

STAPHYLOCOCCAL ENTEROTOXIN B

Bioterrorism Agent Profiles for Health Care Workers

Causative Agent: Staphylococcal enterotoxin B (SEB) is one of seven enterotoxins produced by strains of *Staphylococcus aureus*.

Routes of Exposure: Humans are primarily exposed to SEB by consuming contaminated food.

Infective Dose & Infectivity: Minute concentrations are able to cause incapacitation. All people are considered susceptible.

Incubation Period: The incubation period ranges from 4-10 hours after ingestion and 3-12 hours after inhalation.

Clinical Effects: Symptoms of SEB intoxication are abrupt and include nonspecific flu-like symptoms (fever, chills, headache, myalgias), and specific features dependent on the route of exposure. Gastrointestinal exposure results in severe nausea, vomiting, abdominal cramps, and prostration often accompanied by diarrhea. Inhalation exposures produce respiratory symptoms including nonproductive cough, retrosternal chest pain, and dyspnea. Gastrointestinal symptoms may accompany respiratory exposure due to inadvertent swallowing of the toxin after normal mucocilliary clearance. The fever may last up to five days and range from 103 to 106 degrees F, with variable degrees of chills and prostration. The cough may persist up to four weeks.

Physical examination in patients with SEB intoxication is often unremarkable. Conjunctival injection may be present, and postural hypotension may develop due to fluid losses. Chest examination is unremarkable except in the unusual case where pulmonary edema develops. The chest X-ray is also generally normal, but in severe cases increased interstitial markings, atelectasis, and possibly overt pulmonary edema or an ARDS picture may develop. Intoxication is usually self-limiting though, presumably, severe exposure could lead to septic shock and death.

Lethality: SEB intoxication is rarely fatal, though at higher exposures death is possible.

Transmissibility: SEB is usually transmitted by ingesting a contaminated food product. When contaminated foods remain at room temperature for several hours before being eaten, toxin-producing staphylococci multiply and elaborate the heat stable toxin. SEB could also be transmitted through inhalation during an aerosolized release.

Primary contaminations & Methods of Dissemination: In a terrorist attack, SEB intoxication would most likely occur due to an aerosolized release. In addition, intentional contamination of food or water supplies could be a possibility.

Secondary Contamination & Persistence of organism: Secondary transmission does not occur. SEB is relatively stable and resistant to temperature fluctuations.

Decontamination & Isolation:

Patients – Standard precautions should be practiced. Specific isolation procedures are not indicated.

Equipment, clothing & other objects – 0.5% sodium hypochlorite solution (one part household bleach and 9 parts water = 0.5% solution) is effective for environmental decontamination.

Laboratory testing: Laboratory findings are not very helpful in the diagnosis of SEB intoxication. A nonspecific neutrophilic leukocytosis and an elevated erythrocyte sedimentation rate may be seen, but these abnormalities are present in many illnesses. Toxin is difficult to detect in the serum by the time symptoms occur; however, toxin accumulates in the urine and can be detected for several hours post exposure. Therefore, urine samples should be obtained and tested for SEB. Because most patients will develop a significant antibody response to the toxin, acute and convalescent serum should be drawn which may be helpful retrospectively in the diagnosis.

Therapeutic Treatment: Treatment is limited to supportive care. Artificial ventilation might be needed for SEB inhalation. Attention to fluid management is important.

Prophylactic Treatment: There is no vaccine available to prevent SEB intoxication.

Differential Diagnosis: The differential diagnosis of gastrointestinal SEB includes other recognized forms of food poisoning. The differential diagnosis of a rapid onset of respiratory distress would include ricin, mycotoxins, chemical poisons, Hantavirus pulmonary syndrome, and routine bacterial and viral respiratory infections.

References:

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For more information call (602) 364-3289

Frequently Asked Questions About Staphylococcal Enterotoxin B

What is Staphylococcal Enterotoxin B?

Staphylococcal Enterotoxin B (SEB) is one of several toxins produced by the *Staphylococcus aureus* bacteria. The toxin commonly causes unintentional outbreaks of food poisoning.

How is SEB spread?

SEB thrives in unrefrigerated meats, dairy, and bakery products. Therefore, SEB is generally transmitted by eating contaminated foods. If SEB were used as a biological weapon, it could be aerosolized and thus inhaled. It is not possible to spread SEB from person-to-person.

What are the symptoms of SEB exposure?

Symptoms differ depending on the type of exposure. After eating contaminated foods, symptoms with usually start within 4-10 hours and include nausea, vomiting, stomach cramps, and diarrhea. Symptoms of inhaled SEB include a sudden high fever (103° F. to 106° F.), chills, headache, muscle aches, and a dry cough and will usually appear within 3-12 hours after breathing in SEB.

How is SEB exposure diagnosed?

SEB is initially diagnosed based on symptoms. Laboratory confirmations can be made by testing blood and urine samples.

How is the illness treated?

Usually treatment of foodborne disease is not needed, other than taking steps to prevent or treat dehydration. For respiratory distress from inhaled SEB, ventilation may be required.

What can be done to prevent SEB food poisoning?

By properly preparing meat products and using appropriate refrigeration techniques to store meat and dairy products you can greatly reduce your risk of SEB food poisoning. It is also important to wash your hands before preparing or serving foods and after handling raw meat.

Why are we concerned about SEB as a biological weapon?

We know that in the past SEB has been studied as a biological weapon and even stockpiled by the United States during its old biological weapons program, which ended in 1969. SEB is considered an effective biological weapon because it can be easily aerosolized and is very stable. Though death is possible after exposure to large amounts of the toxin, fatalities are rare. Since SEB is much more likely to cause illness than death, it is classified as an "incapacitating agent."

Is a vaccine available for SEB?

No vaccine or antitoxin is available to treat SEB before or after exposure.

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