

The *Clostridium perfringens* enterotoxin (CPE) mediating the disease is heat-labile (dies at 74°C) and can be detected in contaminated food, if not heated properly, and feces.

Incubation time is between 6 and 24 (commonly 10–12) hours after ingestion of contaminated food. Often, meat is well prepared but too far in advance of consumption. Since *C. perfringens* forms spores that can withstand cooking temperatures, if let stand for long enough, germination ensues and infective bacterial colonies develop. Symptoms typically include abdominal cramping and diarrhea; vomiting and fever are unusual. The whole course usually resolves within 24 hours. Very rare, fatal cases of clostridial necrotising enteritis (also known as Pig-Bel) have been known to involve ‘Type C’ strains of the organism, which produce a potentially ulcerative  $\beta$ -toxin. This strain is most frequently encountered in Papua New Guinea.

It is likely that many cases of *C. perfringens* food poisoning remain subclinical, as antibodies to the toxin are common among the population. This has led to the conclusion that most of the population has experienced food poisoning due to *C. perfringens*.

Despite its potential dangers, *Clostridium perfringens* is used as the leavening agent in salt rising bread. The baking process is thought to reduce the bacterial contamination, precluding negative effects.

### Gas Gangrene

*Clostridium perfringens* is the most common bacterial agent for Gas gangrene.

1. Gangrene is necrosis and putrefaction of tissues. Gas production forms bubbles of gas in muscle (crepitus) and smell in decomposing tissue.
2. After rapid and destructive local spread (which can take hours), systemic spread of bacteria and bacterial toxins may result in death. This is a problem in major trauma and in military contexts.
3. Gram-positive spore can form anaerobic bacilli.
4. It is a saprophyte, meaning it occurs in soil, H<sub>2</sub>O, decomposing plant, human and animal feces.
5. Under appropriate conditions, spores can reactivate into a vegetative cell.
6. Can grow in anaerobic dead tissue or dirt. Produces cytotoxin that can lyse cells.
7. Traumatic wounds should be cleaned. Wounds that cannot be cleaned should not be stitched shut.
8. Spores can withstand boiling water. Autoclaving is necessary to ensure sterility.
9. Penicillin prophylaxis kills clostridia, and is thus useful for dirty wounds and lower leg amputations.
10. If detected on clinical grounds, should not wait for lab results.
11. If adrenaline used for injection is contaminated with spores, catastrophic reactions can result.
12. Prompt and adequate surgical attention is of paramount importance.
13. Grows readily on blood agar plate in anaerobic conditions and often produces a zone of haemolysis.
14. Growth in food can produce toxins causing acute, self-limiting diarrhea.
15. High infectious dose is required; carrier state persists for several days.

### Colony Characteristics

On blood agar plates, *C. perfringens* grown anaerobically produces  $\beta$ -haemolytic, flat, spreading, rough, translucent colonies with irregular margins. A distinguishing characteristic of *C. perfringens* is a zone of double Beta Haemolysis. On a Nagler agar plate, containing 5–10 per cent egg yolk, is used to identify strains that produce  $\alpha$ -toxin, a diffusible lecithinase that interacts with the lipids in egg yolk to

***Bureau of local health support and emergency medical services — regional office director and staff***

1. Provide assistance in coordinating outbreak investigations (especially those involving multiple jurisdictions) and ensure the involvement of all appropriate local agencies.
2. Provide consultation and obtain appropriate technical assistance for the LHD in epidemiologic investigation of disease outbreaks.
3. Assign appropriate regional staff (e.g. public health nurses, sanitarians, nutritionists, educators, regional staff) to participate in investigations, as needed.
4. Notify CDES of all investigations, and other agencies as necessary.
5. Assist the LHDs in completing outbreak investigations, initiating control measures, and submitting the DPH and/or CDC report forms to CDES.

***Regional public health sanitarian or agency sanitarian***

1. Coordinate environmental investigation with epidemiologic investigations being conducted by LHDs.
2. Inspect establishment and enforce rules pertaining to the regulation of hotels, tourist rooming houses, bed and breakfast establishments, restaurants, food and beverage machines, vending commissaries, campgrounds, public swimming pools, recreational and educational camps.
3. Conduct or direct a complete sanitation investigation of the facility or site of a suspected outbreak. Do a Hazard Analysis and Critical Control Points (HACCP) investigation for implicated food(s).
4. Collect food, water, and other specimens as needed.
5. Consult and participate (as needed) in investigations of outbreaks not specifically involving licensed facilities or sites.
6. Send copy of the sanitarian's inspection report and narrative of inspection to LHD and CDES.

***Bureau of communicable diseases and preparedness/communicable disease epidemiology section***

1. Provide consultation and technical assistance to regional office staff and LHD staff in the epidemiologic investigation of disease outbreaks.
2. Provide guidelines for the epidemiologic investigation and control of a specific outbreak consistent with state and national objectives, current policy, and current medical and scientific literature.
3. Determine whether a particular outbreak warrants further epidemiologic investigation and the nature and extent of additional epidemiologic or laboratory data required.
4. Keep BEOH and regional offices informed of the progress of any outbreak investigation.
5. Identify and arrange for additional staff and material resources from the BCDP if an outbreak exceeds the resource capacity of the LHD and the regional office.
6. Provide advice on collection of food, water or other specimens in coordination with WSLH and/or DATCP/BLS.
7. Recommend and request implementation of control measures.
8. Maintain and distribute surveillance information and summary reports relating to outbreaks to LHDs, regional offices, physicians and other agencies.
9. Provide training materials instructive in the methods of outbreak investigations.

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