

CENTRAL NERVOUS SYSTEM INTOXICATIONS

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TETANUS

Tetanus is a severe, acute, non-contagious disease, with tonic spasm and paroxysmal



HISTORY

- First records of clinical phenomena Hippocrates
- Description of opisthotonus in the 3rd century AD
- First records from our region in 1615
- Nicolaier in 1885. discovers tetanus bacillus
- Behring Kitasato in 1893. produce anti-tetanus serum



ETIOLOGY OF TETANUS

- The causative agent of tetanus is a gram-positive, anaerobic and sporogenic bacillus *Clostridium tetani*
- In the external environment, it produces spores that are very resistant
- If the spore enters a wound where anaerobic conditions exist, it passes into a vegetative form
- In the vegetative form, *Clostridium tetani* synthesizes exotoxins
- Tetanospasmin and tetanolysin



EPIDEMIOLOGY OF TETANUS

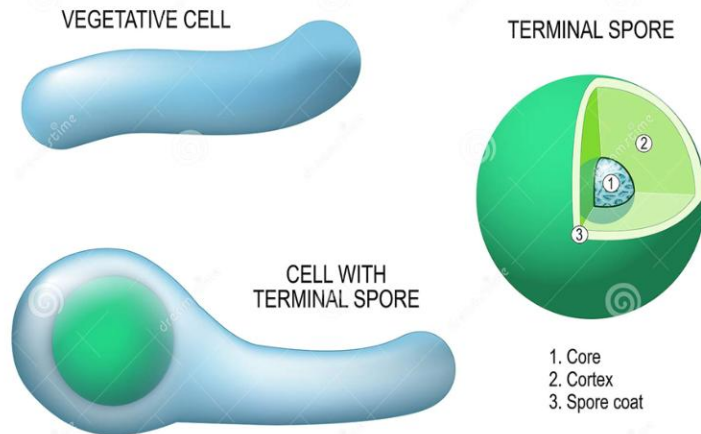
- Infectious and non-contagious disease belonging to zoonoses
- Cosmopolitan disease
- Sporadic disease
- Most commonly affected are farmers and livestock farmers
- The natural reservoir of tetanus bacilli is the digestive tract of domestic and wild animals
- Most commonly affected are people over 60 years of age



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Clostridium tetani



- Sporogenic and vegetative forms of *Cl. Tetani*, terminal spores have a nucleus, cortex and sheath
- Spores can survive in the external environment for more than 10 years

- A person becomes infected when the spores of *Cl. tetani* enter injured tissue, i.e. a wound where anaerobic conditions exist
- It is believed that any wound can be tetanogenic, if anaerobic conditions exist
- Classical tetanogenic wounds are:
 - Punch wounds
 - Cuts
 - Lacerations
 - Ulcerative wounds
 - Burns
 - Frost wounds
 - Crash syndrome, etc.



EPIDEMIOLOGICAL DATA

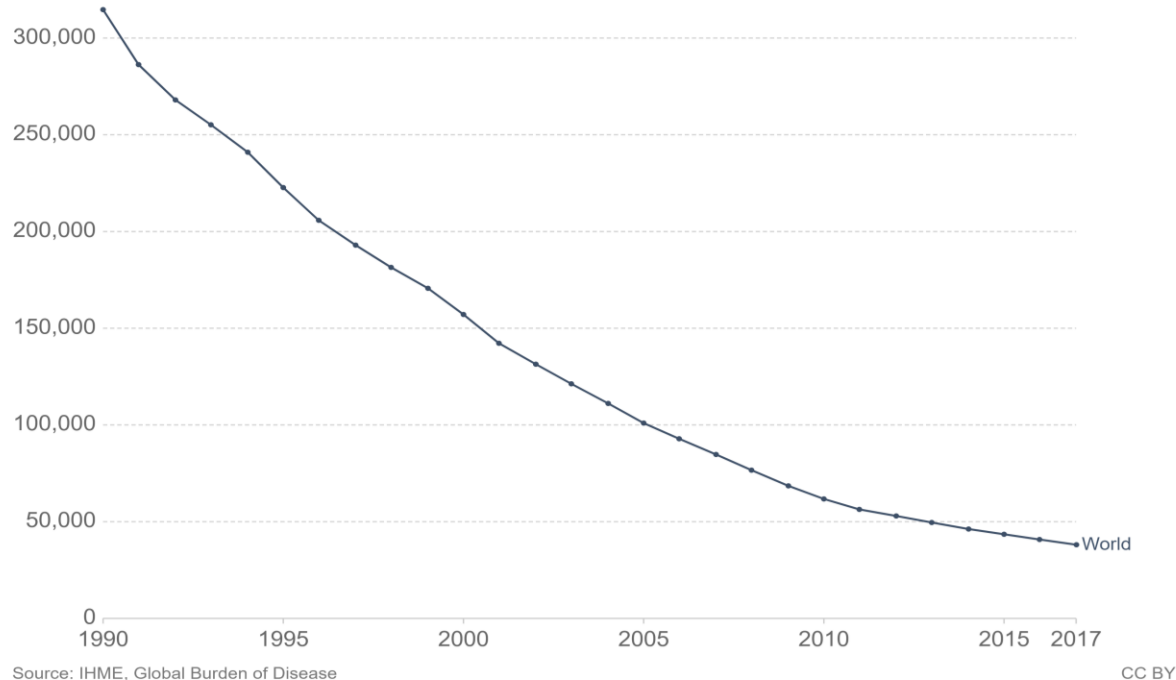
Tetanus alius	Number of tetanus cases in Yugoslavia in the period from 1939 to 1950				
	1939	1946	1948	1949	1950
	462	777	874	899	905
	Number of tetanus cases in Serbia in the period from 2012 to 2016.				
	2012	2013	2014	2015	2016
	3	2	0	4	4

- Institute of Public Health – Batut, 2017.
- Acute Infectious Diseases, Kosta Todorović, 1952.



EPIDEMIOLOGICAL DATA

- The number of deaths in the world from tetanus in the period from 1990. to 2017.



- Mortality among those infected is still high and amounts to 50%
- Thanks to the implementation of vaccination, the number of infected and deceased people in the world has been reduced by 89% since 1990

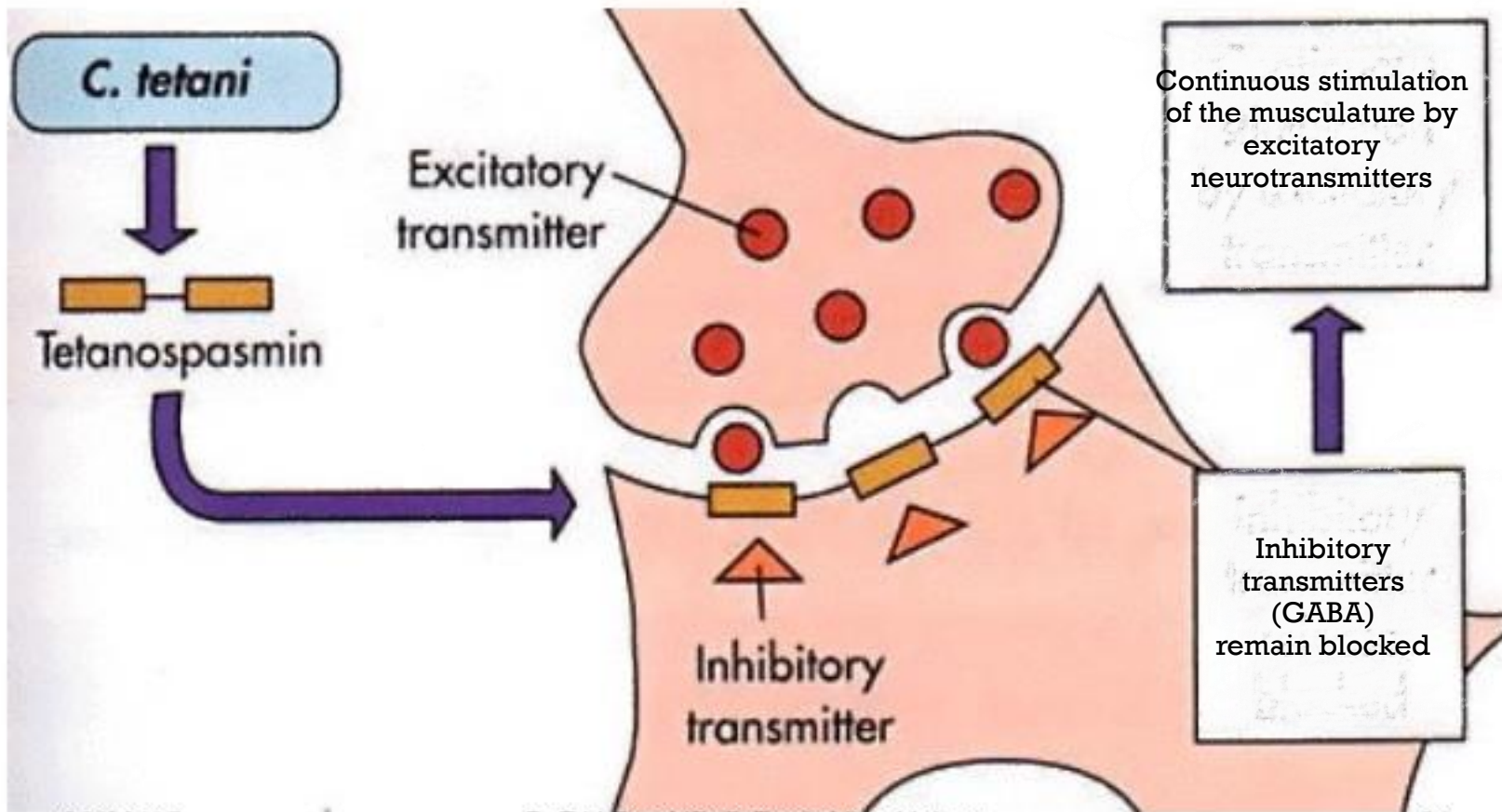


PATHOGENETIC MECHANISMS-TETANOSPASMINE

- **INHIBITS THE RELEASE OF NEUROTRANSMITTERS AT PRESYNAPTIC NERVE TERMINALS**
- **BY REDUCING GABA RELEASE**
- **BY ACTIVATING PROTEIN C KINASE**
- **BY INHIBITING cGMP**
- **CLINICAL EFFECTS OF TETANOSPASMS**
- **LOSS OF CENTRAL MOTOR CONTROL: TONIC AND PAROXYSMAL SPASMS**
- **CHANGES AT THE NEUROMUSCULAR JUNCTION**
- **DISORDERS OF THE AUTONOMOUS NERVOUS SYSTEM: HYPERTENSION, SWEATING, TACHYCARDIA, HYPERPYREXIA**

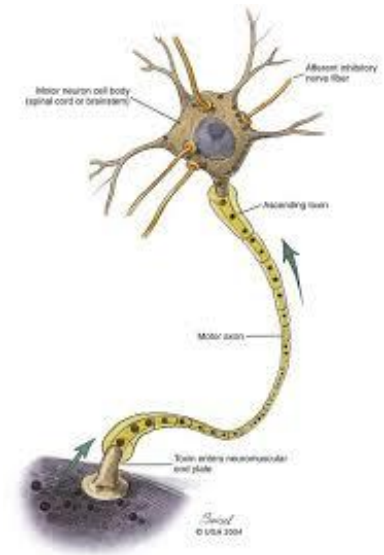


MECHANISM OF ACTION OF TETANOSPASMINE



CLINICAL PICTURE OF TETANUS

- The most important vaccination status of the patient
- The incubation period of the disease is usually 7 to 15 days and is directly related to the prognosis of the disease
- The main clinical sign is tonic spasm of the transverse striated muscles, which is a constant sign of the disease
- In severe forms of the disease, paroxysmal spasms also occur
- Paroxysmal spasms occur spontaneously or at the slightest provocation, they can lead to laryngospasm



“The shorter the incubation period,
the worse the prognosis”

Rosé



CLINICAL FORMS OF TETANUS

- ✓ “The prognosis is worse the shorter the incubation period”
- ✓ Generalized tetanus
- ✓ Gynecological tetanus
- ✓ Neonatal tetanus
- ✓ Surgical tetanus
- ✓ Cephalic tetanus
- ✓ Localized tetanus



GENERALIZED TETANUS



- tonic spasms tonic and paroxysmal spasms
- **The first sign that appears is TRISMUS (painful smile), which is a painful spasm of the masticatory muscles**
- **Risus sardonius seu cinicus**
- **Body “as if in armor”**
- **Paroxysmal spasms (like an electric shock)**
- **Opisthotonus thoracalis**
- **Laryngospasm**
- **Respiratory failure**
- **Autonomic nervous system dysfunction (hypertension, tachycardia, increased sweating)**



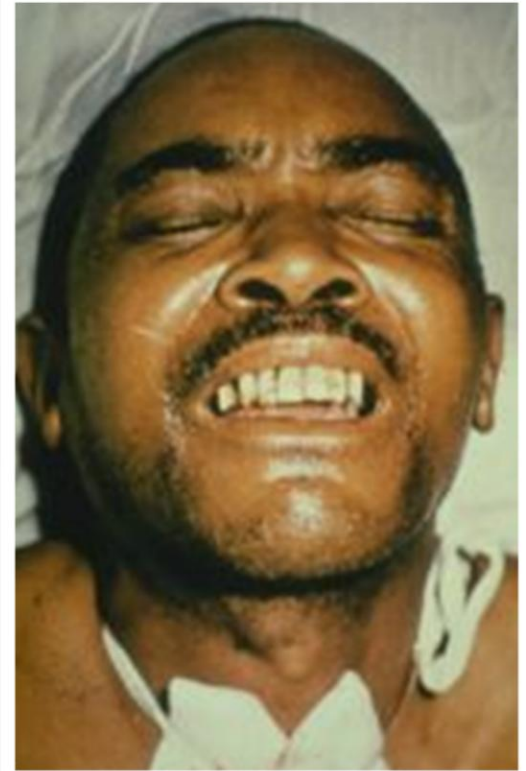
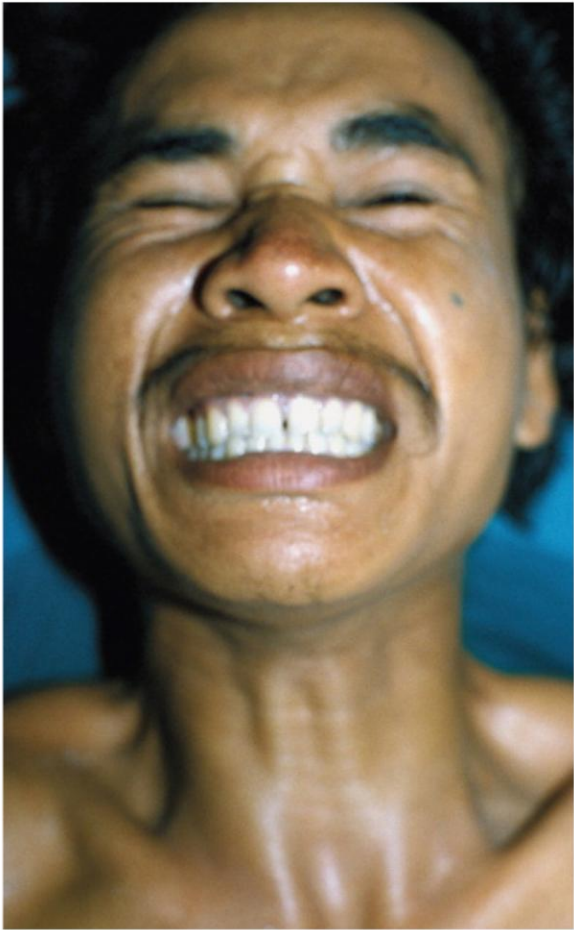
Opisthotonus



**Paroxysmal convulsions
in patients with tetanus.**



RISUS SARDONICUS



OPISTOTONUS





Source: World Health Organization



CLINICAL FORMS OF TETANUS

Гинеколошки тетанус

- Unhygienic delivery, in case the mother has not been previously vaccinated
- Severe clinical picture, short incubation, high mortality
- The newborn quickly develops trismus and is stiff “like a doll”
- Using non-sterile objects in unhygienic conditions
- Unvaccinated deliveries
- The disease has a severe course and poor prognosis
- Picture of severe generalized tetanus
- Short incubation, rapid development of paroxysmal convulsions and high mortality

Тетанус новорођенчета

- Unhygienic delivery, in case the mother has not been previously vaccinated
- Severe clinical picture, short incubation, high mortality
- The newborn quickly develops trismus and is stiff “like a doll”



CLINICAL FORMS OF TETANUS

- Улазно место инфекције хируршка рана
- Често се виђе у ратовима, иначе је редак облик
- Тешка клиничка слика генерализованог тетануса

Surgical tetanus

- Представља вид локалног тетануса који се јавља због повреде у регији главе
- Јавља се пареза **n. facialis**
- Могуће захватање и **n. Hypoglossus** што се манифестује дисфонијом и дисфагијом

Cephalic tetanus

- Јавља се близу места повреде, захвата углавном горње или доње екстремитете
- Инкубација је дуга и грчеви могу трајати месецима
- Јавља се непотпуно вакцинисаних

Localized tetanus



CEPHALIC TETANUS



Left-sided facial nerve paralysis



LOCAL TETANUS

During World War I, it was often seen in wounded soldiers who received antitetanus serum prophylactically

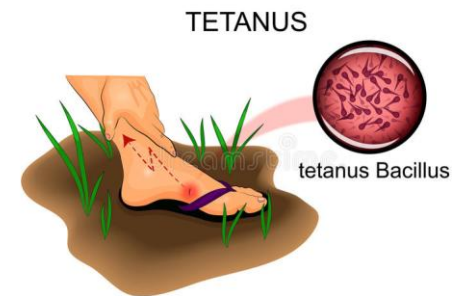


Acute infectious diseases, 1952. Prof. Dr. Kosta Todorović



THE OUTCOME OF THE DISEASE DEPENDS ON:

- Incubation period
- Localization and nature of the injury
- Autonomic nervous system involvement
- Clinical form of the disease
- Patient age and comorbidities

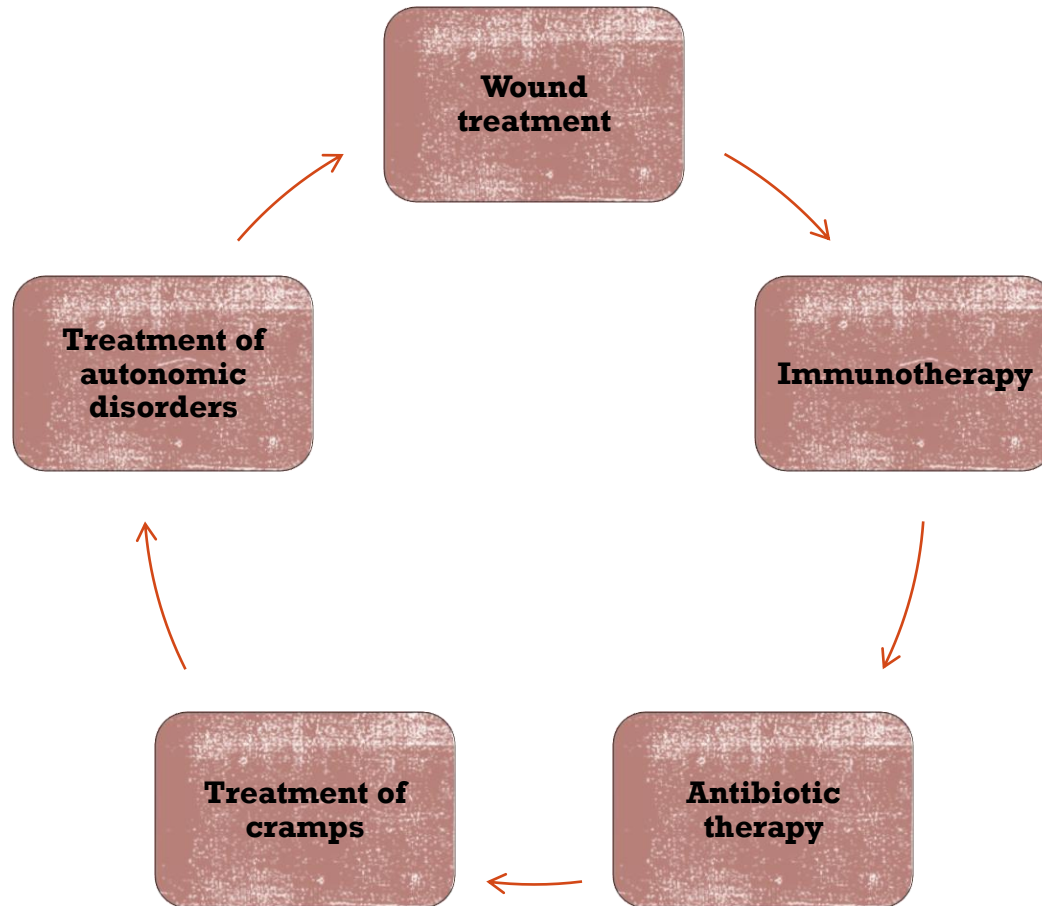


DIAGNOSIS AND DIFFERENTIAL DIAGNOSIS OF TETANUS

- The diagnosis of tetanus is a clinical diagnosis that involves recognizing characteristic clinical signs in the presence of a recent injury
- Differential diagnosis
- Pseudotrismus (inflammatory and tumorous changes in the oral cavity)
- Meningoencephalitis
- Strychnine poisoning
- Tetanophobia
- Tetany



TREATMENT OF TETANUS-PATIENTS ARE TREATED IN INTENSIVE CARE UNITS



TREATMENT OF TETANUS

- Wound treatment
- Immunotherapy - administration of human antitetanus immunoglobulin at a dose of 500 IU intramuscularly
- Antibiotic therapy - parenteral administration of Metronidazole 500mg/8h
- Treatment of seizures
 - benzodiazepines (amp.Diazepam 1-2mg/kg/24h)
 - amp.midazolam intravenous administration (0.2-0.3mg/kg/h)
- Blockade of the neuromuscular junction
- Treatment of vegetative disorders - blockade of adrenergic receptors
- Correctional therapy (protein-rich diet, correction of acid-base status, fluid balance...)



TETANUS PREVENTION

- Regular immunization schedule
- DPT in the first year of life
- DPT in the second year of life
- DPT in the seventh year of life
- DPT at age 14
- TT in the 30th, 40th, 50th, 60th years of life



**PATIENTS IMMEDIATELY AFTER THE INJURY RECEIVE 250 IU XTIG
IMMUNIZATION AGAINST TETANUS OF INJURED PERSONS IT IS CARRIED OUT WITH A
VACCINE CONTAINING THE TT COMPONENT AND HUMAN ANTITETANUS
IMMUNOGLOBULIN (HTIG) IN THE FOLLOWING WAY:**

Persons who have been vaccinated and revaccinated against tetanus and less than 10 years have passed since the last dose to the injury, do not receive either the vaccine or HTIG.

Persons who have been fully vaccinated and revaccinated against tetanus and more than 10 years have passed since the last dose to the injury, receive one dose of vaccine (TT) and 250 IU HTIG

Persons who have not been vaccinated, who are incompletely vaccinated, or who have no evidence of immunization against tetanus, receive the first dose immediately, the second in a month, and the third dose, six months after the second dose (0,1, 7)Patients immediately after the injury receive 250 IU of XTIG

BOTULISM

Botulism is an acute neurointoxication caused by *Clostridium botulinum*



БОТУЛИЗМ

CAUSANT-EXOTOXIN BACTERIA CLOSTRIDIUM BOTULINUM: GRAM POSITIVE ANAEROBIC BACILLUS, PRODUCING SPORES.

CLOSTRIDIUM BOTULINUM PRODUCES 7 ANTIGENIC TYPES OF EXOTOXINS: A, B, C, D, E, F and G (A, B, E, less often F).

EPIDEMIOLOGY

*SOURCE OF INFECTION: FOOD CONTAMINATED FOOD
SPORADIC OR MINOR EPIDEMICS*

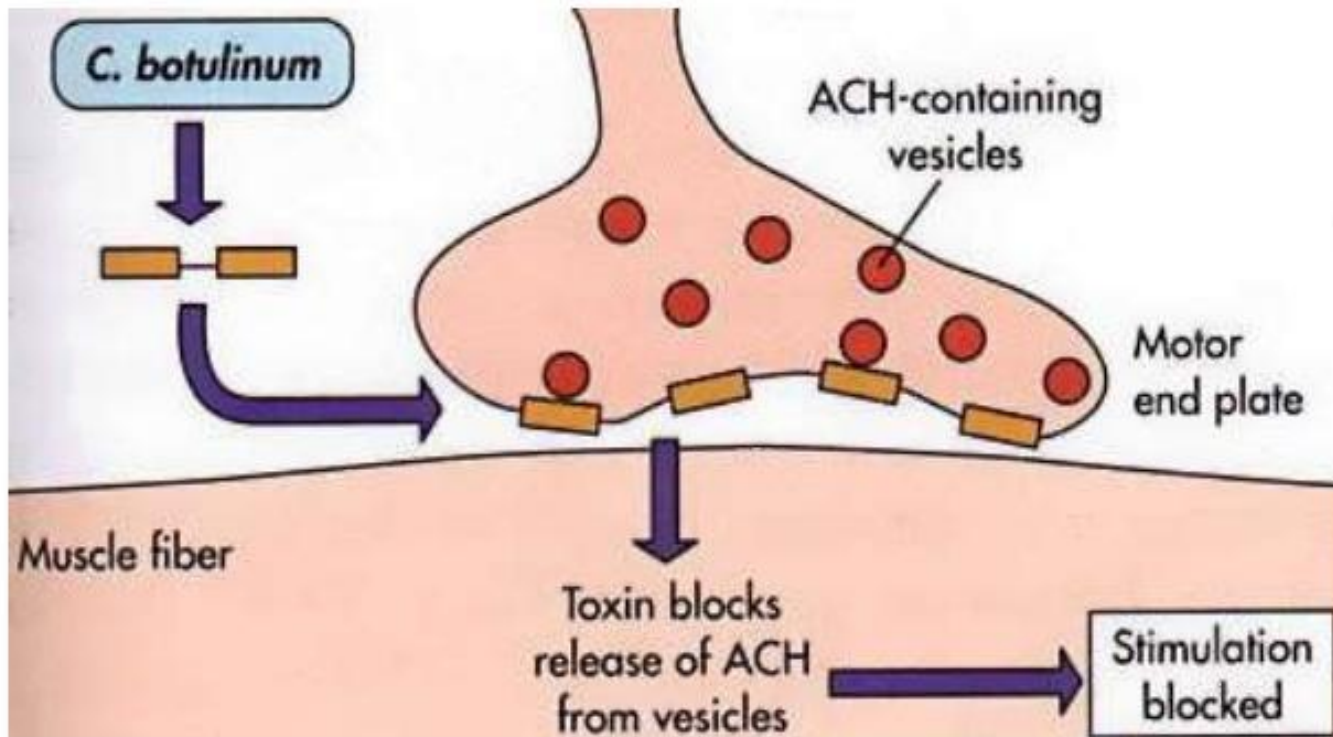
PATHOGENESIS

*THE TOXIN BINDS TO RECEPTORS ON CHOLINERGIC NERVE TERMINALS
AND AUTONOMOUS GANGLIA.*



PATHOGENETIC MECHANISM OF BOTULISM

Mechanism of Action of Botulinum Toxin



CLINICAL PICTURE

Incubation is short, 2-3 days

Gastrointestinal disorders

(Nausea, vomiting, loose stools...)

Neurological disorders

Double vision and blurred vision (paralysis of accommodation and mydriasis)

Eyelid ptosis

Dry oral mucosa, difficulty speaking and swallowing

Muscle paralysis that spreads downwards

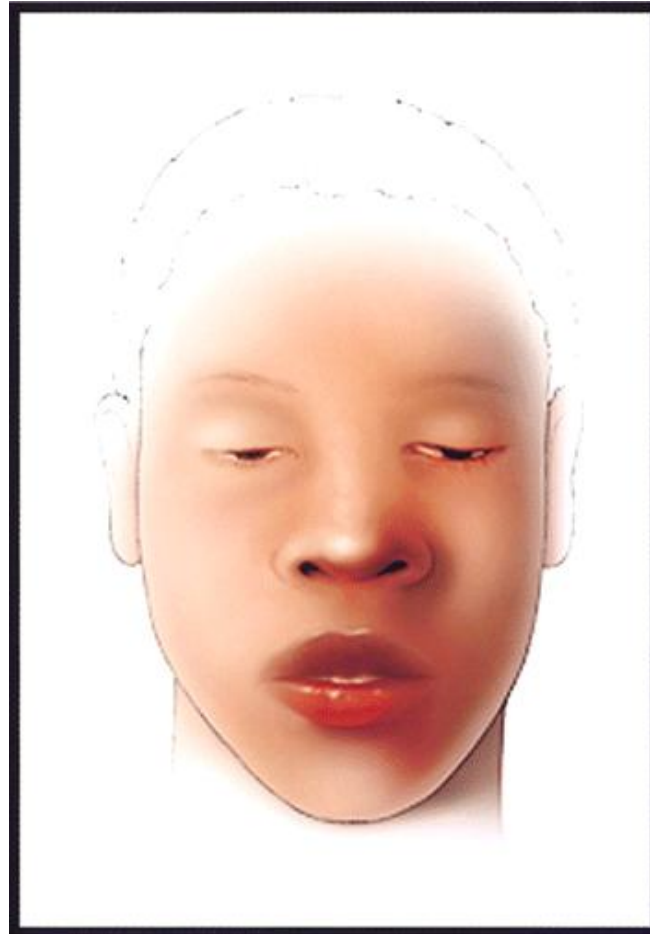
Difficult movement

Urinary retention and constipation

Respiratory failure



A PATIENT WITH A MODERATELY SEVERE FORM OF BOTULISM - EYELID PTOSIS
AND AN EXPRESSIONLESS FACE ARE REGISTERED AS A RESULT OF FLACCID
PARALYSIS



CLINICAL FORMS

- **Wound botulism**
- **Rare clinical form**
- Vegetative forms develop from spores in injured tissue
- Severe clinical manifestations
- **Newborn botulism**
- **Newborn on artificial feeding**
- Constipation
- Muscle weakness
- Hypotension
- Respiratory failure



MYDRIASIS AND EYELID PTOSIS



DIAGNOSIS OF BOTULISM

Differential diagnosis

polyradiculoneuritis (Miller Fischer syndrome)

myasthenia gravis

atropine poisoning, mushrooms

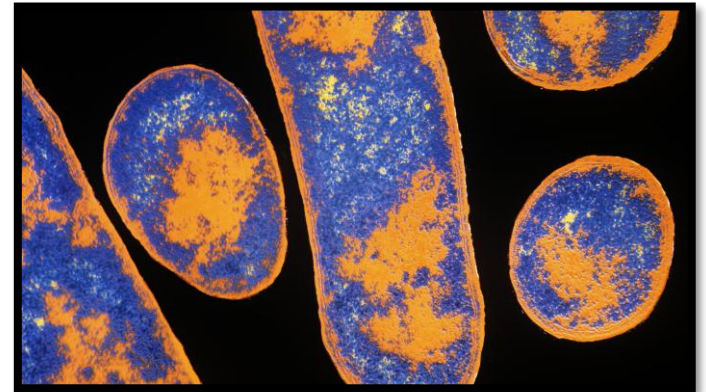
Diagnosis

Clinical manifestations

Epidemiological data

Isolation of *C. Botulinum* or toxin

Biological examination of the stool



BOTULISM THERAPY

- **Patients are treated in intensive care units**
- **Specific treatment**
- **Polyvalent botulinum serum**
- **Antibiotics (Metronidazole, crystalline Penicillin)**
- **Non-specific treatment**
- **Cholinesterase inhibitor (Prostigmin)**
- **Rectal enemas**
- **Nasogastric tube**
- **Mechanical ventilation**
- **Prevention - polyvalent vaccine containing A, B, E toxins**

