# NPS Reference Manual 50B
# Occupational Safety and Health Program

## Chapter 56: Tickborne Disease Prevention

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# Chapter 56
# Tickborne Disease Prevention

## 55.1 Introduction

Ticks and tickborne diseases are increasing in number and geographic spread in the United States (Centers for Disease Control and Prevention [CDC], Tickborne Diseases of the United States). This increase involves ecological and climate changes, closer associations between humans and wildlife, human behavioral changes, and increased recognition and reporting of disease (Beard 2014).

Ticks carry multiple different diseases caused by viruses, bacteria, and parasites (CDC, Selected Tickborne Diseases). Certain types of tick bites may also induce, in rare circumstances, an allergy to meat (Steinke 2016). Lyme disease is the most common tickborne disease in the United States. In 2021, the CDC estimated nearly 500,000 cases of Lyme disease are diagnosed annually https://wwwnc.cdc.gov/eid/article/27/2/20-2731_article).

Although the majority of illnesses associated with ticks occur in the Northeast and upper Midwest regions, other regions do experience tickborne diseases as well. While Lyme disease is spread on the East Coast and upper Midwest by the tick *Ixodes scapularis*, it also exists on the Pacific Coast, where it is spread by the tick *Ixodes pacificus*. Data have been published describing the presence of *I. pacificus and I. scapularis* (which also transmits other illnesses including anaplasmosis, babesiosis, and Powassan virus disease) at the county level, using literature searches, individual state health department websites, and contacts with public health officials, acarologists, and Lyme disease investigators throughout the United States (Eisen et al. 2016). Although the tick burden may differ in the national parks compared to surrounding county data, existing park-specific data also demonstrate the presence of disease-carrying ticks in multiple parks (Adjemian 2012, Eisen L 2013, Geissler 2014, Han 2014, Johnson 2016).

Employees in the national parks, because of extended time spent outside, may be at high risk of coming into contact with ticks. In a recent needs assessment distributed to the national parks, approximately one-quarter of respondents in the analysis described the lack of Standard Operating Procedures (SOP) as a challenge to preventing tickborne diseases in the parks, and about half of the respondents requested assistance developing an SOP. The purpose of this NPS Tickborne Diseases Prevention guidance is to educate and empower employees to protect themselves from tickborne diseases. Specifically, this document provides guidance on where to obtain information on tick ecology and specific tickborne diseases, how to prevent tick bites, instructions, and procedures on what to do if bitten by a tick, and assigns responsibilities for park personnel.

## 55.2 Scope

The NPS Tickborne Diseases Prevention guidance provides recommendations and requirements for NPS employees and volunteers, including student interns and Youth Conservation Corps members on how best to protect against tickborne disease and report tick exposures in the electronic safety management information system. Partners integrated into supervisory chains and/or directed day-to-day can report exposures. Partners will not be covered under the Federal Employees Compensation Act (FECA) but may be covered under the partner organization's workers' compensation program. Much of the guidance about tickborne disease prevention provided in this document applies to partners, but payment for evaluation and treatment after a tick

bite would need to be addressed on a case-by-case basis. This document does not apply to contractors, concessioners, or commercial use authorized service providers; they must comply with the safety and health clauses in their contract or authorization and with federal, state, and local requirements.

## 55.3 References

Detailed information for implementation is contained in the following references.


1. Occupational Safety and Health Act (OSHA) Federal Agency Safety Programs and Responsibilities (Public Law 91-596, Sections 5(a)(1) and 19).
2. Basic Program Elements for Federal Employee Occupational Safety and Health Programs and Related Matters (29 CFR 1960).
3. Federal Employees Compensation Act 5 U.S.C. Sections 8101 et seq. Regulations implementing the FECA are provided at 20 C.F.R. Sections 10.00-10.826
4. Executive Order 12196, Occupational Safety and Health Programs for Federal Employees.
5. Department of the Interior Occupational Medicine Program Handbook, Tab 12 E-4(a) Specific Program Requirements, Attachments, and References.
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20. Jones EH, Hinckley AF, Hooks SA, et al. Pet ownership increases human risk of encountering ticks. Zoonoses Public Health 2018; 65(1):74-9
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## 55.4 Responsibilities

This section addresses the responsibilities and requirements for all roles.

### 55.4.1 Washington Area Support Office (WASO)

The WASO Office of Risk Management, Office of Public Health, Wildlife Health Branch, and Integrated Pest Management (IPM) Program, working in collaboration, are responsible for:

1. Maintaining the guidance, and when necessary, revising the guidance.
2. Assisting parks/offices in understanding the risks of tickborne disease within their park/office.
3. Providing up-to-date scientific information to parks/offices on tickborne diseases and how they can best be prevented.
4. Providing consultative services for questions around tickborne diseases and guidance on occupational safety and health.

### 55.4.2 Regional Safety Manager

The regional safety manager provides services to the parks/offices and regional office and is responsible for:

1. Reviewing this tickborne diseases policy.
2. Assisting the park/office with reporting tick bites/attachments and tick-related illnesses in the electronic injury and illness reporting system (currently the Safety Management Information System [SMIS]).
3. In the absence of a Workers' Compensation Coordinator, assisting the employee and supervisor with questions related to the FECA

about tickborne injuries and illnesses.

4. Consulting, if requested by the parks/offices, on the content of Job Hazard Analyses (JHAs) for operations in areas endemic to ticks and tickborne diseases.

### 55.4.3 Workers' Compensation Coordinators

The Workers' Compensation Coordinator provides services to parks and offices within their area of authority. They are responsible for:

1. Reviewing and maintaining knowledge of this tickborne disease policy.
2. Advising employees and supervisors with reporting tick bites/attachments and tick-related illnesses in the electronic injury and illness reporting system (currently the Safety Management Information System [SMIS] in the absence of the park/office Safety Officer.
3. Advising and assisting employees and supervisors with initiating, reviewing, submitting, and managing workers' compensation claims for tick-borne injuries and illnesses using the Employees Compensation Operations & Management Portal (ECOMP).

### 55.4.4 The Superintendent

The superintendent is responsible for:

1. Reviewing this tickborne diseases policy.
2. Determining whether his/her park/office is at risk for tickborne diseases and the extent to which this guidance will apply. The NPS Office of Public Health can assist the superintendent in determining a park's/office's risk.
3. Assigning a park/office point person to head the tickborne diseases efforts. If no point person is designated, the superintendent will fill this role.
4. Ensuring there are sufficient support and resources for tickborne disease prevention efforts.
5. Ensure all staff attends tickborne disease education events.

### 55.4.5 NPS Park/Office Point Person for Tickborne Disease Prevention

Although it is beneficial for the point person to be involved in natural resources or safety, this is not a requirement of the position. The only clear requirement of this position is that the point person is willing to familiarize themselves with tickborne disease prevention and with this guidance. In some cases, he/she may choose to delegate some of the responsibilities to another employee with the most expertise in a

particular area. The designated park/office tickborne diseases prevention point person is responsible for the following tasks:

1. Reviewing the tickborne diseases guidance and tailoring it, if and as needed, to the individual park/office.
2. Developing and promoting ongoing tickborne diseases prevention education for the park/office, tailored to the risk of the park/office. Education should contain the elements described under "Training/Education" below.
3. Ensuring documentation of tickborne diseases prevention education efforts.
4. Complying with NPS Management Policies 4.4.5.3, so that the purchase of tick repellents and permethrin with government funds are approved using the NPS Pesticide Use Proposal System (PUPS) and providing the park IPM coordinator with the yearly use record.
5. Assuring staff is aware that appropriate clothing should be worn to protect against tick bites. In some areas with a high incidence of tickborne diseases, the safety manager, CDSO, or CDSC might explore the purchase of specialized clothing, such as light-colored clothes and/or special equipment such as permethrin-treated gaiters, in accordance with NPS Reference Manual 43.

(https://www.nps.gov/policy/DOrders/DOrder43.htm)

Payment would be provided by the park, but the park/office could also query the regional office about additional support.

6. Advising employees on workers' compensation procedures and policies.

### 55.4.6 Supervisors

Supervisors are responsible for:

1. Incorporating tickborne disease prevention measures into Job Hazard Analyses (JHAs).
2. Assuring the availability of tick repellent and permethrin for employees.
3. Assuring the availability of tweezers or other tick removal devices.
4. Working with the safety manager, CDSO, or CDSC to ensure proper documentation of tick bite exposures, injuries from tick bites, and development of tickborne diseases in NPS's electronic reporting system.
5. Ensuring employees receive appropriate medical follow-up and follow them for symptoms after a tick.
6. Completing and issuing workers' compensation forms as needed.
7. Returning employees to work as quickly as possible, including assignment of light-duty work where medically allowed.

### 55.4.7 Employees

Employees are responsible for:

1. Becoming educated on tickborne disease prevention. Education should contain the elements described under "Training/Education" below.
2. Preventing tick bites through the use of clothing, repellent use on skin, and permethrin use on clothing and gear.
3. Removing attached ticks safely.
4. Reporting any tick bites, any injury, or any illness after a tick bite.
5. Seeking medical care, when appropriate.
6. Completing and submitting workers' compensation forms as needed if desired.
7. Following up with medical providers for documentation and bill payment resolution.
8. Returning to work as soon as allowed by a medical provider.

## 55.5 Training and Education

This section describes the basic elements of a tickborne disease prevention program. Training and education should include information on the following:

1. Types of ticks and the diseases they transmit (basic tick and tickborne disease information).
2. Park/Office-specific risks of tickborne diseases (tick surveillance).
3. Tick behavior, habitats, and ecology.
4. How to prevent tick bites.
5. How and when to check for ticks.
6. How to remove an attached tick.
7. What to do with a tick that has been removed.
8. When to seek medical care.
9. How to report a tick bite.
10. How payment for medical care may be covered.
11. Where to obtain additional information.

## 55.6 Types of Ticks and the Diseases They Transmit

Table 1 describes the diseases currently known to be transmitted by ticks in the United States. Additional information on individual tickborne diseases and the symptoms they cause can be

obtained through the CDC's "Tickborne Diseases of the United States" (https://www.cdc.gov/ticks/tickbornediseases/index.html). The NPS Office of Public Health can also assist the park/office with information about the epidemiology, symptoms, diagnosis, and treatment of individual tickborne diseases.

### Table 1. Tickborne Diseases in the United States

| Disease | Pathogen/Cause | Tick Genera |
|---|---|---|
| ***Bacteria*** | | |
| Anaplasmosis | *Anaplasma phagocytophilum* | *Ixodes* spp. |
| Borrelia miyamotoi disease (Hard tickborne relapsing fever) | *Borrelia miyamotoi* | *Ixodes* spp. |
| Ehrlichiosis | *Ehrlichia chaffeensis*<br>*Ehrlichia ewingii*<br>*Ehrlichia muris species* | *Amblyomma* spp.<br>*Ixodes* spp. |
| Lyme disease | *Borrelia burgdorferi*<br>*Borrelia mayonii* | *Ixodes* spp. |
| Rickettsia parkeri rickettsiosis | *Rickettsia parkeri* | *Amblyomma* spp. |
| Rocky Mountain spotted fever | *Rickettsia rickettsii* | *Dermacentor* spp.<br>*Rhipicephalus* spp. |
| Pacific Coast tick fever | *Rickettsia philipii* | *Dermacentor* spp. |
| Tick Borne Relapsing fever (TBRF) | *Borrelia hermsii*<br>*Borrelia parkeri*<br>*Borrelia turicatae* | *Ornithodoras* spp. |
| Tularemia | *Francisella tularensis* | *Amblyomma* spp.<br>*Dermacentor* spp. |
| ***Viruses*** | | |
| Colorado tick fever | Colorado tick fever virus (Coltivirus) | *Dermacentor* spp. |
| Heartland virus disease | Heartland virus (Phlebovirus) | *Amblyomma* spp. |
| Powassan encephalitis | Powassan virus (Flavivirus) | *Ixodes* spp. |
| Bourbon virus disease | Bourbon virus | Potentially through a tick or another insect. |
| ***Protozoa*** | | |
| Babesiosis | *Babesia microti* | *Ixodes* spp. |
| ***Other*** | | |
| Southern Tick-Associated Rash Illness (STARI) | Unknown | *Ambylomma* spp. |
| Meat or Alpha-Gal allergy | IgE antibodies specific for galactose-alpha-1,3-galactose (alpha-gal) | *Amblyomma* spp. likely |
| Tick Paralysis | Thought to be caused by a toxin in tick saliva | Multiple species. In the U.S., most cases are |

| | | |
|---|---|---|
| | | associated with *Dermacentor* species |

## 55.7 Park/Office-Specific Risks of Tickborne Diseases (Tick Surveillance)

The types and burdens of ticks vary across the country. Tickborne disease education should be specific in addressing the risk within a particular park/office. Information on a particular park's/office's risk can be determined through surveillance, often conducted by the CDC (https://www.cdc.gov/ticks/geographic_distribution.html). The NPS Office of Public Health can provide additional assistance in helping a park/office determine its particular risk, including establishing a tick monitoring program.

## 55.8 Tick Behavior, Habitats, and Ecology

In general, hard ticks (which transmit the majority of tickborne diseases, including Lyme disease) live in grassy, brushy, or wooded areas or on animals. When possible, employees should walk in the center of trails to avoid contact with plants and leaves.
Soft ticks (which transmit Tickborne Relapsing Fever and may play a role in transmitting *Coxiella burnetii*, the bacteria that causes Q fever) are associated with rodent nests in forests at altitudes of 1,500 to 8,000 feet, where they feed on tree squirrels and chipmunks, or at lower altitudes where they inhabit caves and burrows of ground squirrels, prairie dogs, and burrowing owls. People usually come into contact with soft ticks when they sleep in rodent-infested cabins, as the ticks emerge at night and feed briefly while the person is sleeping. Rodent exclusion can minimize ticks in sleeping quarters.

This chapter focuses on the prevention of tickborne diseases related to hard ticks, not soft ticks. However, information on rodent exclusion is available through the NPS 2014 Rodent Exclusion Manual (https://www.nps.gov/orgs/1103/upload/NPS-Rodent-Exclusion-Manual-Mechanical-Rodent-Proofing-Techniques_2019_508.pdf) and the NPS Rodent Exclusion Video (https://doimspp.sharepoint.com/sites/nps-in2-protect-and-promote-health/SitePages/Rodent-Associated-Diseases.aspx).

Additional information on tick habitats and ecology are available at the CDC website https://www.cdc.gov/ticks/.

## 55.9 How to Prevent Tick Bites

Clothing and minimization of skin exposure is the first direct line of personal defense against ticks. Tick repellents and the use of permethrin can also prevent tick bites. The following steps can help minimize tick bite exposures.

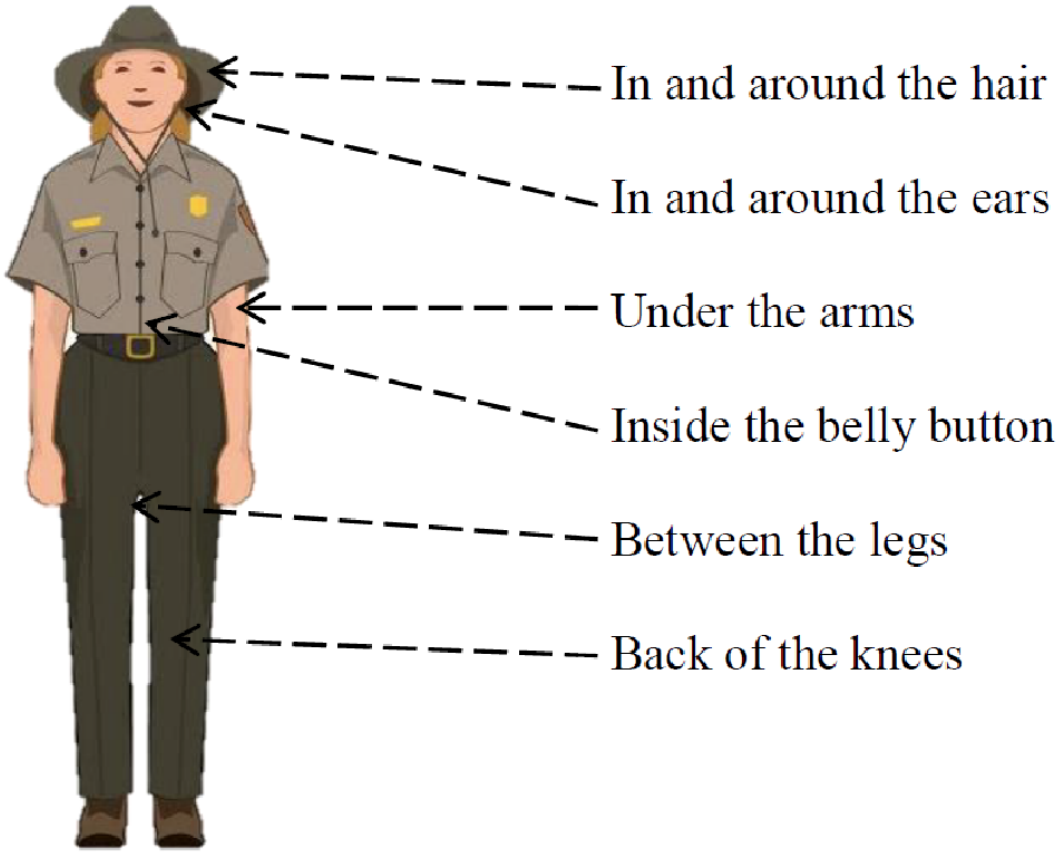
1. Tuck pant legs into boots or sock gaiters. This forces ticks to climb up the outside of the pant legs, thus decreasing access to the skin and increasing the likelihood of the tick

being seen.

2. Roll sleeves down if possible and close the collar to help protect the arms and neck from tick bites.
3. Tuck the undershirt into the pants to prevent ticks from crawling into the waistline.
4. Wear a hat to protect the head.
5. Treat boots, clothing, and gear with products containing 0.5% permethrin. Permethrin remains protective through several washings. Factory-treated clothing can remain protective for >70 washings (Beard 2014).
6. Use on skin Environmental Protection Agency (EPA) registered insect repellents containing DEET, picaridin, IR3535, or Oil of Lemon Eucalyptus (OLE) (https://www.epa.gov/insect-repellents). The EPA has an online tool that can help you find the repellent that is right for you (https://www.epa.gov/insect-repellents/find-repellent-right-you). Always follow product instructions. Do not use insect repellent on babies younger than 2 months old. Do not use products containing OLE or para-menthane-diol (PMD) on children under 3 years old.
7. For work in heavily infested areas, consider the use of dedicated insect protection clothing (e.g. permethrin-treated) or disposable coveralls.
8. The use of products that combine sunscreen and DEET is discouraged, because frequent re-application may lead to greater-than-recommended exposure to the repellent. Sunscreen should be applied before DEET. Since DEET may decrease the sun protection factor (SPF) of sunscreens, users may need to reapply the sunscreen more frequently (CDC, The Pretravel Consultation, 2019; Ross 2004).
9. Consult your veterinarian about how best to protect your pet against ticks. Examine pets for ticks after they have been outdoors (Jones 2018).

## 55.10 How and When to Check for Ticks

All employees, after being in tick habitats, should check themselves and their clothes for ticks frequently, at least at the end of every shift and before getting into vehicles, and remove ticks safely (for tick removal, see below). A tick check should be done using a hand-held or full-length mirror or with the help of another person. Areas to check to include under the arms, in and around the ears, inside the belly button, back of the knees, in and around the hair, between the legs, and around the waist.




In addition, employees should shower soon after being outdoors. Showering within two hours of coming indoors has been shown to reduce the risk of getting Lyme disease and may be effective in reducing the risk of other tickborne diseases. Showering may help wash off unattached ticks and is a good opportunity to check for ticks.

When returning from the field, employees should change their clothes and examine gear. Placing clothes in a dryer on high heat for at least six minutes is effective for killing *I. scapularis*, although up to 60 minutes may be required for other tick species. If clothes are damp, they may need to be dried longer. When washing clothes first, hot water should be used, as cold and warm water will not kill ticks (Nelson 2016; Carroll 2003).

## 55.11 How to Remove an Attached Tick

To prevent transmission, the employee should remove the tick as soon as possible. In laboratory experiments in animals, animals were rarely infected within 24 hours of attachment; a low percentage became infected within 24-36; and the majority of animals became infected ≥ 48 hours (Piesman et al. 1987; Piesman et al. 2002; des Vignes et al. 2011, Hojgaard et al. 2008; Piesman et al. 1993). Other, less common tickborne diseases can be transmitted more quickly. For example, anaplasmosis may be transmitted within 24 hours, and the Powassan virus may be transmitted within 15 minutes of attachment (des Vignes et al. 2001; Ebel et al. 2004). To remove a tick safely:

1. Use fine-tipped tweezers to grasp the tick as close to the skin's surface as possible. There are also several tick removal devices on the market, but a plain set of fine-tipped tweezers works very well.
2. Pull upward with steady, even pressure. Don't twist or jerk the tick; this can cause the mouthparts to break off and remain in the skin. If this happens, remove the mouth-parts with tweezers. If you are unable to remove the mouth easily with clean tweezers, leave it alone and let the skin heal.
3. After removing the tick, thoroughly clean the bite area and your hands with hand sanitizer or soap and water.

   Never crush a tick with your fingers. Dispose of a live tick by putting it in alcohol, placing it in a sealed bag/container, wrapping it tightly in tape. Avoid folklore remedies such as "painting" the tick with nail polish or petroleum jelly or using heat to make the tick detach from the skin; some of these practices may cause the tick to regurgitate bacteria and thus increase the risk of transmission. In some cases, OPH & WHB may request that the tick be submitted for identification and pathogens testing. Tick identification can provide valuable information on tick prevalence that ticks are carrying in certain areas. It is important to note that positive results showing that a tick contains a disease-causing organism do not necessarily mean that the person that was bit is infected and will develop the disease.

## 55.12 What to do with a Tick that has Been Removed

Saving the tick to show to a health care provider may help determine the type of tick (i.e., species and life stage) and potentially enable an assessment of the degree of blood engorgement and thus the time of attachment. Sending the tick for tick identification and pathogen identification can be useful from a surveillance standpoint to help identify the geographical location of ticks and the pathogens they carry.

However, employees and visitors should not rely on tick pathogen testing to determine whether they need to seek health care. Based on guidance from the CDC,

1. laboratories that conduct tick testing are not required to have the high standards of quality control used by clinical diagnostic laboratories and therefore the validity of a commercial test is questionable.
2. positive results showing that the tick contains a disease-causing organism do not necessarily mean that infection has occurred.
3. negative results can lead to false assurance, as a person may have been unknowingly bitten by a different tick that was infected; and
4. if a person has been infected, they will probably develop symptoms before the results of the tick test are available. Importantly, if an employee does become ill, they should not wait for tick testing results before beginning appropriate treatment.

## 55.13 When to Seek Medical Care

After a tick bite or after possible tick exposure, regardless of the time of attachment, employees should be alert to any signs or symptoms they develop. For high-risk *Ixodes* bites, health care providers may recommend, based on guidance from the Infectious Diseases Society of America, the administration of prophylactic antibiotics within 72 hours of tick removal as a prophylactic measure, even before symptoms develop. Symptoms of tickborne diseases can include fever and chills, aches and pains, rashes, skin ulcers at the site of the tick bite, joint pain, and neurological symptoms, including facial paralysis (https://www.cdc.gov/ticks/symptoms.html).

If employees develop symptoms within days or several weeks of removing a tick, they should promptly see a healthcare provider. They should tell the healthcare provider about their recent tick bite, where the bite occurred and how long the tick may have been attached, and where they most likely acquired the tick. The provider may make a diagnosis based on signs and symptoms alone or may obtain blood tests. A person who is concerned they may have developed long-term symptoms from an exposure that occurred previously but has not been diagnosed or treated should also seek healthcare advice.

## 55.14 How to Report a Tick Bite

Employees must report tick bites to the park/office point person for preventing tickborne diseases as well as their supervisor. The tick bite must be recorded in the NPS's electronic reporting system (currently the Safety Management Information System [SMIS]) as exposure, and if medical attention is needed, they may initiate a workers' compensation claim in the Department of Labor ECOMP (Employees' Compensation Operations & Management Portal) system. Exposures must be entered into the electronic reporting system when they occur, as these may be evaluated as part of a later Workers' Compensation claim if illness develops. Employees should also consult with Regional Worker's Compensation Manager before initiating a claim for reimbursement.

## 55.15 How Payment for Medical Care may be Covered

If an employee seeks medical attention and the medical provider recommends preventative (prophylactic) medical treatment, the employee will be responsible for the initial payment and may submit an SF-1164 for reimbursement. The completed SF-1164, an invoice, and payment receipt must be approved by the supervisor and entered into the Financial and Business Management System (FBMS) with the coversheet via the non-IPP Invoice Submission to AOC.

If an injury or illness has resulted from the tick bite, or if a healthcare provider was needed to remove a tick, a claim for workers' compensation may be filed. The employee should contact their supervisor and/or workers' compensation coordinator for further information on filing a claim. The Department of Labor's Division of Federal Employees' Compensation (DFEC) will determine the merits of the case and authorize payment for examination and treatment as they deem necessary in coordination with the employee's medical provider.

## 55.16 Additional Information

The following websites contain additional information:

1. The CDC website on tickborne diseases: https://www.cdc.gov/ticks/
2. The Infectious Diseases Society of America (IDSA) website: https://www.idsociety.org/
3. The NPS internal website on tickborne diseases: (View Here)
4. The NPS public website on tickborne diseases: https://www.nps.gov/articles/one-health-disease-ticks-borne.htm

In addition, the References section of this document contains information that might be helpful.

Finally, WASO is available to answer questions or provide guidance. The NPS Office of Public Health Epidemiology Branch (publichealthprogram@nps.gov) can answer specific questions about tickborne diseases. The NPS Office of Risk Management (risk_management@nps.gov) can answer specific questions related to workers' health.

The Regional Worker's Compensation Program Managers in your region can answer questions regarding workers' compensation.