



Food poisoning due to a TSST1-producing *Staphylococcus aureus*

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ABSTRACT

Toxic Shock Syndrome (TSS) is a very rare and severe complication of *Staphylococcus aureus* infections. However, bacteremia is very uncommon in this disease. We present here the case of a healthy 15-year old boy who presented septic shock and diffuse exanthema four hours after eating in a fast food restaurant. Blood cultures were positive for a TSST-1 producing *Staphylococcus aureus*. The patient was treated with antibiotics and fully recovered.

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Introduction

Toxic Shock Syndrome is a very rare complication of *Staphylococcus aureus* (SA), a common bacterial pathogen, in which production of several toxins act as superantigens generating an overwhelming immune response [1]. This leads to a clinical picture of septic shock with multiple organ failure. The most common toxin implicated is TSS toxin-1 (TSST-1).

Case presentation

A 15-year old boy was admitted to our Emergency Department with fever and confusion that started one day after having eaten meat in a fast food restaurant. He reported sweating, vomiting, myalgias and a cutaneous rash, whilst his mother noted that he was mildly confused. The patient had no medical history nor followed any treatment and had not traveled recently. On the initial physical examination his body temperature was 38.6 °C, blood pressure 60/30 mmHg, heart rate 170 bpm, and oxygen saturation 98%. He had a diffuse cutaneous exanthema appearing mainly on the chest and upper limbs. The rest of the examination was normal, except for a moderate abdominal tenderness and mild confusion. Blood tests showed elevated inflammatory markers with 21 000 WBC/mm³ (92% neutrophils) and a CRP of 250 mg/L, coagulopathy, and acute renal

failure. The patient was transferred to the Intensive Care Unit where he was stabilized with intravenous fluids and vasopressors; empirical amoxicillin-clavulanate was initiated. The following day, results of both admission blood cultures were positive for staphylococci. Rapid identification by Maldi-TOF MS (Bruker® Germany) with a 5-hour culture showed *Staphylococcus aureus* and a quick test of PBP2a (Aler®) was negative. A complete antibiogram confirmed the presence of a multi-sensitive bacterial strain. Follow-up blood cultures remained negative, stool culture was negative, and a trans-esophageal echocardiography was normal. Treatment with intravenous antibiotics was maintained for 7 days and the patient was discharged with oral antibiotics for one more week. Hand and feet desquamation was observed 2 weeks after disease onset. Molecular analysis by real-time PCR assay of the *Staphylococcus aureus* strain confirmed the presence of the *tst-1* gene and the absence of *eta* or *etb* toxins. Typing of the strain showed the presence of *t2509 Staphylococcus aureus*.

Discussion

Staphylococcus aureus is a common type of bacteria which causes a wide range of infections, ranging from minor cutaneous infections to life-threatening bacteremia (community-acquired or hospital-acquired) with toxic shock. TSS is characterized by fever, rash, hypotension, multisystem involvement and cutaneous desquamation during the healing phase due to the ability of the toxin (TSST-1) produced by the bacteria to cross mucosal surfaces [2]. TSS can be subdivided into two major categories: menstrual TSS caused by the use of tampons and non-menstrual TSS for all the other cases, predominantly cutaneous lesions or surgical wound [3]. Our patient did not present any of those risk factor for TSS. Among non-menstrual cases, mortality in adults is estimated at

Abbreviations: CRP, C-reactive protein; ICU, Intensive Care Unit; MRSA, Methicillin-resistant *Staphylococcus aureus*; PCR, Polymerase Chain Reaction; TSAGs, Pyrogenic Toxin Superantigens; TCR, T cell receptor; TSS, Toxic Shock Syndrome; TSST-1, Toxic Shock Syndrome Toxin; SA, *Staphylococcus aureus*; SAB, *Staphylococcus aureus* bacteremia

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13–17%. Our patient had recently eaten meat in a fast-food restaurant and presented four hours later a food intoxication syndrome (emesis and diarrhea). Staphylococcal food poisoning is an intoxication that results from the consumption of food containing *Staphylococcus aureus*. Usually, the disease is self-limiting and resolves within 24–48 h after onset [4]. In our case, *Staphylococcus aureus* was found in blood cultures, which only occurs in 5% of the cases of TSS. But, the positivity of the blood culture is not associated with a higher mortality. Some studies have highlighted the presence of TSST-1 producing *S. aureus* on the hands of food handlers. In fact, *S. aureus* is a common commensal of the skin and mucosal membranes of humans, with estimates of 60% for intermittent colonization [5]. Interestingly, an in vivo study by Schlievert et al. showed clinical symptoms of TSS induced by the ingestion of TSST-1 [6]. In our case, ingestion of a meal with a *Staphylococcus aureus* producer of TSST-1 was highly suspected. Indeed, the *Staphylococcus aureus* strain found in our case, t2509, has been associated with the foodborne illness outbreak in St Petersburg in 2013. The TSST-1 is specific for TSS but some SA strains may have the tsst-1 gene without expression of the toxin. It is possible, prior to degradation, TSST-1 was able to cross the gut mucosa into blood circulation and induced TSS. The absence of any risk factor for TSS and the initial digestive symptoms lead us to the hypothesis of a food poisoning. To our knowledge, this is the first Belgian case reported of bacteremia due to a TSST-1-producing *S. aureus* causing a TSS acquired by ingesting contaminated food. A report by the Public Health Department published in 2018, the same year of our case, stated 2216 cases of food poisoning, including 23 requiring hospitalization but any of those foodborne illness was declared due to positive coagulase *Staphylococci* [7]. At that time, we did not notify it because it was an isolated case in our hospital. The management of TSS is based on the recognition of the pattern, treatment of the shock and appropriate antibiotic therapy.

Ethics approval

No approval of the ethics committee was deemed necessary for this case report.

Consent

The laboratory results came back after the discharge of the patient. We decided to publish this case report afterwards and we didn't have the opportunity to ask for his consent.

CRediT authorship contribution statement

Anouk Goudsmit: Writing. **Samuel Markowicz:** Case report diagnosis. **Salah Eddine Lali:** Microbiological analysis. **Soraya Cherifi:** Supervision of the manuscript.

Declaration of Competing Interest

We declare no conflicts of interests.

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