

# **Group A *Streptococcus* (GAS), Invasive Disease**

Including Streptococcal Toxic Shock Syndrome (STSS)

## **DISEASE REPORTABLE WITHIN 24 HOURS OF DIAGNOSIS**

Per N.J.A.C. 8:57, healthcare providers and administrators shall report by mail or by electronic reporting within 24 hours of diagnosis, confirmed cases of invasive GAS disease to the health officer of the jurisdiction where the ill or infected person lives, or if unknown, wherein the diagnosis is made. A directory of local health departments in New Jersey is available at <http://localhealth.nj.gov>

If the health officer is unavailable, the healthcare provider or administrator shall make the report to the Department by telephone to 609.826.5964, between 8:00 A.M. and 5:00 P.M. on non-holiday weekdays or to 609.392.2020 during all other days and hours.



September 2016



# 1 THE DISEASE AND ITS EPIDEMIOLOGY

### A. Etiologic Agent

Invasive GAS disease is caused by the bacterium, *Streptococcus pyogenes*. There are over 100 serologically distinct types of *S. pyogenes* within group A. Streptococcal toxic shock syndrome (STSS) is a serious complication associated with infection caused by strains of *S. pyogenes* that produce a pyogenic exotoxin A.

### B. Clinical Description and Laboratory Diagnosis

Pharyngitis (“strep throat”) is the most common result of infection with GAS. Skin infections (impetigo or pyoderma) are also common. In those two conditions, infection of the deeper tissue or blood is very uncommon. However, in some cases the bacteria may become invasive and cause more severe illness. Invasive GAS may manifest as any of several clinical syndromes, including: (1) pneumonia, (2) bacteremia in association with cutaneous infection, (3) deep soft tissue infection (i.e., necrotizing fasciitis [colloquially referred to as “flesh-eating bacteria”]), (4) meningitis, (5) peritonitis, (6) osteomyelitis, (7) septic arthritis, (8) postpartum sepsis (i.e., puerperal fever), (9) neonatal sepsis, and (10) bacteremia alone. Case-fatality ratios for some of these syndromes can be as high as 10–70%. Risk factors for invasive disease include chickenpox in children, human immunodeficiency virus infection, diabetes mellitus, and chronic cardiac or pulmonary disease.

STSS is a severe toxin-mediated illness characterized by sudden onset of high fever (usually temperature > 102°F), vomiting, profuse watery diarrhea, and myalgia, followed by hypotension (systolic blood pressure < 90 mm Hg) and, potentially, shock. During the acute phase of the illness, a sunburn-like rash is present. One to two weeks after onset, desquamation of the skin occurs, especially on the soles and palms. In addition, there is multiorgan involvement characterized by renal impairment, coagulopathy, acute respiratory distress syndrome, and/or liver involvement (i.e., elevated aminotransferase and bilirubin levels).

Isolation of GAS in the context of the above signs and symptoms is diagnostic; however, Rocky Mountain spotted fever, leptospirosis, and measles should be ruled out. STSS can be fatal; case-fatality ratio is about 4%.

### **C. Reservoirs**

Humans are the only reservoir for GAS.

### **D. Modes of Transmission**

The primary mode of transmission of GAS bacteria is person-to-person spread of large respiratory droplets through direct contact with patients or carriers. GAS can also be transmitted through ingestion of contaminated food, e.g., milk, eggs, ice-cream, eggs, steamed lobster, ground ham, potato salad, egg salad, custard, rice pudding and shrimp salad. Certain foods that are left to stand at room temperature for several hours between preparation and consumption may transmit disease. Indirect contact through objects is rarely associated with illness, but it has occurred in schools through contaminated wrestling mats and in daycare centers through play food and other shared toys.

Nasal, throat, skin, anal and vaginal carriers of GAS can all serve as sources of infection. STSS in and of itself is not transmitted from person to person. It may occur with an infection at any body site, but most often occurs in association with infection of a skin lesion.

### **E. Incubation Period**

The incubation period for GAS pharyngitis is usually one to five days, rarely longer. The incubation period for invasive GAS disease is variable. The median incubation period for postsurgical STSS is two days.

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

Communicability of individuals with invasive GAS is highest during acute infection, and in untreated people, gradually diminishes over a period of weeks. Individuals are no longer infectious within 24 hours after the initiation of antibiotic therapy. Among persons with symptomatic pharyngeal carriage of GAS, the risk of transmission to others is minimal, but carriage may persist for months. Untreated purulent GAS skin lesions may be infectious for weeks or months.

### **G. Epidemiology**

In the United States, the Centers for Disease Control and Prevention (CDC) estimates the rate of invasive GAS to be 3.2 to 3.9 cases per 100,000. Of the estimated 9,000-11,500 cases of invasive GAS in the United States each year, approximately 700-1000 cases develop necrotizing fasciitis (NF). Surveillance studies have suggested that 85% of cases of invasive GAS occur sporadically in the community, 10% are hospital-acquired, 4% occur in long-term care facilities and 1% occur after close contact with a case. Healthcare-associated outbreaks and cases of invasive GAS have been traced to healthcare workers who were anal, vaginal, skin or throat carriers of GAS.

The New Jersey Department of Health (NJDOH) made invasive GAS disease reportable in 1995, and in 2001, electronic reporting was implemented. From 2010 through 2015, NJDOH received a total of 1,417 reported GAS cases.

Cases of invasive GAS occur year-round with a peak incidence reported during December – March. People who have chronic cardiac or pulmonary disease, diabetes mellitus or HIV infection, or who inject drugs or abuse alcohol are believed to be at higher risk for invasive GAS infection. In children, *varicella* infection has been identified as a significant risk factor. Infection with invasive GAS may be followed by the noninfectious complication of rheumatic fever (characterized by arthritic, cardiac, neurologic signs and symptoms) or glomerulonephritis. Death occurs in 10%-15% of all invasive cases, approximately 40% of patients with STSS and approximately 25% of NF cases die from their infection. Organ system failure (STSS) and amputation (NF) also may result. One goal of prompt identification and treatment of GAS cases (with at least ten days of antibiotic therapy) is to prevent these sequelae.

Cases of STSS have been associated with childbirth, abortions, vaginal infections, surgical wound infections, 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 observed in both sexes.

## **2 CASE DEFINITION**

In addition to the CSTE case definition the NJDOH definition specifies that a wound culture associated with necrotizing fasciitis also represents a case of invasive GAS. This definition is also used by states participating in CDC’s Emerging Infections Program.

### **A. Clinical Description**

#### **1. Invasive GAS Infections**

Invasive GAS Infections may manifest as any of several clinical syndromes, including pneumonia, bacteremia in association with cutaneous infection (e.g., cellulitis, erysipelas, or infection of a surgical or nonsurgical wound), deep soft-tissue infection (e.g., myositis or necrotizing fasciitis), meningitis, peritonitis, osteomyelitis, septic arthritis, postpartum sepsis (i.e., puerperal fever), neonatal sepsis, non-focal bacteremia and STSS (see below).

#### **2. STSS**

STSS is a severe illness associated with invasive or noninvasive GAS infection. STSS may occur with infection at any site but most often occurs in association with infection of a cutaneous lesion. Signs of toxicity and a rapidly progressive clinical course are characteristic, and the case-fatality rate may exceed 50%.

An illness with the following clinical manifestations occurring within the first 48 hours of hospitalization or, for a healthcare-related case, within the first 48 hours of illness:

- Hypotension defined by a systolic blood pressure less than or equal to 90 mm Hg for adults or less than the fifth percentile by age for children younger than 16 years **AND**
- Multiorgan involvement characterized by **two or more of the following**:
  - *Renal impairment*: Creatinine greater than or equal to 2 mg/dL (greater than or equal to 177  $\mu\text{mol/L}$ ) 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/ $\text{mm}^3$  (less than or equal to  $100 \times 10^6/\text{L}$ ) or disseminated intravascular coagulation, defined by prolonged clotting times, low fibrinogen level, and the presence of fibrin degradation products.
  - *Liver involvement*: Alanine aminotransferase, aspartate aminotransferase, 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 over 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.

## **B. Laboratory Criteria for Diagnosis**

Isolation of *S. pyogenes* by culture from a normally sterile site (e.g., blood or cerebrospinal fluid, or, less commonly, joint, pleural, or pericardial fluid) OR from a wound culture of a patient with necrotizing fasciitis confirms a case of invasive GAS. Isolation of *S. pyogenes* from a sterile site in association with a clinical presentation of STSS supports a confirmed case of STSS. Isolation of *S. pyogenes* from a nonsterile site in association with a clinical presentation of STSS supports a probable case of STSS.

## **C. Case classification**

### **CONFIRMED INVASIVE GAS**

A case that is laboratory confirmed with the isolation of *S. pyogenes* from a normally sterile site.

### **PROBABLE INVASIVE GAS**

A clinically compatible case epidemiologically linked to a confirmed case.

### CONFIRMED STSS

A case of invasive GAS that is laboratory confirmed with the isolation of *S. pyogenes* from a normally sterile site AND in association with a clinical presentation of STSS as defined above.

### PROBABLE STSS

A case of invasive GAS that is laboratory confirmed with the isolation of *S. pyogenes* from a nonsterile site AND in association with a clinical presentation of STSS as defined above.

### SUSPECT/POSSIBLE GAS OR STSS

Not used.

A confirmed case of GAS is one that is laboratory confirmed with the isolation of *S. pyogenes* from a normally sterile site, e.g. blood, cerebrospinal fluid, joint, pleural or pericardial fluid **OR** from a wound culture of a patient with necrotizing fasciitis. A positive wound culture in the absence of necrotizing fasciitis is **NOT** a confirmed case. This is not indicative of invasive GAS and is therefore not considered a case. In addition, positive throat cultures are not considered a confirmed case as the throat is not a normally sterile site.

## 3 LABORATORY TESTING SERVICES AVAILABLE AT PHEL

The New Jersey Department of Health Public Health and Environmental Laboratories (PHEL) does not conduct testing on suspected *S. pyogenes* isolates. However, hospital and commercial labs have the capability to conduct testing on these specimens.

## 4 PURPOSE OF SURVEILLANCE AND REPORTING REQUIREMENTS

### A. Purpose of Surveillance and Reporting

1. To provide information about the disease, its transmission, and methods of prevention.
2. To identify close contacts of the case and provide recommendations for appropriate preventive measures and thus prevent: a) infection and complications in close contacts and b) further spread of disease.
3. To promptly identify clusters or outbreaks of disease in order to initiate appropriate prevention and control measures. If an outbreak of invasive GAS is identified in a

community or organization such as a school or daycare center, *varicella* vaccination might be recommended if cases are associated with chickenpox, or prophylactic antibiotics might be recommended to certain groups depending on the number of cases and the community or organization involved.

## **B. Laboratory and Healthcare Provider Reporting Requirements**

1. The New Jersey Administrative Code (N.J.A.C.) 8:57 stipulates that healthcare providers and laboratories report (by telephone, confidential fax, over the Internet using Communicable Disease Reporting and Surveillance System [CDRSS] or in writing) all invasive cases of GAS to the local health officer having jurisdiction over the locality in which the patient lives, or, if unknown, to the health officer in whose jurisdiction the healthcare provider requesting the laboratory examination is located.
2. The N.J.A.C. 8:57 stipulates that each local health officer must report the occurrence of any case of invasive GAS, as defined by the reporting criteria in Section 2A above. Current requirements are that cases be reported to the NJDOH Infectious and Zoonotic Diseases Program (IZDP) electronically using the confidential and secure CDRSS.

# **5 CASE INVESTIGATION**

## **A. Form**

There is no paper form used to report invasive GAS/STSS.

## **B. Laboratory Reports**

1. If the local health department receives a report of GAS from the laboratory or healthcare provider, local health department staff should enter the report into CDRSS, and investigate the case by contacting the patient, a family member or the healthcare provider by telephone to complete the required information (see C. below).
2. If a report of GAS from the laboratory or healthcare provider is received by NJDOH and includes the patient's address, NJDOH will enter the report into CDRSS as PENDING; the report will not be mailed to the local health department.
3. If a report of GAS from the laboratory or healthcare provider received by NJDOH does not include the patient's address, NJDOH will either return the report to the sending laboratory or healthcare provider or call the sender to obtain a complete address. Once this information is received, the report will be entered into CDRSS as PENDING.

### C. CDRSS

The mandatory fields in CDRSS include: disease, last name, county, municipality, gender, race, ethnicity, signs and symptoms, laboratory results, case status and report status.

### D. Other Reporting/Investigation Issues

1. It is not always possible to obtain all the information necessary to classify a case. A minimum of three attempts (not necessarily to the same person) should be made to obtain necessary information. If information cannot be obtained after these three attempts, the case should be entered into CDRSS if it has not been already. The number of attempts and the dates and outcomes of the attempts should be documented in the Comments section. The case status should be changed to “NOT A CASE” and the report status changed to “LHD CLOSED.”
2. Every effort should be made to complete the investigation within three months of opening a case. Cases which remain open for three months or more and have no investigation or update notes will be closed by NJDOH and assigned a case status of “NOT A CASE.”
3. Once an LHD completes its investigation and assigns a report status of “LHD CLOSED,” NJDOH will review the case. NJDOH will change the report status to “DHSS APPROVED,” if appropriate, upon completion of its review. At this time, the case will be locked for editing. If additional information is received after a case has been assigned a report status of “DHSS APPROVED,” an LHD will need to contact NJDOH to reopen the case. This should be done only if the additional information changes the case status.

## 6 CONTROLLING FURTHER SPREAD

### A. Isolation and Quarantine Requirements (NJAC 8:57)

None.

### B. Protection of Contacts of a Case

Depending on the number of cases of invasive GAS, in certain settings or situations, recommendations may include antibiotic prophylaxis for potential carriers, *varicella* vaccination for susceptible children, and throat cultures for contacts. See “Managing Special Situations,” directly below.

## C. Managing Special Situations

### 1. Daycare

One case of invasive GAS in a daycare center is not usually a cause for alarm. However, to better characterize the situation, the following questions should be asked:

- Was the case-patient's illness preceded by *varicella* infection?
- Have any *varicella* cases been reported in the daycare center in the previous two weeks? If so, how many and what were the dates of illness onset?
- Have any cases of pharyngitis or impetigo been reported at the daycare in the previous two weeks? If so, how many and what were the dates of illness onset? Investigators will be required to develop a line list to document information about all cases of known and suspect GAS illness. The information to be included in the line list should include, at a minimum, the date of birth of case-patients, symptoms, dates of illness onset, laboratory testing performed, dates of absence from daycare, and whether there are other known cases of GAS involving close contacts (e.g., family members). When attempting to identify cases of GAS in toddlers, be aware of the atypical clinical presentations described in Section 1.B.
- The recommendations for control will depend on the answers to the above questions and the information obtained via the line list. Control measures will include review of hand washing protocols for attendees and staff as well as exclusion of symptomatic attendees and staff. The public health response may also include obtaining throat cultures for all symptomatic daycare contacts, with subsequent antibiotic treatment of those who are culture-positive for GAS.
- LHD staff should contact IZDP at 609.826.5964 to report suspected or confirmed cases in a daycare center (or any other childcare setting). The IZDP staff will work with LHD staff to ensure all contacts are identified and notified.

### 2. School

As described above for daycare centers, one case of invasive GAS in a school is not necessarily a cause for alarm. While GAS is much more likely to spread in a daycare setting, the health officer will need to determine if the case-patient recently had *varicella* and how many cases of pharyngitis, impetigo and *varicella* are occurring in the school. As described for situations involving a daycare center, the recommendations for control will depend on the answers to these questions. Control measures may include obtaining throat cultures for all symptomatic school contacts with subsequent antibiotic treatment of those who are culture-positive for GAS.

### 3. Hospital

GAS is an unusual cause of surgical site or postpartum infections. The bacterium is only isolated from <1% of surgical-site infections and 3% of infections after vaginal delivery. Since most nosocomial transmission is traced to carriers involved in direct patient care, **even one case of postoperative or postpartum GAS should be vigorously investigated.** Usually the infection preventionist or hospital epidemiologist will investigate to find a possible carrier. Investigations usually consist of medical and laboratory record reviews, further

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characterization of the GAS isolates, screening of healthcare workers from multiple sites, and sometimes environmental testing.

### 4. Long-Term Care (LTC) Facilities

Cases of invasive GAS infection in a long-term care facility, while rare, do occur. Steps should be taken to rule out the possibility of a more widespread problem. At a minimum, surveillance should include the floor where the case-patient resides and focus on other residents with possible symptoms of GAS infection, such as fever, sore throat or wound infection. These residents should be tested for GAS infection and treated if positive. Additional cases of invasive GAS would require a more vigorous response. CDS will work with the LHD staff to determine the best prevention and control measures to implement and how to proceed with a more rigorous investigation. This might involve screening healthcare workers and asymptomatic residents, and perhaps environmental testing.

### 5. Reported Incidence Is Higher than Usual/Outbreak Suspected

If the number of reported cases in the city/town is higher than usual, or if an outbreak in a school, daycare center, hospital or long-term care facility is suspected, LHD staff should immediately contact the Communicable Disease Service (CDS) of the NJDOH at 609.826.5964. This situation may warrant an investigation of clustered cases to determine a course of action to prevent further cases. CDS staff can also perform surveillance for clusters/outbreaks that involve multiple jurisdictions, which would otherwise be difficult to detect at the local level.

## D. Preventive Measures

### 1. Environmental Measures

Daycare centers should be advised to clean toys daily using an approved disinfectant (i.e., an EPA-registered sanitizing solution safe for use in the daycare setting) and to discourage the use of play food and other shared toys, which facilitates the transmission of not only this bacterium but other infectious agents as well. Schools should be advised to frequently sanitize shared sports equipment, such as wrestling or gymnastic mats. Healthcare facilities should ensure that all equipment and supplies are stored and used exclusively within the same unit.

### 2. Personal Preventive Measures/Education

To protect themselves from potential future exposures, advise individuals to:

- Practice good hygiene, including frequent hand washing
- Avoid sharing food, beverages, cigarettes or eating utensils
- Receive *varicella* vaccine if indicated

### 3. Prophylaxis

Most individuals who are exposed to someone with group A strep should not receive antibiotic therapy. However, in some situations, prophylaxis may be recommended for certain individuals exposed to someone with an invasive GAS infection. Due to the increased risk of invasive GAS disease among certain high-risk groups, e.g., individuals >65 years old, immunocompromised individuals, and the risk of death among persons aged 65 and older who develop invasive GAS disease, health care providers may choose to offer chemoprophylaxis to these groups who are household contacts of patients with invasive GAS infection.

## 7 OUTBREAK SITUATIONS

If the number of reported cases in an institutional setting or jurisdiction is higher than usual for the time of year, an outbreak might be occurring. In accordance with NJAC 8:57, CDS should be contacted immediately at 609.826.5964. This situation may warrant an investigation of clustered cases to determine a course of action to prevent further cases. In contrast to what routinely occurs at the local level, CDS staff can perform surveillance for clusters of illness that may cross several jurisdictions and thereby be better able to assess the extent of an outbreak during its infancy.

### Additional Information

Additional information about GAS infection is available on the CDC website: <http://www.cdc.gov/groupastrep/index.html>.

### References

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