

Recommendations for Reducing Risk of Tick-Borne Relapsing Fever

Remove rodents and nests, stop rodents from reentering buildings, and reduce exposure to infected ticks

A fact sheet for pest control professionals & public health practitioners

Background & transmission

Tick-Borne Relapsing Fever (TBRF) is an infection caused by *Borrelia* species bacteria and transmitted by soft ticks in North America. Soft ticks are known to inhabit the nests of rodents and birds and can remain in the nest for many years after the nest has been vacated.¹ The three major *Borrelia* species that cause TBRF in North America are:

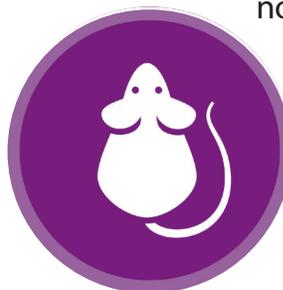
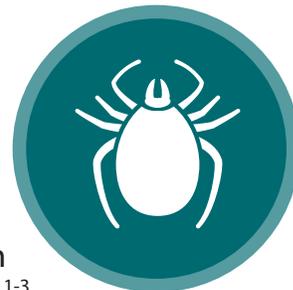
- *B. hermsii* – found in the soft tick *Ornithodoros hermsi*. This tick lives in close association with chipmunks, deer mice, wood rats, and some birds in western states, specifically in coniferous forests at elevations of 1200-8000 feet.¹⁻³
- *B. parkeri* – found in the soft tick *O. parkeri*, which inhabits burrows of ground squirrels and prairie dogs or caves in southwestern states at low elevations. *O. parkeri* can also parasitize other mammalian hosts such as mice, cottontail rabbits, and burrowing owls.¹⁻³

- *B. turicatae* – found in the soft tick *O. turicata*, which is associated with ground squirrels, prairie dogs, wood rats, rabbits, and numerous other animals in the western United States.¹⁻³

The ticks prefer areas with low humidity and low elevations and have been found in caves and underground burrows.

Bites from soft ticks are usually painless and last less than 30 minutes. Therefore, a person may not realize that he or she was

bitten.¹ A person typically becomes infected with *B. hermsii* while sleeping in a rodent-infested cabin or other building.



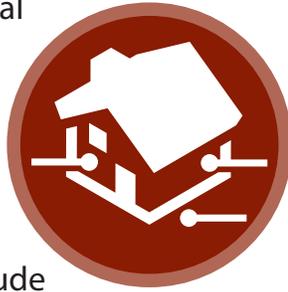
TBRF symptoms

Symptoms usually develop approximately 5-15 days after a bite from an infected soft tick and may include fever, headache, myalgia, and chills occasionally accompanied by nausea, arthralgia, vomiting, or abdominal pain.^{4,5} Fever typically resolves after 3-5 days and the patient experiences up to a week of apparent recovery before fever and other symptoms return. Up to a dozen relapses can occur as the bacteria repeatedly alters its surface antigens, each time eliciting a new immune response from its human host.^{4,6} Individuals who develop these or other symptoms after spending time in wilderness or following exposure to rodents or rodent nests should see a health care provider as soon as possible.

Reducing risk of TBRF

Many cases of TBRF have been linked to cabins with rodent infestation. In buildings where one or more cases of TBRF have been identified, the building should be thoroughly inspected by a pest-control professional or other knowledgeable persons to locate and remove rodent nests and eliminate points of ingress.

The central tenets of TBRF prevention are to remove rodents and their nests, exclude reintroduction of rodents into the building, and reduce exposure to the infected ticks. TBRF infections can be decreased through public education, awareness, preventive control measures, and avoidance of areas where infected ticks are most abundant.⁷



Assessing evidence of rodent activity in and around structures

Signs of rodent activity include visible droppings, gnaw and rub marks on walls where rodent movement is restricted, and nests.^{8,9} Buildings may have structural deficits or age-related wear that create separations at wall junctions and ceilings where rodents can enter. Rodents may also gain access through or around heating ducts, ventilation, cracks in masonry, utility openings, areas where other animals (e.g. woodpeckers) have made access, or any openings on the outside walls that allow access to the wall's interior structure.

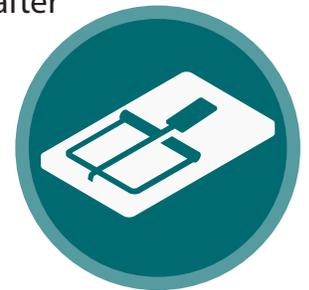
Removal of rodents

It is important to remove rodents from the premises first by trapping. Lethal spring or “snap” traps are recommended.¹⁰ Traps should be set near rodent nests or at points where rodents enter or leave buildings. In most instances, a mixture of peanut butter and rolled oats provides a suitable bait that is sticky and will adhere to the treadle (trigger device) of snap traps. Other methods of rodent removal—such as glue traps and poisoned baits—are less effective, less humane, and less discriminating between target and non-target animals.

Furthermore, a partially glued rodent can drag the trap into an inaccessible area, and most poisoned rodents will die unobserved. If this occurs, then there would be no evidence to determine whether the control was successful.⁸

Always wear waterproof disposable gloves when handling trapped rodents. Trapped dead rodents should first be sprayed with a disinfectant solution before removal. Diluted hypochlorite solutions (1 part household bleach: 10 parts water), hospital grade Lysol, phenolic detergents, and most general purpose household disinfectants are useful for disinfection. Always read and follow the instructions on the disinfectant's label prior to use. Disinfectant should be allowed to sit for at least 5 minutes before handling the trap or nest. Ideally, rodents should not be removed from traps but disposed of — rodent and trap together. Rodents and traps should be placed in a sturdy plastic bag and knotted or sealed tightly. This bag should then be placed inside a second bag and sealed.¹¹ The double-sealed bag may then be disposed of with ordinary household trash in a covered container. Where municipal codes permit, bagged rodent materials may also be buried (at least 3 feet deep) or burned.¹² Rinse gloved hands with disinfectant when done, and vigorously scrub hands with soap and water after gloves have been removed.

When conducting TBRF control measures in areas where deer mice are also present and likely to be trapped, consider guidance on additional protective measures as described in “Hantavirus Pulmonary Syndrome--United States: Updated Recommendations for Risk Reduction.”¹¹



Removal of rodent nests

Rodents often make their nests inside walls and utilize spaces not easily accessible. Nests may be found under cluttered areas, logs, bushes, trees, ground-level patios and decks, abandoned cars, attics, cabinets, and other small

spaces.¹³ Because rodent nests are often found in spaces that are not easily accessible, it may be difficult to impossible to get to rodent nests in a building without removing paneling or major deconstruction of the walls.

Prior to removing nests, spray the area with a disinfectant solution until thoroughly soaked and wait at least 5 minutes before wiping up with a paper towel or rag.^{11, 12, 14} In some cases, water may be used instead of disinfectant if the surface is prone to damage by chemicals.

It is important not to vacuum or sweep rodent urine, droppings, or contaminated surfaces until they have been disinfected in order to avoid generating potentially infectious aerosols.^{11, 12} Nest materials should be double-bagged and disposed of according to the same procedures for trapped rodents (outlined in the previous section).



Rodent exclusion

To limit further infestation of rodents in residences:

- Identify and seal gaps and holes inside (e.g., plumbing under kitchen cabinets, basement crawl space, or floor vents)¹⁴ and outside of the residence (e.g., windows, doors, rafters, and around pipes, foundations and footings).¹⁰ Large openings can be covered with appropriately sized boards, metal sheeting, or sturdy wire mesh such as hardware cloth. Smaller mouse- or chipmunk-sized openings can be stuffed with steel wool.

- Eliminate food sources for rodents in and around the house (seal food in containers, keep bird feeders away from house, keep compost and trash bins away from house, collect uneaten pet food, etc.).¹⁰
- Avoid placing firewood right next to the home as this tends to be a place where rodents may nest.⁹

Reducing tick exposure

Although removal of rodent nests is important to reduce exposure risks, some soft ticks are likely to remain following nest removal. These ticks could pose a risk to people as they seek new hosts, including humans.⁹

The most commonly used method to reduce risk is treating tick-infested structures with an appropriate pesticide applied by a professional pest control operator who is familiar with the types of “crack and crevice” treatments used to control cockroaches or other wall-dwelling pests. Although these methods have not been studied directly as a means of controlling soft ticks in cabins and other structures, based on general principles of pest control it is thought to be effective for soft ticks as well.

To reduce the risk of bites from soft ticks, inspect sleeping areas for any cracks or gaps in the walls or ceilings and baseboards where ticks could gain entry. If found, they should be filled in. In order to limit travel of soft ticks to bedding, move beds away from walls and do not to allow bed sheets to touch the ground.⁹



Contact information

For additional information please contact the Centers for Disease Control and Prevention Division of Vector-Borne Diseases at 970-221-6400.

Acknowledgments

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