

Botulism of Cattle in Brasil

Diagnosis and Vaccination

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Map of SA

Brazil:

5th biggest country in the world

8 547 404 km²

~166 million Inhabitants

~160 million cattle

Main breeds:

Nelore, crossbreds
Gir and crossbreds
Holstein Friesian

other Beefbreeds
Angus, Indubrasil,
Simmental, Charolais



Ecology and Climate

Brazilian Highlands

Rainy season (summer):
October-March

Dry season (winter):
April-September





Typical Brazilian Pastureland





Brachiaria pasture in the rainy season



Brachiaria pasture in the dry season



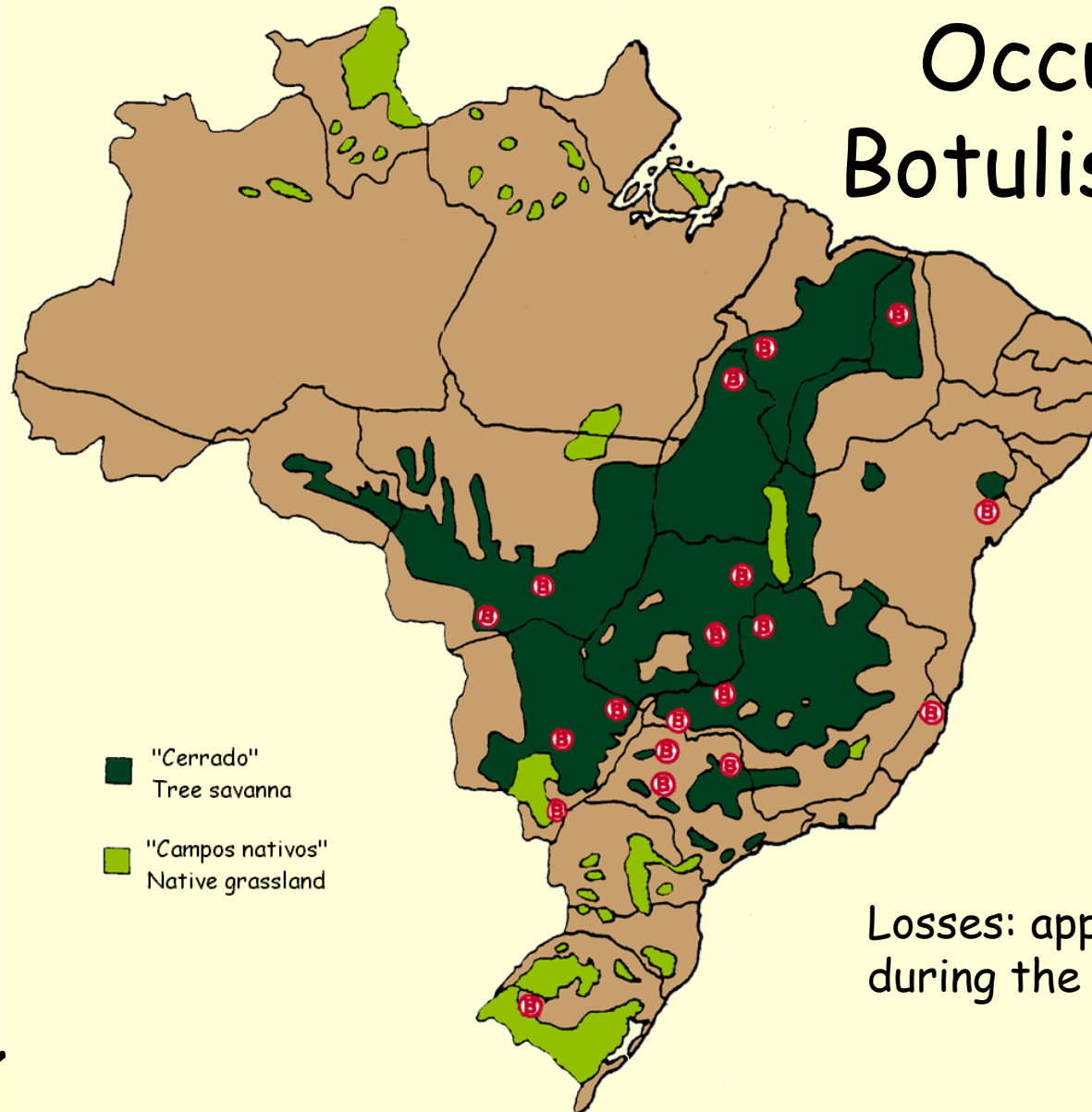
Hygenical status

National
eradication
program for FMD

No national
progamms for the
eradication of
tuberculosis,
brucellosis and IBR



Occurrence of Botulism in Brazil



Losses: app. 1.5 Billion US\$
during the last 10 years

What is Botulism?

Botulism : in most cases a fatal intoxication with a neurotoxin produced by

Clostridium botulinum:

- 8 types recognized on the basis of the produced toxins (A,B,C α , C β ,D,E,F,G)
- anaerobic gram positive rods, which produces oval, subterminal endospores
- endospores are distributed in soils and aquatic environments worldwide
- the types C and D can often be found in the intestinal-tract of domestic animals (cattle and fowl)
- germination of spores, growth of vegetative cells and toxin production occurs in anaerobic locations (rotting carcasses, decaying vegetation, wounds)



What is Botulism?

Intoxication occurs when preformed BoNt is ingested

Osteophagia: phosphorus deficient cattle take up bones or carcasses where *C. botulinum* has multiplied and formed its toxins

drinking of contaminated water

feed on contaminated silage or other feeding stuffs

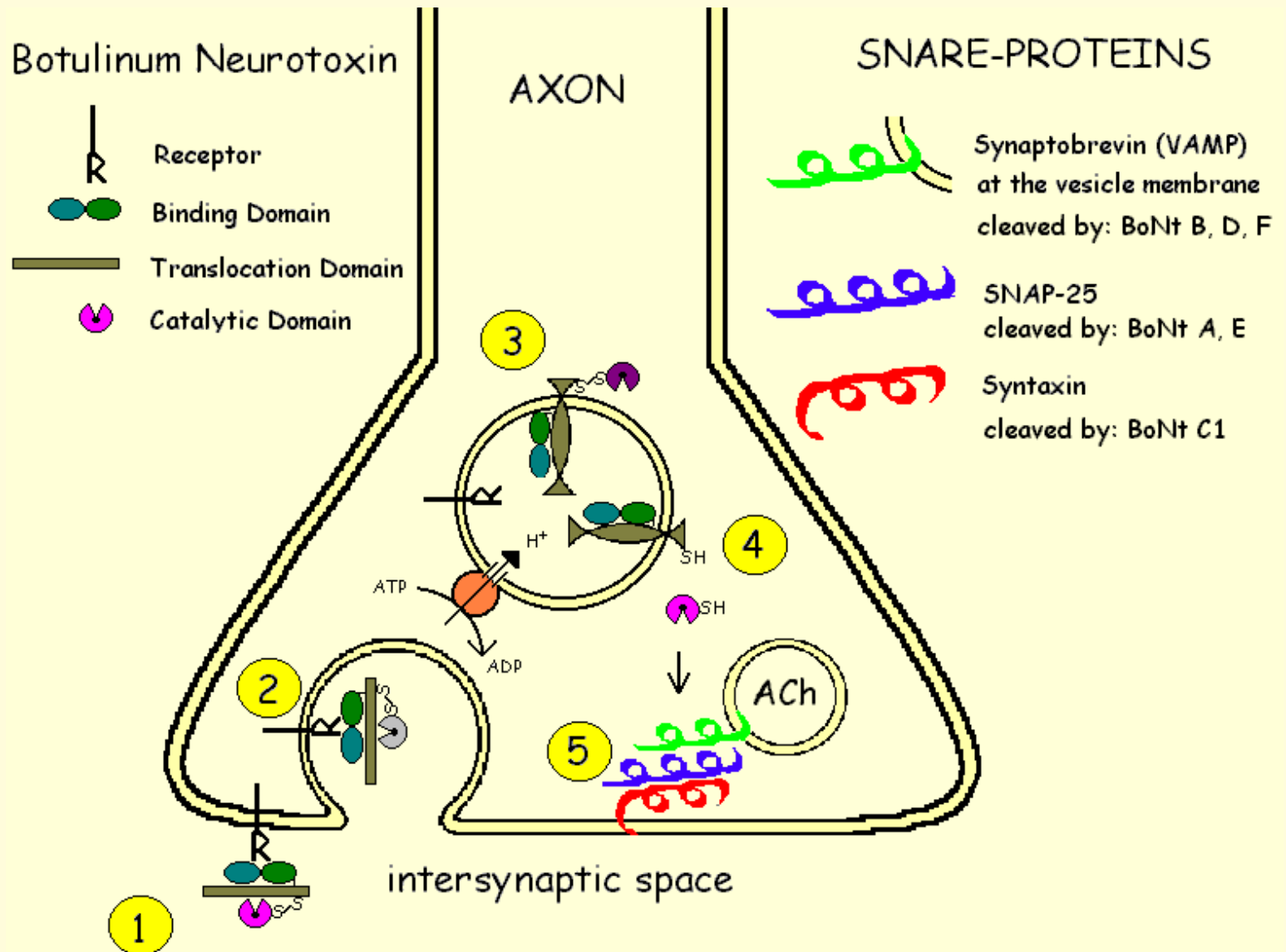
Toxico-infectious botulism occurs when spores germinate in wounds or in the intestinal tract

Intestinal toxico-infectious botulism is recorded in foals (shaker foal syndrome), broiler chickens, and human infants (infant botulism)

Wound botulism is recorded in humans associated with the use of contaminated drugs or syringes



Mode of action of the BoNt



Osteophagia

During the rainy season the fast growing and relatively low demanding pasture species *Brachiaria* contains very low amounts of phosphorus (0.12%) especially in the „Cerrado“-areas where the soil is phosphorus deficient.



Brachiaria spp.



Ostophagia

Inadequate phosphorus
supplementation

Improper mineral
supplementation sites



Osteophagia

High demanding cattle breeds

The result is a phosphorus deficiency in cattle especially in the lactation period or during growth when the demand of phosphorus is high.



Foto by: I.S. Dutra, Universidade Estadual Paulista, Campus Araçatuba



Ostophagia

Inadequate
removal of
carcasses lead to
a vicious circle



Other sources of intoxication



water holes: „cacimbas“ which serve as a cistern

Cattle enter the holes, loose their droppings and contaminate the water with botulinal spores



Other sources of intoxication

Decaying carcass in
a water hole



Foto by: I.S. Dutra, Universidade Estadual Paulista, Campus Araçatuba



Other sources of intoxication

Chicken litter:

Used for
supplementation in
the winter



Other sources of intoxication

Poorly fermented
silage:

During a poor
fermentation process
C. botulinum is able to
produce its toxin.



Other sources of intoxication

Harvested maize
fields with decaying
material



Foto by: I.S. Dutra, Universidade Estadual Paulista, Campus Araçatuba



Diagnosis

Clinical signs:

Weak gait



Paralysis of the limbs



Diagnosis

Clinical signs:

Unability to get up



Diagnosis

Clinical signs:

atony of the tail



Unshadowed sensorium



Diagnosis

Clinical signs:

Complete paralysis of
muscles



Diagnosis

Clinical signs:

Tongue
flaccidity

Dysphagia

Decreased
salivation



Foto by: I.S. Dutra, Universidade Estadual Paulista, Campus Araçatuba



Therapy

If available a polyvalent antitoxin is effective in neutralizing unbound toxin in early stages of the disease.

But: antitoxin is very costly and the action of already bound toxin is nonreversible

Mildly affected animals sometimes recover over a period of weeks without therapy

Good nursing is essential for recovery



Research and results

80 samples (soil, carcass material, fodder, feces) were collected

64 on farms with known history of botulism (23 positive, 35%)

16 samples at sites of no known history of botulism (2 positive 12,5%)

25 were positive for the presence of *C. botulinum*, 24 of the CD complex group and 1 of *C. botulinum* type A.

Type C	4
Type D	6
CD complex	14
Type A	1
total	25

In this work *C. botulinum* types C and D were found in 96% of all positive samples



Laboratory diagnosis in Brazil was done by mouse bioassay with neutralization tests.

Vaccine

There are several types of vaccine available on the market which are more or less effective.

The efficacy of three in Brazil available vaccines was tested.
A group of 60 young bulls mainly Nelore and Nelore crossbreds were selected.

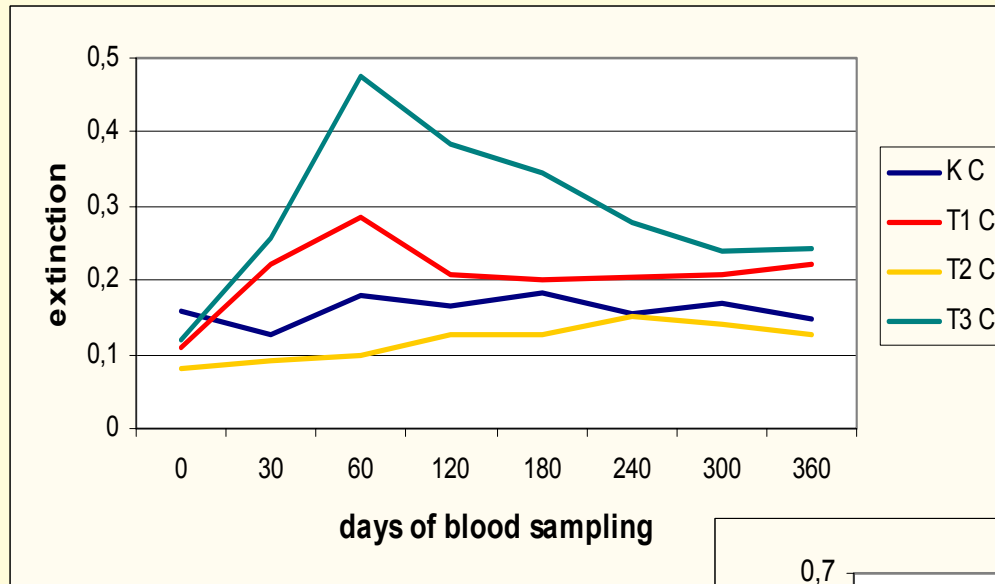
15 animals each were vaccinated with one of the three vaccine types, 15 served as the negative control.

Blood was taken over a period of one year, once a month at the beginning and then every second month.

The immunologic titre was determined by ELISA using the toxin of reference strains of *C. botulinum* types C and D.

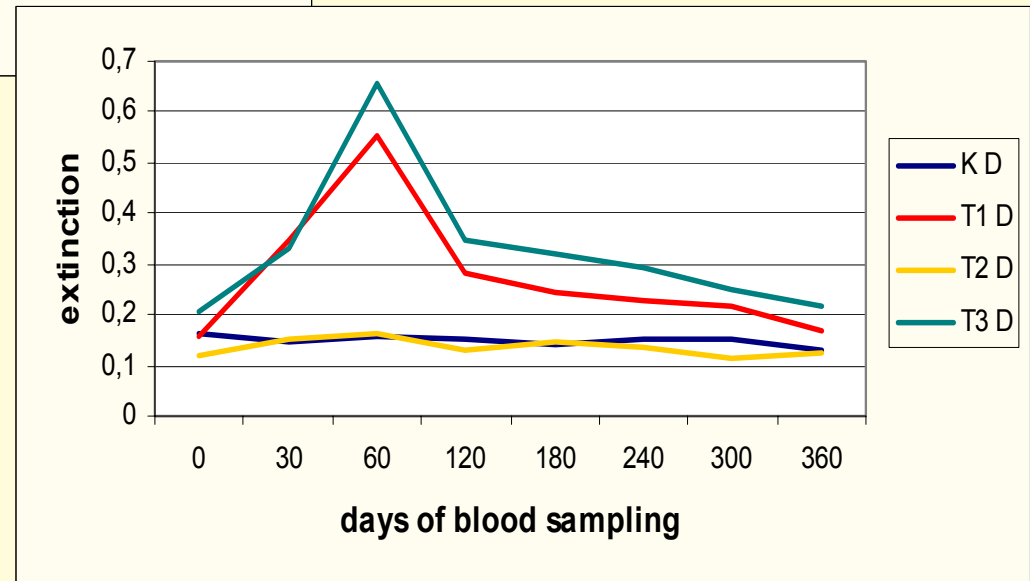


Vaccine



Two of the tested vaccines (T1, T3) produced a good antibody titre

T2 had no measurable response compared to the control group



Conclusions

The types C and D are playing a major role in causing botulism in Brazil.

Not every vaccine against botulism is producing a measurable antibody titre



Prophylaxis

Vaccination: protection against botulism types C and D with an effective vaccine

Pasture management:

- supplementation of phosphorus
- removal of carcasses
- use of different grass species (*panicum spp*)
- proper preparation of silage
- exclude chicken litter as cattle fodder
- avoid overstocking



