

## TOXIC SHOCK SYNDROME (TSS)

For more on Strep Toxic Shock Syndrome, see Group A Strep (GAS)

### ✓ DISEASE AND EPIDEMIOLOGY

#### 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 GAS-mediated TSS. Both forms of TSS may be associated with invasive infections and can be fatal. TSS may also occur without an identifiable focus of infection.

#### Causative Agent:

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

#### Differential Diagnosis:

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.

#### Laboratory identification:

GAS is easy to culture and identify in most clinical laboratories. It is important to note that tests that are positive for “Toxic Shock Syndrome Antibody, MAID” do NOT indicate the presence of Toxic Shock Syndrome; rather, they preclude the possibility because individuals that have the antibody are protected from the disease. TSS due to staphylococcus is not a laboratory diagnosis, it is a clinical diagnosis. Staphylococcus will not be isolated from these patients.

**UPHL:** The Utah Public Health Laboratory does not perform routine cultures for streptococcal or staphylococcal diseases.

#### Treatment:

**STSS:** Surgical debridement, clindamycin plus penicillin plus supportive care.

**TSS:** Clindamycin plus oxacillin or vancomycin plus supportive care.

### **Case fatality:**

**STSS:** Pediatric 5-10%, adult 30-80%

**TSS:** Usually 3-5%

### **Reservoir:**

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

### **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 from person to person through direct contact with lesions or contaminated respiratory secretions, including droplets. With both *S. aureus* and GAS, transmission involving indirect contact through objects 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.

### **Susceptibility:**

Toxic shock syndromes are toxin-mediated illnesses. Both produce “superantigens” which are capable of stimulating certain T-cells to produce massive numbers of new cells. These new T-cells are not targeted towards an antigen and are therefore not helpful in eliminating the infection. It is hypothesized that HLA type may predispose some individuals to greater susceptibility to the toxic effects.

### **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 be as short as 14 hours after the subcutaneous inoculation of GAS, such as might occur during childbirth or injury.

### **Period of communicability:**

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 discharges are 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.

### **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 are seen in both males and females. Persons considered at higher risk for *S. aureus*-mediated TSS include:

- Menstruating women using tampons or other inserted vaginal devices (such as diaphragms or contraceptive sponges);
- Persons who have undergone nasal surgery; and
- 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 coinfecting with varicella.

## ✓ PUBLIC HEALTH CONTROL MEASURES

### Public health responsibility:

- Investigate all suspect cases of disease and fill out and submit appropriate disease investigation forms.
- Provide education to the general public, clinicians, and first responders regarding disease transmission and prevention.
- Identify clusters or outbreaks of this disease.

### Prevention:

For menstruation-associated disease, education regarding the dangers of super-absorbent tampons, along with knowledge of risky behaviors (such as leaving tampons in for lengthy periods of time) are key to reducing the risk of disease.

For other TSS caused by Streptococcal or Staphylococcal organisms, good hygienic practices, such as handwashing and respiratory etiquette, are helpful.

Following a case of invasive GAS disease, the risk to close cases in schools and childcare facilities is low and chemoprophylaxis is not indicated in these settings UNLESS there is a concomitant association with varicella.

### Chemoprophylaxis:

There may be an increased risk of invasive GAS disease among household members and chemoprophylaxis may be considered. Severe invasive GAS disease outbreaks HAVE occurred in some closed environments such as military bases, nursing homes, and hospitals. Things to consider when contemplating chemoprophylaxis are:

- Extent of contact with index case
- Underlying conditions in contacts which may potentiate risk (advanced age, immunosuppression, diabetes, varicella)
- Costs and potential side effects of chemoprophylaxis

### Vaccine:

None.

### **Isolation and quarantine requirements:**

**Isolation:** None.

**Hospital:** Standard body substance precautions

**Quarantine:** None.

## **CASE INVESTIGATION**

### **Reporting:**

Toxic shock syndrome is a disease of clinical recognition, therefore the burden of reporting this disease falls to clinicians rather than to laboratories.

### **Case definition:**

#### **Toxic Shock Syndrome (other than streptococcal) (1997):**

##### **Clinical Description**

An illness with the following clinical manifestations:

- *Fever:* temperature greater than or equal to 102.0°F (greater than or equal to 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 less than or equal to 90 mm Hg for adults or less than fifth percentile by age for children aged less than 16 years; orthostatic drop in diastolic blood pressure greater than or equal to 15 mm Hg from lying to sitting, orthostatic syncope, or orthostatic dizziness
- *Multisystem involvement* (three or more of the following):
  - *Gastrointestinal:* vomiting or diarrhea at onset of illness
  - *Muscular:* severe myalgia or creatine phosphokinase level at least twice the upper limit of normal
  - *Mucous membrane:* vaginal, oropharyngeal, or conjunctival hyperemia
  - *Renal:* blood urea nitrogen or creatinine at least twice the upper limit of normal for laboratory or urinary sediment with pyuria (greater than or equal to 5 leukocytes per high-power field) in the absence of urinary tract infection
  - *Hepatic:* total bilirubin, alanine aminotransferase enzyme, or aspartate aminotransferase enzyme levels at least twice the upper limit of normal for laboratory
  - *Hematologic:* platelets less than 100,000/mm<sup>3</sup>
  - *Central nervous system:* disorientation or alterations in consciousness without focal neurologic signs when fever and hypotension are absent.

##### **Laboratory Criteria**

Negative results on the following tests, if obtained:

- Blood, throat, or cerebrospinal fluid cultures (blood culture may be positive for *Staphylococcus aureus*)
- Rise in titer to Rocky Mountain spotted fever, leptospirosis, or measles

### **Case Classification**

*Probable:* a case which meets the laboratory criteria and in which four of the five clinical findings described above are present

*Confirmed:* a case which meets the laboratory criteria and in which all five of the clinical findings described above are present, including desquamation, unless the patient dies before desquamation occurs

### **Case Investigation Process:**

- Fill out a morbidity form
- Fill out the investigation form.

### **Outbreaks:**

An outbreak will be defined as 3 or more cases occurring at a hospital, school, or childcare in a 30 day period.

### **Identification of case contacts:**

For disease due to GAS, school and day care children should be checked to assure that they are immunized against varicella.

Household contacts and other close adult contacts may be screened for potentiating factors (see CHEMOPROPHYLAXIS above) and chemoprophylaxis recommended on a case-by-case basis.

### **Case contact management:**

On a case by case basis only.

## **REFERENCES**

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