**Section 1**

MASSACHUSETTS DEPARTMENT OF PUBLIC HEALTH GUIDE TO SURVEILLANCE, REPORTING, AND CONTROL

Toxic Shock Syndrome

**ABOUT THE DISEASE**

**A. Etiologic Agent**

Toxic shock syndrome (TSS) is a serious complication of infection with strains of *Staphylococcus aureus* and *Streptococcus pyogenes* (group A *Streptococcus* or GAS) that produce certain toxins (TSS toxin 1 for *S. aureus*, pyrogenic exotoxin A for GAS).

**B. Clinical Description**

TSS is a severe, toxin-mediated illness characterized by sudden onset of high fever, vomiting, profuse watery diarrhea and myalgia, followed by hypotension and multi-system organ involvement. The systems affected may include the gastrointestinal, muscular, mucocutaneous (including vagina, pharynx, and conjunctivae), renal, hepatic, respiratory, hematologic, and central nervous systems. Severe cases may result in shock and death. A “sunburn like” rash is often present during the acute phase of the illness, with desquamation—especially on the soles and palms—typically occurring 1–2 weeks later. The gastrointestinal symptoms and cutaneous desquamation are more commonly present with *S. aureus*-mediated TSS than with GAS-mediated TSS. Pain is a common initial symptom of GAS-mediated TSS, with 80% of patients having clinical signs of soft tissue infection, such as localized swelling and erythema. Both forms of TSS may be associated with invasive infections and can be fatal. TSS may also occur without an identifiable focus of infection. Since TSS can be confused with many infectious and non-infectious causes of fever with mucocutaneous manifestations, diseases such as Rocky Mountain spotted fever, leptospirosis, and measles should be ruled out.

**C. Vectors and Reservoirs**

Humans are the primary reservoir for both *S. aureus* and GAS.

**D. Modes of Transmission**

While TSS itself is not communicable from person-to-person, the organisms that cause TSS are transmissible. Both *S. aureus* and GAS are transmitted through direct contact with infected lesions or contaminated respiratory secretions, including droplets. Both *S. aureus* and GAS may also be transmitted by indirect contact through contaminated objects as has occurred in schools (contaminated wrestling mats) and in daycare centers (through play food and shared toys). Nose, throat, skin, anal, and vaginal carriers can all serve as sources of GAS infection.

**E. Incubation Period**

The incubation periods for both *S. aureus*-mediated TSS and GAS-mediated TSS vary from hours to days, depending on the source and the route of infection. For post-operative *S. aureus*-mediated TSS, the incubation period can be as short as 12 hours. For GAS-mediated TSS, the incubation period can also be as short as 12 hours after the subcutaneous inoculation of GAS, such as might occur during childbirth or after injury.

**F. Period of Communicability or Infectious Period**

TSS itself is not communicable from person-to-person, but the bacteria that cause TSS are transmissible. With *S. aureus,* the infectious period lasts as long as lesions drain or the carrier state exists. In untreated, uncomplicated GAS cases, the infectious period may be 10–21 days; if purulent discharge is present, the infectious period may be extended to weeks or months. Persons with untreated GAS pharyngitis may carry and transmit the bacteria for weeks or months, with decreasing contagiousness 2–3 weeks after illness onset.

**G. Epidemiology**

In 1980, TSS became widely recognized when an association between TSS and the use of tampons was established. Since that time, the proportion of TSS cases associated with menstruation has decreased. Cases of TSS have been associated with childbirth, abortion, vaginal infection, surgical wound infection, focal lesions of the bone or respiratory tract, and cutaneous or subcutaneous lesions. The source of infection is unknown in up to one-third of cases. Cases occur in both males and females. Persons considered to be at higher risk for *S. aureus*-mediated TSS include: 1) menstruating women using tampons or other inserted vaginal devices (such as diaphragms or contraceptive sponges); 2) persons who have undergone nasal surgery; and 3) persons with post-operative staphylococcal wound infections. People who have chronic cardiac or pulmonary disease, diabetes mellitus, or HIV infection, or persons who inject drugs or abuse alcohol are believed to be at higher risk for GAS-mediated TSS. The incidence of GAS-mediated TSS is also higher in the elderly and in young children, especially those with concomitant varicella infection.

**H. Bioterrorist Potential**

These pathogens are not considered to be of risk for use in bioterrorism.

**Section 2**

**REPORTING CRITERIA AND LABORATORY TESTING**

**A. What to Report to the Massachusetts Department of Public Health (MDPH)**

Report a clinically diagnosed case of TSS, as reported by a health care provider.

**B. Laboratory Testing Services Available**

The Massachusetts State Public Health Laboratory (MA SPHL) does not provide diagnostic testing for TSS. In some outbreak circumstances, isolates may be sent to the Centers for Disease Control and Prevention (CDC) for toxin testing. For more information about testing, contact MA SPHL at (617) 983-6607.

**Section 3**

**REPORTING RESPONSIBILITIES AND CASE INVESTIGATION**

**A. Purpose of Surveillance and Reporting**

* To identify household and other close contacts for possible microbiologic cultures and treatment of bacterial infection or carriage.
* To initiate surveillance for concurrent cases of varicella in a daycare (for cases of GAS-mediated TSS).
* To identify transmission sources of public health concern (e.g., a health care worker who is a GAS carrier), and to stop transmission from such sources.

**B. Laboratory and Health Care Provider Reporting Requirements**

TSS is reportable to the local board of health (LBOH). The MDPH requests that health care providers immediately report to the LBOH in the community where the case is diagnosed, all confirmed or suspect cases of TSS, as defined by the reporting criteria in Section 2A.

Laboratories performing examinations on any specimens derived from Massachusetts residents that yield evidence of GAS infection in a normally sterile site or *S. aureus* with additional clinical evidence of TSS shall report such directly to the MDPH within 24 hours.

**C. Local Board of Health (LBOH) Reporting and Follow-Up Responsibilities**

*Reporting Requirements*

MDPH regulations (105 CMR 300.000) stipulate that TSS is reportable to the LBOH and that each LBOH must report any case of TSS or suspect case of TSS, as defined by the reporting criteria in Section 2A. Cases should be reported to the MDPH Bureau of Infectious Disease and Laboratory Sciences, Epidemiology Program at 617-983-6800. Cases will be captured in the Massachusetts Virtual Epidemiologic Network (MAVEN), usually through electronic laboratory reporting.

The most up-to-date reporting requirements can be found at:

<http://www.mass.gov/eohhs/gov/departments/dph/programs/id/epidemiology/rdiq/reporting-diseases-and-surveillance-information.html>.

*Case Investigation*

It is the responsibility of the LBOH to complete questions in each of the question packages in

MAVEN by interviewing the case and others who may be able to provide pertinent information.

Some of the information can be obtained from the health care provider.

Calling the provider

TSS cases are usually very ill. If the case is or was hospitalized (i.e. reporting facility is a hospital), call infection control and prevention at the named hospital. A list of infection preventionists can be found in the help section of MAVEN. If the case was seen at a clinician’s office, ask to speak to a nurse working with the responsible provider. You should confirm that the patient was notified of the diagnosis and let them know that you will be calling the case for further information.

Calling the case or parent/guardian of the case

Before calling the case, review all information in this chapter. Some additional information about streptococcal TSS is in the group A *Streptococcus* disease fact sheet, and can be found by clicking on the Help Button located in MAVEN. The call may take a few minutes, so in order to maximize the chance of getting the information needed, it might be good to note the potential length of the call with your contact, and offer the opportunity to call back when it is more convenient. If the case is too ill to respond to questions, ask to speak with a family member or other proxy to obtain the needed information. Asking questions about how the case or child is feeling may get the case or parent talking. If you are unable to answer a question they have, don’t hesitate to call the Division of Epidemiology and Immunization at 617-983-6800 for assistance, and call the case back with the answer later. People are often more than willing to talk about their illness, and they may be very happy to speak with someone who can answer their questions.

*Using MAVEN*

Administrative Question Package

Cases of TSS are represented in event type Group A *Streptococcus* for streptococcal TSS or *Staphylococcus aureus* for staphylococcal TSS. An MDPH epidemiologist-of- the-day (EOD) will review all new cases and request immediate follow up for TSS. Once a new event appears in this workflow, open the Administrative Question Package (QP) and under the “Local Health and Investigation” section, answer the first question “**Step 1** - LBOH acknowledged” by selecting “Yes”. The “LBOH acknowledged date” will then auto populate to the current day. Completing this first step will move the event out of this workflow and into your “Online LBOH notified but Case Report Forms (CRF) are pending” workflow. Note the date you started your investigation by answering “**Step 2** – Investigation started” as “Yes” and then note the date where shown. Record your name, agency, and phone numbers where shown in “**Step 3** - LBOH/Agency Investigator.”

Demographic Question Package

Please enter all relevant demographic and employment information. It is particularly important to complete the Race/Ethnicity and Occupation questions.

Clinical Question Package

Complete the “Diagnosis/Clinical Information” section. Accurately record clinical information, including date of symptom onset, whether hospitalized (and associated hospital information and dates), and other medical information, including any underlying illness. Answer “yes” for “Is this a case of toxic shock syndrome?” and note the additional questions that appear for symptoms and laboratory findings. Sometimes it is best to request the medical record of the patient from the hospital in order to accurately complete as much information as possible. Determine whether this is a post-surgical infection. The post-surgical time period includes all inpatient days after a surgical procedure and seven days after discharge. Determine whether the infection occurred post-partum. The post-partum time period includes all inpatient days after the delivery of a baby and seven days after discharge.

Risk Exposure/Control & Prevention Question Package

Indicate whether or not the case attends or is employed at a daycare center, school, or long-term care facility. Ask if the case injected drugs not prescribed by a doctor during their incubation period.

*Completing your Investigation*

1. If you were able to complete a case investigation and follow-up is complete, mark “**Step 4** – Case Report Form Completed” as “Yes” and then choose Local Board of Health (LBOH) –Ready for MDPH review for the “Completed by” variable.
2. If you have made several attempts to obtain case information but have been unsuccessful (e.g., the case or health care provider does not return your calls or respond to a letter, or the case refuses to divulge information or is too ill to be interviewed), please complete “**Step 4** - Case Report Form Completed” as “No” and then choose a primary reason why the case investigation was not completed from the choices provided in the primary reason answer variable list.
3. If you are not online for MAVEN you may submit a paper case report form. After completing the form, attach laboratory report(s) and fax or mail (in an envelope marked “Confidential”) to ISIS. The confidential fax number is (617) 983-6813. Call ISIS at (617) 983-6801 to obtain a copy of the case report form and to confirm receipt of your fax.

The mailing address is:

**MDPH, Office of Integrated Surveillance and Informatics Services (ISIS)**

**305 South Street, 5th Floor**

**Jamaica Plain, MA 02130**

**Fax: (617) 983-6813**

**Section 4**

**CONTROLLING FURTHER SPREAD**

**A. Isolation and Quarantine Requirements *(105 CMR 300.200)***

None.

**B. Protection of Contacts of a Case**

There are no recommendations for contacts of a case of TSS caused by *S. aureus.* For TSS caused by GAS, please refer to Section 4 in the chapter entitled *Group A Streptococcus (Invasive)* for recommendations regarding contacts of a case.

**C. Managing Special Situations**

*Daycares, Schools, Long-Term Care Facilities, and Hospitals*

If TSS is caused by GAS in these settings, please refer to the chapter entitled *Group A Streptococcus (Invasive)* for specific recommendations regarding invasive cases of GAS (such as TSS) in daycares, schools, long-term care facilities, and hospitals.

*Reported Incidence is Higher than Usual/Outbreak Suspected*

If the number of reported cases in your city/town is higher than usual or if you suspect an outbreak, investigate to determine the source of infection and the mode of transmission. Seek a common exposure, such as association with a daycare center, and institute applicable preventive or control measures. Control of person-to-person transmission requires special emphasis on personal and hand hygiene. Consult with the epidemiologist on-call at the MDPH Division of Epidemiology and Immunization at (617) 983-6800. The Division can help determine a course of action to prevent further cases and can perform surveillance for cases across town lines, which would otherwise be difficult to identify at the local level.

**D. Preventive Measures**

*Environmental Measures*

Advise daycare centers to clean toys daily using an EPA-registered disinfectant safe for use in the daycare setting and to discourage the use of play food, which facilitates the transmission of not only this bacterium but others as well. Also advise schools to sanitize shared sports equipment, such as wrestling and gymnastics mats, frequently.

*Personal Preventive Measures/Education*

To avoid exposure, advise individuals to:

* Practice good hygiene and frequent hand washing.
* Avoid sharing food, beverages, cigarettes, or eating utensils.
* Receive varicella vaccine, if susceptible to varicella (see the *Chickenpox* and *Shingles* chapter for more information).
* Use the lowest absorbency effective tampon and change frequently. Advise individuals to discontinue tampon use immediately and to call their health care provider if they develop a high fever and vomiting or diarrhea during menstruation.
* Follow directions for use of diaphragms or contraceptive sponges, and do not leave the device in place for more than 30 hours.
* Complete the full course of treatment of prescribed antibiotics for *Staphylococcus* or *Streptococcus* infections.

A Group A Streptococcal Disease Public Health Fact Sheet is available from the MDPH Epidemiology Program or on the MDPH website at <http://www.mass.gov/eohhs/gov/departments/dph/programs/id/epidemiology/factsheets.html>.

**ADDITIONAL INFORMATION**

The following is the formal CSTE surveillance case definition for TSS. It is provided for your information only and should not affect the investigation and reporting of a case that fulfills the criteria in Section 2A of this chapter. (The CDC and the MDPH use the CSTE case definitions to maintain uniform standards for national reporting.) For reporting to the MDPH, always use the criteria outlined in Section 2A.

*Note: The most up-to-date CSTE case definitions are available on the CDC website at* <https://wwwn.cdc.gov/nndss/case-definitions.html>

**Staphylococcal Toxic Shock Syndrome Clinical Case Definition**

An illness with the following clinical manifestations:

* Fever: Temperature ≥102.0°F (≥38.9°C).

• Rash: Diffuse macular erythroderma.

* Desquamation: 1–2 weeks after onset of illness, particularly on the palms and soles.
* Hypotension: Systolic blood pressure ≤90 mm Hg for adults or less than fifth percentile by age for children aged ≤16 years; orthostatic drop in diastolic blood pressure ≥15 mm Hg from lying to sitting, orthostatic syncope, or orthostatic dizziness.
* Multi-system involvement (three or more of the following):

- Gastrointestinal: Vomiting or diarrhea at onset of illness.

- Muscular: Severe myalgia or creatine phosphokinase (CPK) level at least twice the

 upper limit of normal.

- Mucous membrane: Vaginal, oropharyngeal, or conjunctival hyperemia.

- Renal: Blood urea nitrogen (BUN) or creatinine at least twice the upper limit of normal

 for laboratory or urinary sediment with pyuria (≥5 leukocytes per high-power field)

 in the absence of urinary tract infection.

- Hepatic: Total bilirubin, alanine aminotransferase (ALT) enzyme, or aspartate

 aminotransferase (AST) enzyme levels at least twice the upper limit of normal for

 laboratory.

- Hematologic: Platelets <100,000/mm3.

- Central nervous system: Disorientation or alterations in consciousness without

 focal neurologic signs when fever and hypotension are absent.

**Laboratory Criteria**

* Laboratory results (blood, throat, or cerebrospinal fluid [CSF] cultures) may be positive for either GAS or *S. aureus*. If any other organisms are identified, TSS is ruled out.
* Titers for Rocky Mountain spotted fever, leptospirosis, and measles (if obtained) cannot be rising (four-fold increase in titers).

**Case Classification**

*Probable*

A case in which four of the five clinical findings described in the *Staphylococcal Clinical Case Definition* section are present.

*Confirmed*

A case in which all five of the clinical findings described in the *Staphylococcal Clinical Case Definition* section are present, including desquamation, unless the patient dies before desquamation occurs.

**Streptococcal Toxic Shock Syndrome Clinical Case Definition**

An illness with the following clinical manifestations:

* Hypotension: Systolic blood pressure ≤90 mm Hg for adults or less than fifth percentile by age for children aged ≤16 years; orthostatic drop in diastolic blood pressure ≥15 mm Hg from lying to sitting, orthostatic syncope, or orthostatic dizziness.
* Multisystem involvement (two or more of the following):

- Renal impairment: Creatinine greater than or equal to 2 mg/dL (greater than or

 equal to 177 umol/L) for adults or greater than or equal to twice the upper limit of

 normal for age. In patients with preexisting renal disease, a greater than twofold

 elevation over the baseline level.

- Coagulopathy: Platelets less than or equal to 100,000/mm3 (less than or equal to

 100 x 106/L) or disseminated intravascular coagulation, defined by prolonged

 clotting times, low fibrinogen level, and the presence of fibrin degradation

 products.

- Liver involvement: Alanine aminotransferase (ALT) enzyme, aspartate aminotransferase (AST) enzyme, or total bilirubin levels greater than or equal to twice the upper limit of normal for the

 patient’s age. In patients with preexisting liver disease, a greater than twofold

 increase of the baseline level.

- Acute respiratory distress syndrome: defined by acute onset of diffuse pulmonary

 infiltrates and hypoxemia in the absence of cardiac failure or by evidence of

 diffuse capillary leak manifested by acute onset of generalized edema, or pleural

 or peritoneal effusions with hypoalbuminemia.

- A generalized erythematous macular rash that may desquamate.

- Soft-tissue necrosis, including necrotizing fasciitis or myositis, or gangrene.

**Case Classification**

*Probable*

A case that meets the clinical findings described in the *Streptococcal Clinical Case Definition* section in the absence of another identified etiology for the illness and with isolation of Group A *Streptococcus* from a nonsterile site.

*Confirmed*

A case that meets the clinical findings described in the *Streptococcal Clinical Case Definition* section and with isolation of Group A *Streptococcus* from a normally sterile site (e.g., blood or cerebrospinal fluid or, less commonly, joint, pleural, or pericardial fluid).

**REFERENCES**

American Academy of Pediatrics. [Group A Streptococcal Infections.] In: Kimberlin D.W., ed. Red Book: 2015 Report of the Committee on Infectious Diseases, 30th Edition. Elk Grove Village, IL, American Academy of Pediatrics; 2015.

Heymann, D., ed. Control of Communicable Diseases Manual, 20th Edition. Washington DC, American Public Health Association, 2014.

MDPH. Regulation 105 CMR 300.000: Reportable Diseases, Surveillance, and Isolation and Quarantine Requirements. MDPH, Promulgated January 27, 2017.