

Department of veterinary public health & epidemiology



BOTULISM

Transmission

- Ingestion
 - Organism
 - Spores
 - Neurotoxin
- Wound contamination
- Inhalation
- Person-to-person not documented

History

- 1793, Justinus Kerner
 - “Wurstgift”
- “Botulus” = Latin for sausage
- 1895, Emile von Ermengem
 - Isolated organism during Belgium outbreak
- U.S. outbreaks led to improved industry processing



Neurotoxins

- Seven different types of neurotoxins[BoNTs] produced by bacteria *Clostridium botulinum*: A to G.
 - Different types affect different species
 - . BoNTs A,B,E&F- Out breaks in humans
 - . BoNT C in – Birds
 - . BoNT D in- Cattle

- BoNT G isolated from soils
- BoNT A most common & most potent
- Toxins destroyed by boiling
- Spores- Higher temperature to be inactivated

PATHOGENESIS

- Neurotoxins of *Clostridium botulinum*



Preformed toxin in food, absorbed from the gastro intestinal tract and circulates in the blood stream



Act at the neuro muscular junction of Cholinergic nerve and at peripheral autonomic synapses



Ascending and symmetrical paralysis, Resulting in flaccid paralysis



Death results from paralysis of respiratory muscles & circulating failure

The difference between the effects of Tetanus & Botulinum toxins is due to their different site of action

Tetanus

- Tetanus toxin travels up the nerve axon
- In tetanus toxin condition increase the acetyl choline and causes muscles paralysis known as spastic paralysis

Botulinum

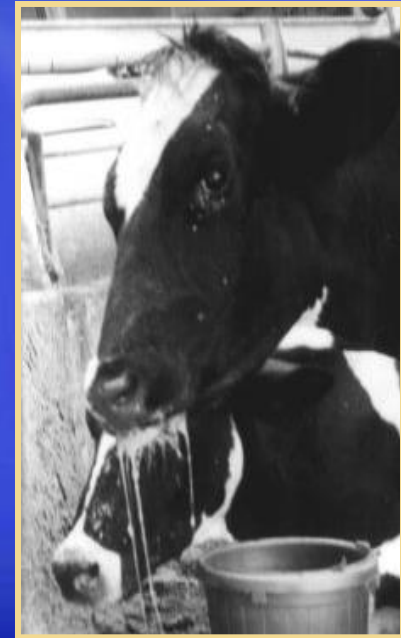
- Botulinum toxin remain at the neuromuscular junction
- In botulinum toxin causes flaccid paralysis

Animals

- Cattle and sheep
- Horses
- Birds and poultry
- Mink and ferrets
- Uncommon in dogs and pigs
 - Fairly resistant
- No natural cases documented in cats

Cattle and Sheep

- Ingestion of toxin
- Incubation
 - 24 hours to 7 days
- Sources
 - Spoiled stored silage or grain
 - Silage using poultry litter or products
 - Phosphorus deficiency in cattle
 - Carcasses: Baled or chopped into hay



Ruminants: Clinical Signs

- Progressive ascending ataxia
- Recumbent
- Head turned into flanks
- Cranial nerve dysfunction
- Rumen stasis; bloat
- Atonic bladder - loss of urination



Ruminants: Prevention

- Good husbandry practices
- Rodent and vermin control
- Prompt disposal of carcasses
- Avoid spoiled feedstuff or poor quality silage
- Vaccination in endemic areas

Cattle and Sheep: Diagnosis

- History
- Bloodwork and CSF tap: Normal
- ELISA test available for type C & D
- Definitive diagnosis
 - Demonstration of toxin in serum, gut contents or organs
- Electromyography (EMG)

Cattle and Sheep: Treatment

- Symptomatic and supportive
- Nutritional
- Ventilatory support, if needed
- Metronidazole
- Antitoxin, in early stages
 - Ineffective by the time clinical signs are present
 - Can block further uptake of toxin

Dogs

- Rare
- Type C; few cases type D
- Source
 - Ingestion of carrion
 - Wetland areas with avian botulism epizootics
- Incubation period
 - Few hours to 6 days

Dogs

- Progressive symmetric ascending weakness
 - Rear limbs to forelimbs
- Cranial nerve deficits
- Respiratory paralysis
- Lose ability to urinate and defecate

Horses

- Horses, especially foals, are highly sensitive to botulism toxin
- Type B & C toxins
- Incubation period
 - 24 hours to 7 days
- Sources
 - Contaminated feed
 - Wound infections



Adult Horses

- “Forage poisoning”
 - Ingest preformed toxin
- Clinical Signs
 - Dyspnea
 - Flaccid tail
 - Muscle tremors
 - Severe paresis to rapid recumbency
 - Unable to retract tongue, drooling



Foals

- “Shaker Foal” syndrome
 - Most 2 weeks to 8 months of age, has been attributed to the impact of stress on the dam leading to increased corticosteroid levels in milk
 - Usually type B
- Spores in contaminated feed

Foals: Clinical Signs

- Clinical signs
 - Paresis, recumbent
 - Muscle tremors
 - Dysphagia
 - Ptosis, mydriasis, decreased PLR
 - Ileus, constipation, urine retention
 - Death due to respiratory paralysis
- Mortality greater than 90%

Equine: Prevention

- Good husbandry
- Rodent and vermin control
- Avoid spoiled feed
- Prophylactic vaccine for pregnant mares
 - Currently only type B botulinum toxoid available for horses

Birds and Poultry

- “Limber neck”
- Types C and E
- Good sentinel species
- Sources:
 - Decomposed vegetation or invertebrates
 - Ingest toxin or invertebrates with toxin
 - Contaminated feed or water of chickens



Birds and Poultry: Clinical Signs

- Occurs 12-48 hours after ingestion
- Droopy head
- Drowsy
- Wing and leg paralysis
 - Unable to hold their head up
 - Unable to use their wings or legs
- Eyelid paralysis

Human Disease

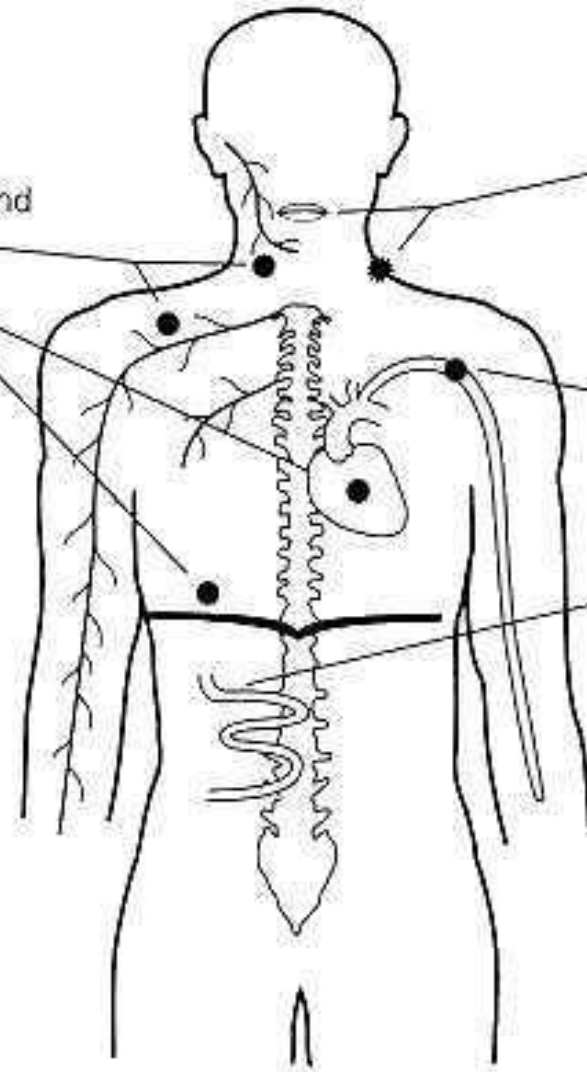
- Three forms
 - Foodborne
 - Wound
 - Infant
- All forms fatal and a medical emergency
- Incubation period: 12-36 hours

4. Disease

Flaccid paralysis (cranial and peripheral nerves)

Cardiac failure

Respiratory failure (musculature)



1. Entry

Adults, toxin

(or wound infection, rare)

Infants, *C botulinum*

3. Spread of toxin

2. Absorption

Adults: ingested toxin

Infants: toxin produced by
C botulinum infection

Infant Botulism

- Most common form in U.S.
- Spore ingestion
 - Germinate then toxin released and colonize large intestine
- Infants < 1 year old
 - 94% < 6 months old
- Spores from varied sources
 - Honey, food, dust, corn syrup



Infant Clinical Signs

- Constipation
- Lethargy
- Poor feeding
- Weak cry
- Bulbar palsies
- Failure to thrive



Adult Clinical Signs

- Nausea, vomiting, diarrhea
- Double vision
- Difficulty speaking or swallowing
- Descending weakness or paralysis
 - Shoulders to arms to thighs to calves
- Symmetrical flaccid paralysis
- Respiratory muscle paralysis

Human: Prevention

- Do not feed honey to children <1 yr of age
- Proper food preservation methods
 - Proper time, temperature and pressure
 - 80°C for 30 min or 100°C for 10 min
- Prompt refrigeration of foods
- Boil foods for > 10 minutes
- Decontamination
 - Boil suspected food before discarding
 - Boil or chlorine disinfect utensils used

