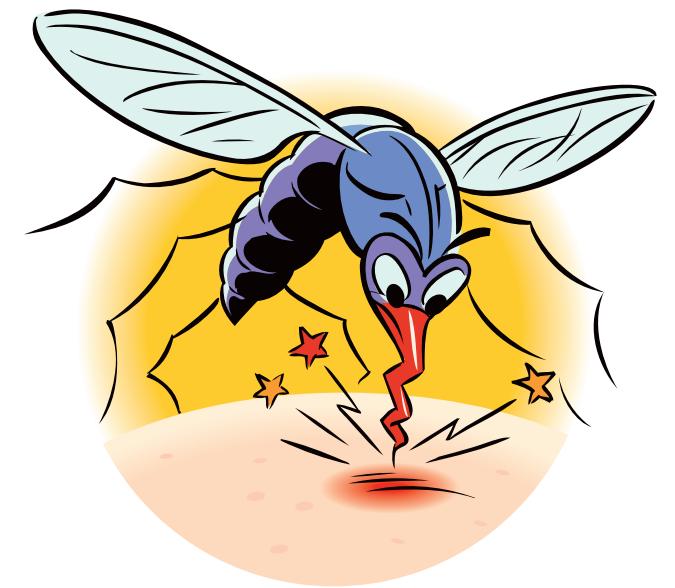
CHIKUNGUNYA

WHAT IT IS This virus first reached the U.S. in late 2006; fortunately, experts think that chances of a widespread outbreak are slim.

WATCH FOR Excruciating joint pain and a fever that sets in a few days after the mosquito bite. Symptoms typically last about a week, though the joint pain may linger for months.

Grab a Quick Bite

Some mosquitoes are aggressive, in-your-face biters, but the *Aedes aegypti* is sneaky instead. "Because it lives closely with humans, right in our houses, it has modified its biting behavior to go undetected," says Jonathan Day, PhD, a medical entomologist and mosquito expert at the University of Florida. The buggers tend to fly close to the ground and target the feet and ankles, and a chemical in their saliva makes their bites less painful—so you might never even know you've been bitten.



5 WAYS TO KEEP MOSQUITOES AT BAY

1. HUNT FOR BREEDING GROUNDS

► You might not think your yard is full of stagnant water, but "mosquitoes will breed quite happily in something as small as a discarded soda bottle cap," says Joe Conlon, a retired U.S. Navy entomologist and a technical adviser for the American Mosquito Control Association. "You have to be fastidious." Clear the water from outdoor kids' toys, birdbaths, flowerpots, clogged gutters—even the tarp you toss over the woodpile, if little puddles tend to pool there. Mosquitoes take about a week to grow from egg to adult, so go on a water-dumping mission every four or five days to ensure you're not hosting the next generation.

2. BLOW THEM AWAY

► Mosquitoes are weak fliers; any breeze stronger than 1 mile per hour is enough to deter them. On a still day, grab a plug-in box fan to create the same effect. "Just make sure to point it at your lower extremities," says Day. "Mosquitoes fly low to avoid the wind, so a fan on your face won't protect your feet."

3. TWEAK YOUR WARDROBE

► "Your risk of getting bitten is reduced considerably just by covering exposed skin," says Conlon. Limit loose-weave fabrics, like

linen and cotton, in favor of tighter weaves, like synthetic and athletic fabrics, that mosquitoes struggle to bite through. (One more reason to embrace your athleisure look!)

4. STRETCH INDOORS

► Mosquitoes zero in on tasty victims by searching for carbon dioxide. Release more and you'll attract more hungry pests. Some factors that raise CO₂ production (such as pregnancy) are impossible to tone down, but you'll also pump out more while exercising or drinking alcohol. "Mosquitoes don't fly very fast, so they can't catch up with you when you're running," says Day. "But you might notice that afterward you get 10 bites while stretching for a few minutes." Consider taking your cooldown inside.

5. WEAR REPELLENT!

► Experts agree: If you do only one thing to keep yourself safe, apply repellent before you spend time outdoors. How much time? "During the dawn and dusk hours, when mosquitoes tend to be more active, spray yourself even if you're just running to the mailbox," suggests Conlon. "One colleague at the CDC contracted West Nile when he went out to check the mail—and that was the sickest he's ever been in his life."

MISERY MAKERS

These six species, common in the U.S., spread the most dangerous viruses.



YELLOW FEVER MOSQUITO

aka *Aedes aegypti*
CARRIES Zika, chikungunya, dengue



ASIAN TIGER MOSQUITO

aka *Aedes albopictus*
CARRIES Zika, chikungunya, dengue



NORTHERN HOUSE MOSQUITO

aka *Culex pipiens*
CARRIES West Nile



SOUTHERN HOUSE MOSQUITO

aka *Culex quinquefasciatus*
CARRIES West Nile



CULEX TARSALIS

CARRIES West Nile



CULEX NIGRIPALPUS

CARRIES West Nile

Hands Off!

Scratching a mosquito bite actually makes it itchier. If you need relief, try a cold compress (to numb the bump) or an oral antihistamine instead.



REPELLENT 2.0

When you're going camping...

REACH FOR DEET at 25 percent concentration. "DEET has a bad reputation, but the health concerns are greatly exaggerated," says Conlon. "Look through the medical literature and you'll find that most adverse reactions are tied to people drinking or overusing the stuff." When it comes to warding off ticks and mosquitoes, DEET is considered by most experts to be the gold standard, which makes it essential if you're spending days outdoors. TRY Off! Deep Woods Dry (\$10 for 4 oz.; amazon.com)

When you're hosting a family BBQ...

REACH FOR Picaridin at 15 to 20 percent concentration. Derived from pepper plants, picaridin is one of the most

popular repellents in the world outside the U.S.—and unlike some repellents, it's safe for kids ages 3 and under. "Picaridin has a light, nongreasy feel, so it's a good one if you need to wear repellent daily," says Conlon. TRY Sawyer Picaridin Premium (\$8 for 3 oz.; rei.com)

When you're exercising outside...

REACH FOR Oil of lemon eucalyptus at 30 to 40 percent concentration. Pure oil of lemon eucalyptus (meaning the essential oil) won't do the trick, but repellent manufacturers sell a synthesized version that's virtually as effective as DEET against ticks and mosquitoes, though it's not as long-lasting. TRY Repel Lemon Eucalyptus (\$7; amazon.com)

SCAN TO SHOP!
SCAN THE IMAGE ABOVE TO BUY THE ITEMS ON THIS PAGE (SEE PAGE 4), OR VISIT HEALTH.COM/SHOP-NOW.

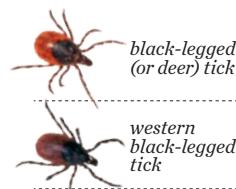
YELLOW FEVER: JORSTAN/GETTY IMAGES; ASIAN TIGER: INSECT WORLD/SHUTTERSTOCK; NORTHERN ANEST/SHUTTERSTOCK; SOUTHERN: NORM THOMAS/GETTY IMAGES; TARSALIS: JOSEPH BURGER/BUGWOOD.ORG; NIGRIPALPUS: JOSEPH BURGER/BUGWOOD.ORG

TICK, TICK, TICK, BOOM!

You've heard of Lyme disease, the most common illness transmitted by bloodsucking bugs in the United States. But ticks can carry a wide array of nasty pathogens, and as more proliferate across the U.S., scientists are tracking the spread of other tick-borne troublemakers, too. "Lyme is the tip of the iceberg," says Durland Fish, PhD, an epidemiologist at Yale School of Public Health. You can also contract more than one disease from one tick bite (known as coinfection), so if you have symptoms that don't improve with treatment, be sure to bring it up with your doctor. The illnesses you're most likely to encounter, and the ticks that spread them:

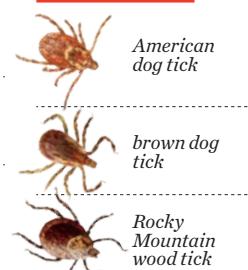


LYME DISEASE



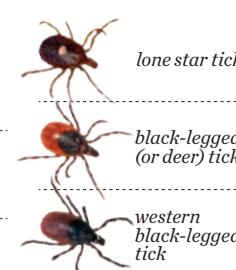
SYMPTOMS Rash, fever, headache and muscle pain are early signs, with joint pain and neurological symptoms showing up later if the illness is untreated. Scientists have long thought Lyme was caused by one species of bacteria, *Borrelia burgdorferi*, but the CDC and Mayo Clinic recently found a second culprit, *Borrelia mayonii*, that can also cause nausea and vomiting. **TREATMENT** People who take a two- to four-week course of antibiotics early on usually recover completely. "The sooner you're treated, the better," says Andrea Gaito, MD, a rheumatologist and Lyme specialist based in Basking Ridge, N.J.

ROCKY MOUNTAIN SPOTTED FEVER



SYMPTOMS Fever, headache, stomach pain and vomiting. A spottike rash may appear after a few days, but not always. **TREATMENT** Taking the antibiotic doxycycline for one to two weeks can typically wipe out the illness if started within a few days, but if left untreated, the bacterium can be fatal. "This disease is easy to diagnose if it's suspected, but not all physicians are aware of it," says Fish. Despite the name, over 60 percent of cases of Rocky Mountain spotted fever occur in North Carolina, Oklahoma, Arkansas, Tennessee and Missouri.

EHRlichiosis



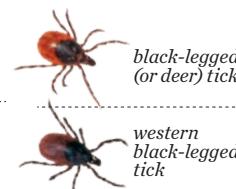
SYMPTOMS This lesser-known bacterial infection is easy to confuse with the flu because rashes are uncommon and symptoms include fever, muscle aches, nausea and malaise. It shows up most often in the Southeastern and South Central United States. **TREATMENT** Doxycycline should be started as soon as ehrlichiosis is suspected. Severe cases require IV meds and hospitalization, and it's fatal about 2 percent of the time.

BABESIOSIS



SYMPTOMS "Most tick-borne diseases can be bad, but babesiosis can be one of the most serious, akin to malaria," says Paul Mead, MD, chief of epidemiology and surveillance for the CDC's Lyme disease program. Think drenching sweats, high fever, fatigue and chills. The disease is caused by microscopic parasites, which infect and destroy red blood cells. It's most common in the Northeast and upper Midwest. **TREATMENT** Doctors typically prescribe a one-two punch of antibiotics (such as clindamycin) and the malarial med quinine to kill the parasites. Though most people do recover, babesiosis can be fatal, especially for people with compromised immune systems.

ANAPLASMOSIS



SYMPTOMS They can vary a lot from patient to patient, ranging from malaise, headache and confusion to cough, fever and stomach pain, which makes this disease particularly tricky to diagnose. Lab tests aren't effective until a week or more after contracting the bacterium, so clinicians look at clues like low platelet counts and elevated liver enzymes. **TREATMENT** A one- to two-week course of doxycycline. The disease can be fatal if not treated properly, even in people who are otherwise in tip-top shape.

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YOUR TICK DEFENSE PLAN

Stick to the middle

► Avoid the edges of paths and trails, where ticks are more prevalent.

Wear white

► Teeny-tiny ticks are easier to spot against light-colored duds.

Protect your noggin

► Don't think ticks are only in the grass. "Brushing against a tree could easily leave one in your hair," says Amesh Adalja, MD, an infectious disease specialist at the University of Pittsburgh. Try donning a cap or tying hair back, and use repellent on your face. (Spray into hands and then apply with your fingers.)

Hike up your socks

► And tuck your pant legs into them. Fashionable, it's not. But every inch of exposed skin matters.

Treat your clothes

► If you're heading into tick-heavy backcountry for days, consider applying the

insecticide permethrin to your clothes (it can last through up to six washes), as well as spraying repellent on skin not covered by clothing. "Ticks are crafty, so you want to use multiple types of protection," says Dr. Mead.

Double-check your damp bits

► Ticks love dark, moist areas, so when you're looking for them, focus on the groin, backs of the knees and armpits. "Women often forget their bra line, but that's a tick's dream spot," says Dr. Gaito.

Hit the shower

► A full-body tick check and a pair of tweezers should be your first line of defense. But you might be able to scrub away any ticks you miss—and slash your risk of tick-borne disease—when you lather up. "Water alone won't do the trick, because you need a bit of resistance to remove ticks," says Dr. Gaito. So grab a loofah!

Let's Not Be Rash

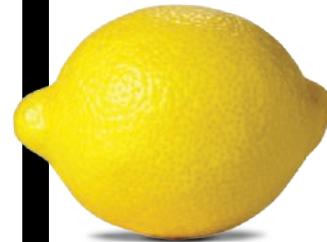
Lyme rashes can resemble spider bites, ringworm or hives, in addition to the classic bull's-eye rash (right). "Doctors have gotten away from even using the word *bull's-eye*, because the diversity of the rash is so astounding," says Dr. Gaito. "The bottom line is, if you see any kind of suspicious rash, go to your doctor and let him check it out."

WHEN LYME DOESN'T GO AWAY

Even after taking antibiotics, some people treated for Lyme disease develop what's known as posttreatment Lyme disease syndrome, in which fatigue, pain, neurological symptoms and joint and muscle aches linger for months. Experts aren't sure why it happens, but the infection may trigger an autoimmune response that causes residual tissue damage. A small subgroup of doctors argue that these symptoms could be a sign of residual bacterial infection and recommend long-term antibiotics (lasting for months or even years) to fight what they call chronic Lyme. But most doctors advise against lengthy antibiotic treatments, and a recent study published in *The New England Journal of Medicine* found that they didn't help patients with persistent Lyme symptoms.



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TEST YOUR PEST SMARTS

1 TRUE OR FALSE: SOME PEOPLE ATTRACT MORE MOSQUITOES THAN OTHERS.

ANSWER: True. The reason can't be reduced to "sweeter blood" (sorry, Granny), but there is a genetic component: In a recent study published in *Plos One*, identical twins (who have the same genes) attracted mosquitoes at the same rate, while fraternal twins were bitten at very different rates. "Humans put off more than 300 different compounds of smells, and some chemicals, like lactic acid, are more attractive to mosquitoes," says Conlon. "It's unlikely we'll ever ferret out all the nuances of what makes someone a mosquito magnet."

2 TRUE OR FALSE: PLANTING LEMON BALM AND CITRONELLA IN THE GARDEN WILL NATURALLY REPEL MOSQUITOES.

ANSWER: False. Mosquitoes do avoid these plants, but once a hungry female is after blood, no amount of citronella in the air will mask your human scent.

3 TRUE OR FALSE: ULTRASONIC DEVICES DETER MOSQUITOES.

ANSWER: False. Alas, none of the many ultrasonic devices and apps that are marketed as mosquito repellents are proven to work. Likewise for "natural" wristbands or clip-on devices that contain DEET. Any repellent needs to be applied directly to your skin to block a mosquito's interest in biting you, says Conlon.

Skip This Time-Saver

Combo lotions that include both repellent and sunscreen might seem like a two-birds-one-stone bargain, but the CDC recommends against using them. Sunscreen needs to be applied liberally and frequently, so keeping your skin UV-safe could mean you'll wind up slathering on more repellent than you need to.

YOU FOUND A TICK. NOW WHAT?



FIRST, DON'T PANIC

"It's not like you get a tick and you instantly have a disease," says Dr. Adalja. Depending on how many bacteria are in the tick, it could take anywhere from 12 to 72 hours to infect you. "A tick will become engorged as it ingests more blood, so in general, the more engorged it is, the longer it's been there," says Dr. Adalja.

GRAB YOUR TWEEZERS

There are a ton of myths about what will work—nail polish, Vaseline, a lit match (ouch)—but don't fall for any of these. Aim tweezers as close to the skin as possible and pull the tick straight out. Then leave the site alone. "You can injure your skin if you keep digging around," says Dr. Adalja.

STASH THE BUGGER

Remember: The tick has to be a carrier of disease and be attached for a while to make you sick. But holding on to it will make it easier to test if needed. Use a jar or ziplock bag.

CHECK YOURSELF OUT

Be alert for flu-like symptoms or a rash of any kind; if you develop either in the following few weeks, talk to your doctor. Look for rashes everywhere, not only in the area where you found the tick, because another one may have bitten you without your spotting it. Be sure to examine your armpits and groin, lift up your hair to search your scalp and check your backside in a mirror or with a partner's help. Rashes can fade fairly quickly, so snap a photo if you're not able to get to the doctor's office for a couple of days.