

Tetanus in WWI and the Horses Who Saved Lives

Senior Men's Club
Birmingham, MI
February 6, 2026

Donald M. Callihan

Disclaimer

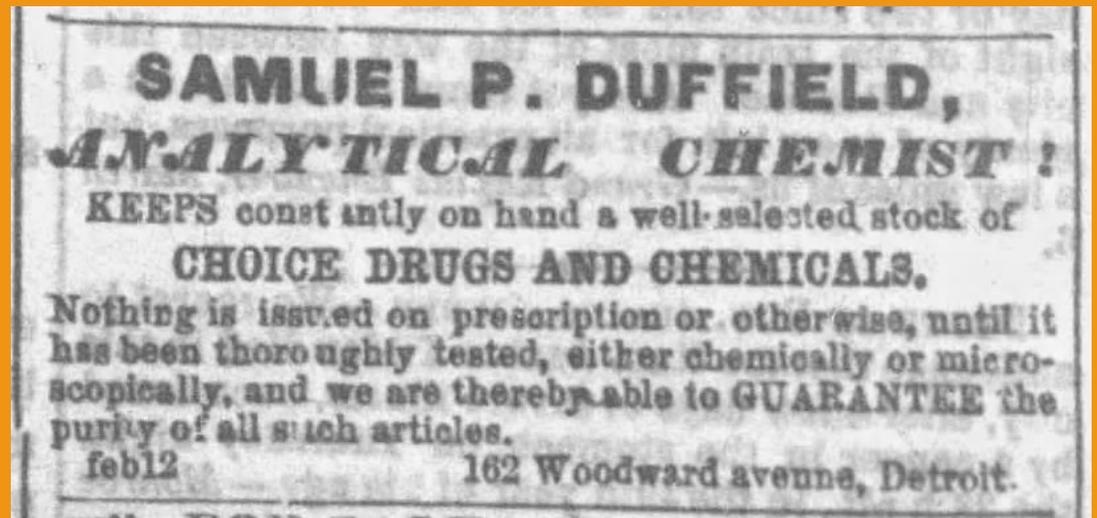
- An engineer with a passion for history
- Not a medical professional
- Not a microbiologist
- Not a pharmaceutical expert

Outline:

- Brief history of Parke-Davis.
- Background Information on Tetanus and its cause.
- How the horses stabled at Parke-Davis in Rochester stopped tetanus from progressing.
- The mitigation of tetanus during WWI
- A World War I Hero
- The tetanus vaccine

Parke, Davis & Co. History

- Small drug store at Woodward & Gratiot owned by Doctor Samuel Duffield

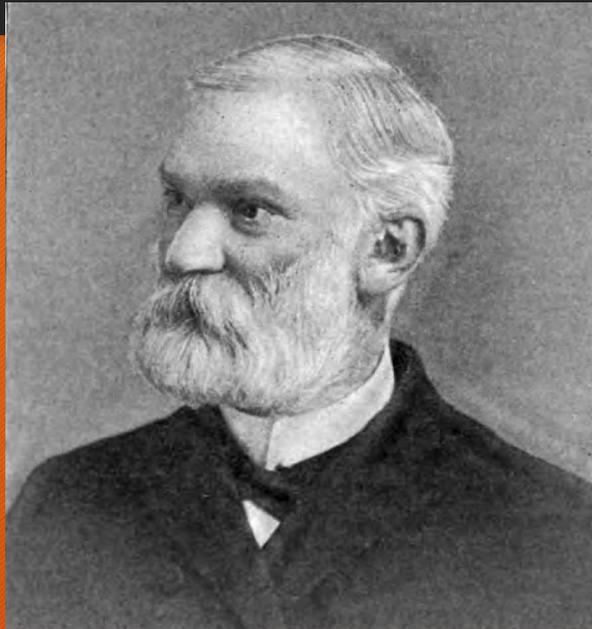


An Early Product

50% finely divided metallic mercury, lanolin, white wax, mercury oleate, and white petrolatum.



Parke and Davis



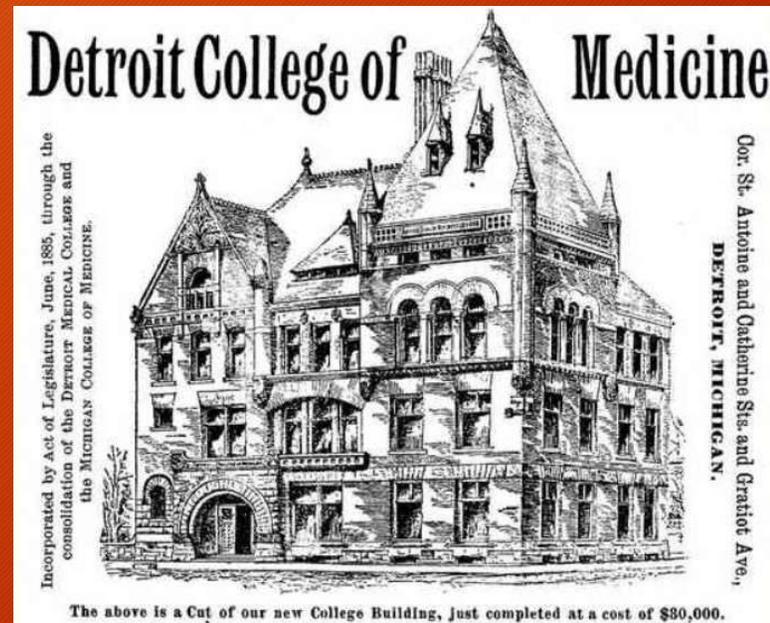
Hervey C. Parke



George S. Davis

Duffield left the business in 1869

A Founder of Detroit
College of Medicine



Parke, Davis & Co.

Parke, Davis & Co.
Nov. 16, 1871

THE PARTNERSHIP HERETOFORE existing between the undersigned, doing business under the name of Parke, Jennings & Co., is this day dissolved by mutual consent. The business of the late firm will be settled by the firm of Parke, Davis & Co., its successors.
Detroit, Nov. 16th, 1871.

**H. C. PARKE,
GEORGE S. DAVIS.**

The undersigned have this day entered into a partnership under the provisions of Chap. 32, of the Compiled Laws of the State of Michigan, relating to limited partnerships, and the Statutes amendatory thereto.

1st. The name of the firm is Parke, Davis & Co.

2d. The business is the manufacture and sale of Detroit, of all preparations, sugar coated pills, &c.

3d. Hervey C. Parke and George S. Davis are general partners, and William H. Stevens and John R. Grout are special partners, and all reside in Detroit, Michigan.

4th. The amount of the capital stock is \$45,000, of which each special partner has contributed and paid in the sum of \$10,000.

5th. The copartnership is to commence at the date hereof, and is intended to continue for the period of five years.

Detroit, Nov. 16th, 1871.

**HERVEY C. PARKE,
GEORGE S. DAVIS,
W. H. STEVENS,
JOHN R. GROUT.**

no22-1aw6t

Quality

Motto:
Medicamenta
Vera

“True Medicine”



First factory

Many biological products

BIOLOGICAL: any substance, as a serum or vaccine, derived from living organisms and used to treat or prevent disease.



Parke-davis & co. 1970s



Began Manufacturing on this Site in 1871

Parkedale Farm

- Initially Purchased 340 Acres of Land in Avon Township outside of Rochester



Parkedale farm - Botanicals

- Digitalis (foxglove) to make heart medications
- Cannabis Americana
 - Fluid Extract
 - Tincture
 - Solid Extract
 - Powdered Extract

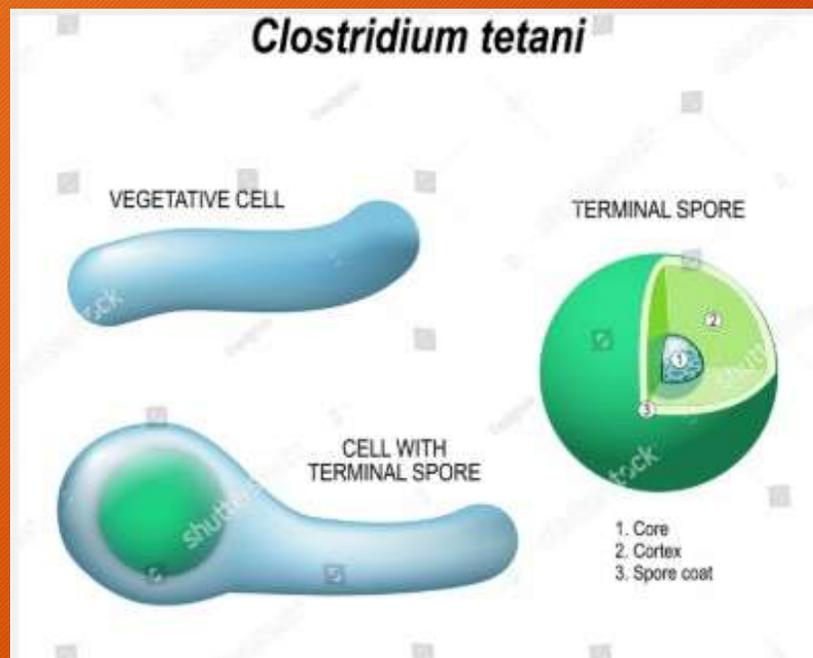
Tetanus

- What Is Tetanus?
- What are its symptoms?
- What early method was used to stop tetanus from progressing?
- What part did Parke-Davis play in this method?
- When was an effective vaccine discovered & developed

Tetanus & The Rusty Nail



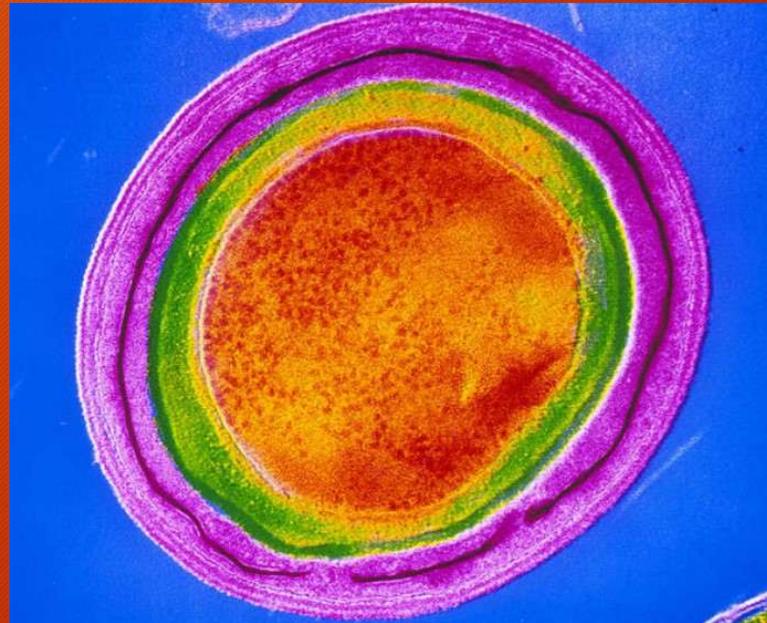
What Is Tetanus?



A serious disease associated with the cells & spores of the bacterium *Clostridium tetani*

Clostridium Tetani Spore

- We can think of spores as seeds
- They can lie dormant almost indefinitely
- In a host organism, spores become a cell that can grow and divide



Clostridium Tetani



Ubiquitous

Toxin Produced By Clostridium Tetani Causes the Disease



Tetanus toxin is a poisonous substance created by a living organism.

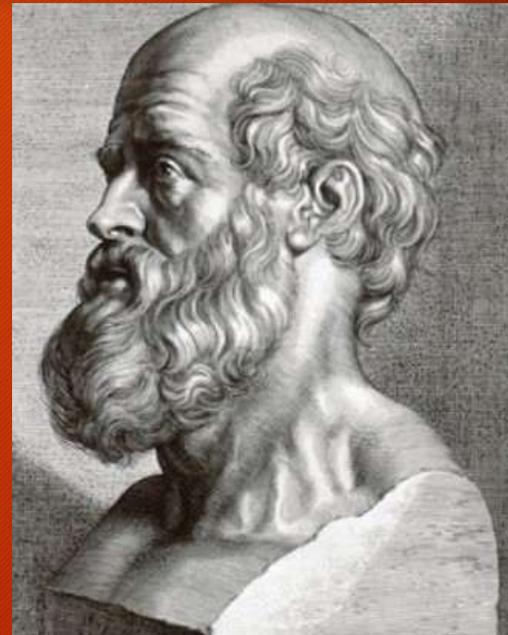
Sterilization Does Not Inactivate Toxins

Cooking does not
inactivate toxins



How Long Has Tetanus Been Around?

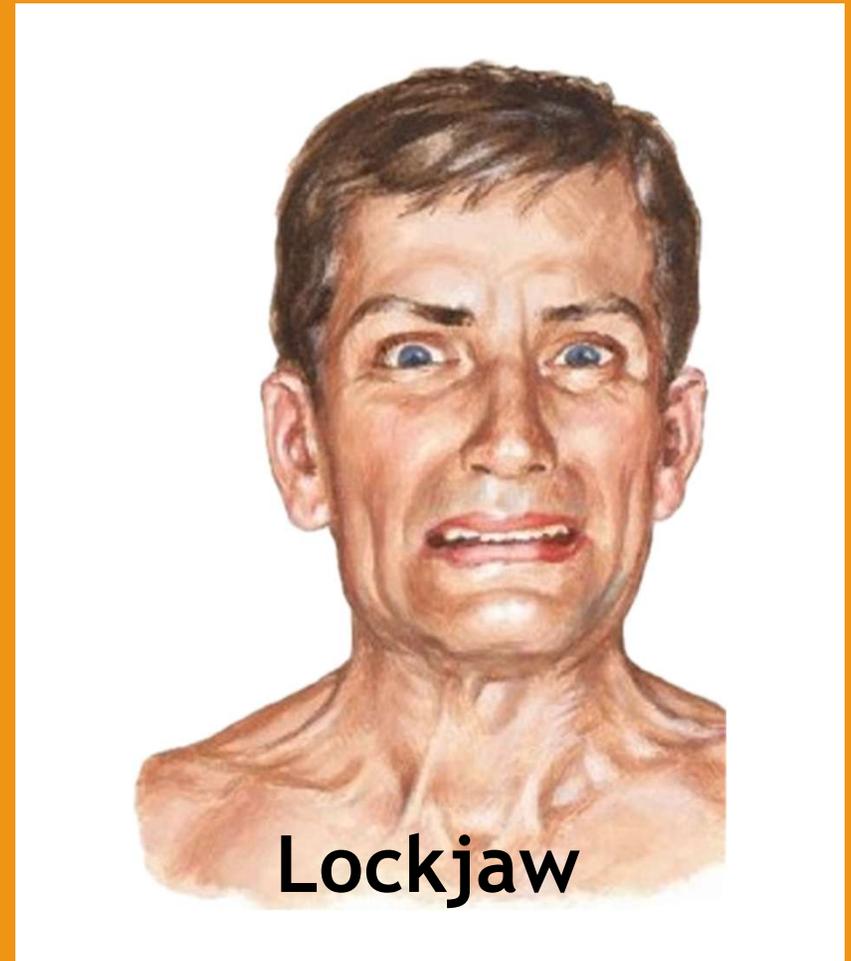
- Probably since man has roamed the earth.
 - Described in the Bible
 - Described by Hippocrates



Hippocrates

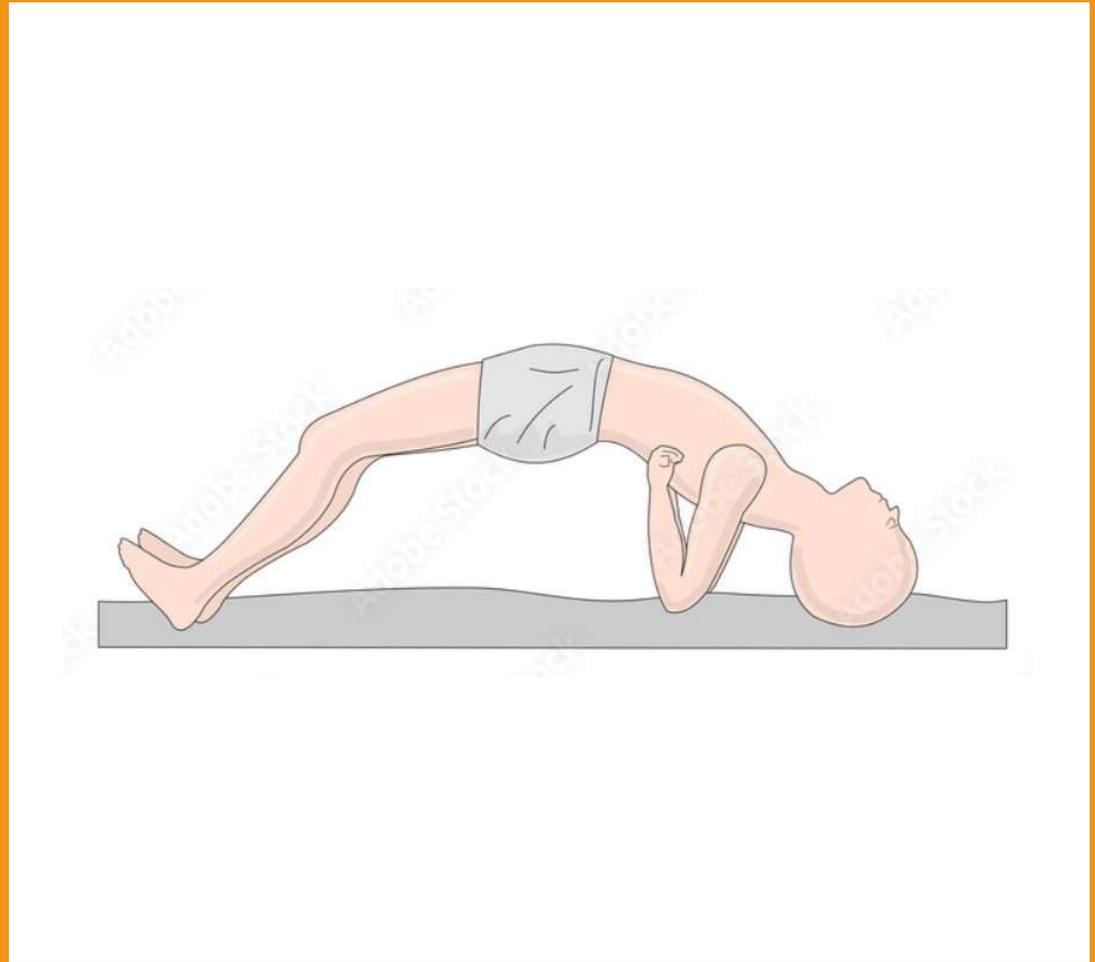
Tetanus Symptoms

- Stiff jaw muscles that become increasingly rigid
- Painful neck muscle spasms and stiffness
- Facial muscle tension



Death From Tetanus

- 1 in 4 People, Worldwide, Who Contract Tetanus Die
- If untreated, 90% of victims die.



Incubation Period

- The time between symptoms and infection is in the range of 7 to 21 days

| Sunday | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday |
|--------|--------|---------|-----------|----------|--------|----------|
| | | | 1 | 2 | 3 | 4 |
| | | | | | | |
| 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| | | | | | | |
| 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| | | | | | | |
| 19 | 20 | 21 | 22 | 23 | 24 | 25 |
| | | | | | | |
| 26 | 27 | 28 | 29 | 30 | 31 | |
| | | | | | | |

A Famous Person Who Died From Tetanus

- John Roebling - Designer of the Brooklyn Bridge
- Died of tetanus on July 22, 1869.

Tetanus Is Not Contagious

- The Toxin Produced By Clostridium Tetani must enter the bloodstream to cause the disease.

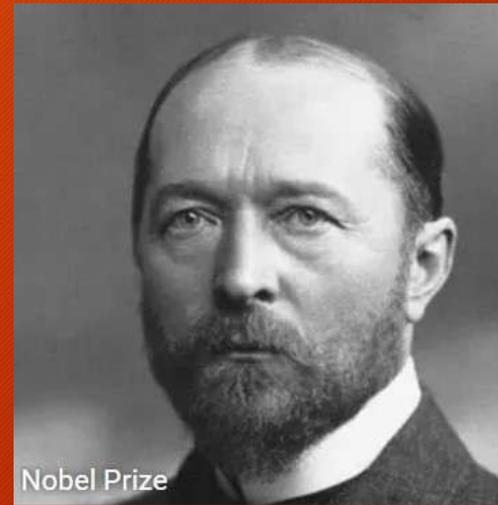


1889 C. Tetani Isolated & Cultivated

**Kitasato
Shibasaburō**



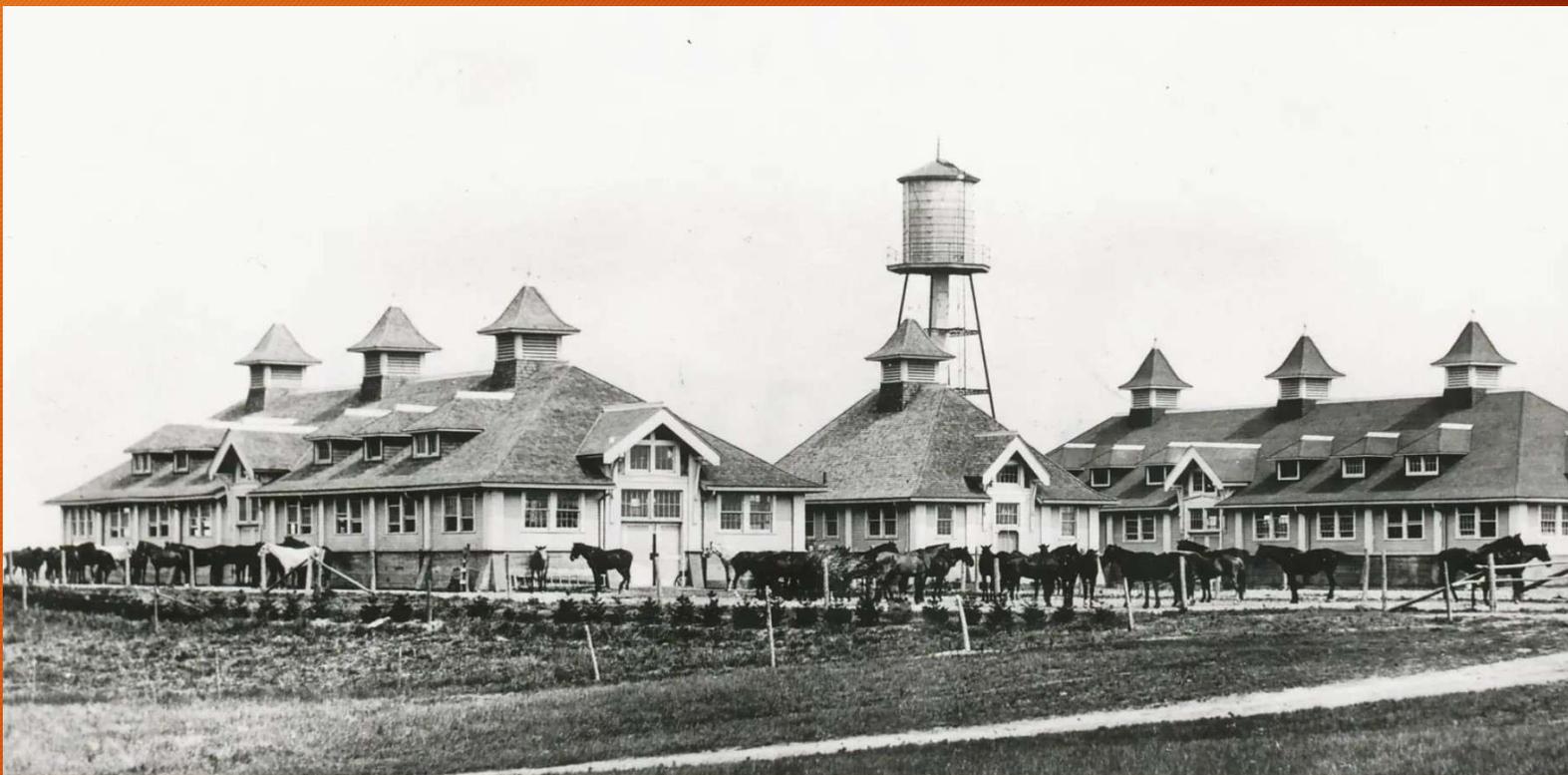
Emil von Behring



Preventing Tetanus

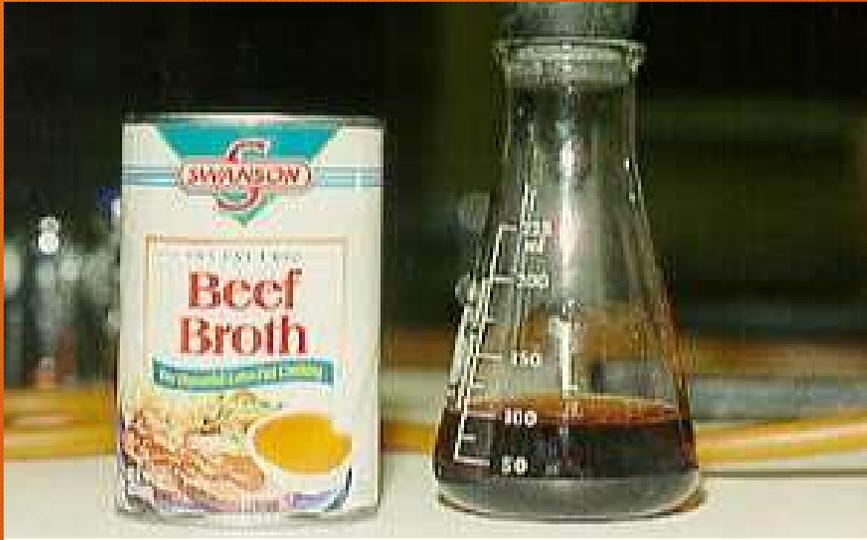
- Tetanus serum containing antitoxin, derived from horses, and administered before the appearance of symptoms prevented the disease from developing.

Making Tetanus Antitoxin Serum at Parkedale Farm



Initially
in
Detroit

Clostridium Tetani Toxin Preparation



- Clostridium Tetani Bacillus are introduced into sterilized flasks of beef broth.
- Incubated

Clostridium Tetani Toxin Preparation

- Incubated fluid was passed through a paper filter and then a sterilizing filter
- The bacteria and solid impurities were removed leaving the toxin, and remnants of the beef broth



Injecting the Horse With Toxin



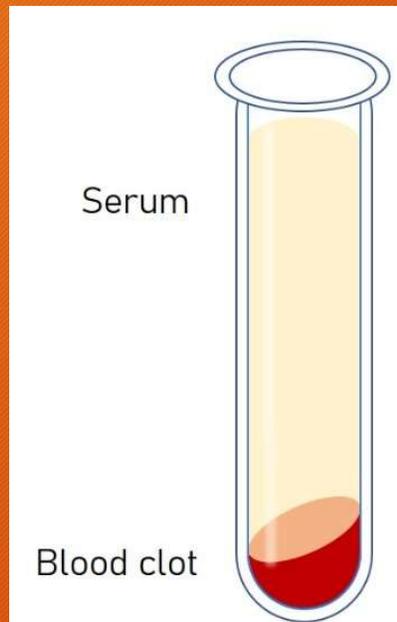
A horse is given small doses of toxin every 8 days until it no longer shows any adverse effects

Bleeding the Horse



Blood is drawn from the jugular vein in the horse's neck

Blood Placed in Test Tubes



When exposed to air, red cells clot and settle to the bottom.

Anti-Tetanic Serum

- Syphoned from Test Tube
- Filtered
- Adjusted for potency
- Filled into Vial



The Great War

World War I and Tetanus

Flanders in Belgium

Men carry a German 15-centimeter high-explosive shell manufactured in 1914 away from the field where a farmer found it.



August 1, 2023

WW I Early Incidence of Tetanus



World War I and Tetanus

Rendering First
Aid in a Trench



WW I Early Incidence of Tetanus

| 15th German Army Corps | British Army |
|------------------------------------|------------------------------------|
| August to October 1914 | October 1914 |
| 63 cases per 1000 wounded soldiers | 32 cases per 1000 wounded soldiers |

American Expeditionary Forces (AEF)

- In the AEF, of 500,000 wounds and injuries, only 23 cases of tetanus were recorded, with no deaths.
- The number of cases tended to further decline as the war went on.

Downside of Horse Serum

- Death & Illness
 - Serum anaphylaxis (acute allergic reaction)
 - Serum sickness - fever, rash, joint pain, and swollen lymph nodes.

A Hero of The Great War

Her name was Tess

Tess - The Horse

- Came to Parkedale in May of 1917
- Produced 1023 Quarts of Tetanus Anti-Toxin or about 100,000 doses



A Bay Mare - Not Tess

Tess Becomes a Mascot



- When she was retired in 1938, the American Legion Homer Wing Post 172 in Rochester adopted her as an official mascot

Tess - The Horse
A WWI Hero

1928 Pontiac
Armistice Day
Parade

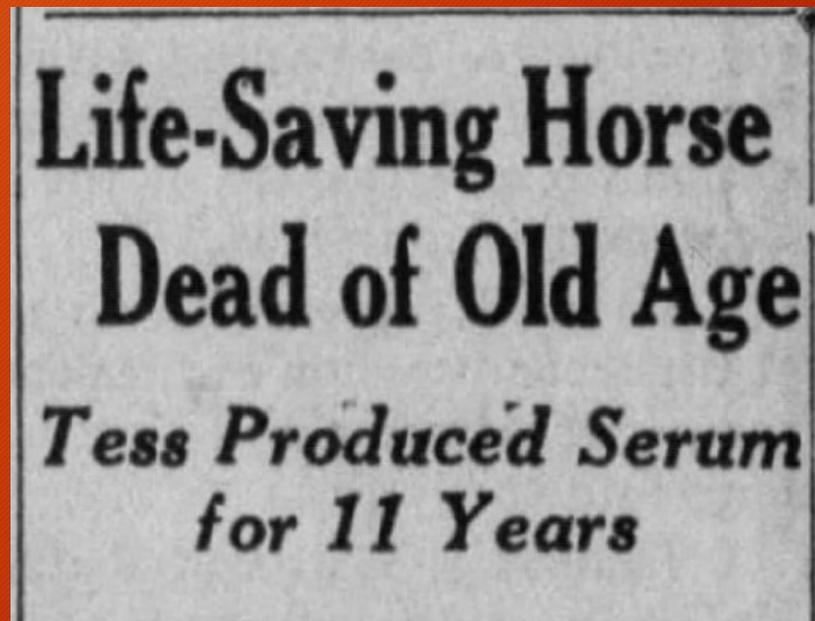


Tess spent her retirement living the dream

- She loafed in the pasture and ate the best oats.
- She had a kind disposition and grew playful in her old age.
- She became the pet of all the employees on the farm

Tess Died in May 1935

- Her obituary appeared on the front page of *The Detroit Free Press*



**Life-Saving Horse
Dead of Old Age**
*Tess Produced Serum
for 11 Years*

Tess Burial

- Tess was buried on the property
- There was once a marker to mark her grave, but it has been lost over the years.



Photo Taken in 1950s

A Vaccine for Tetanus

- In 1924, Pierre Descombey learned that if tetanus toxin was inactivated with formaldehyde, it could be used as a vaccine
- However, it took several weeks for the body to build up significant immunity

A Tetanus Vaccine

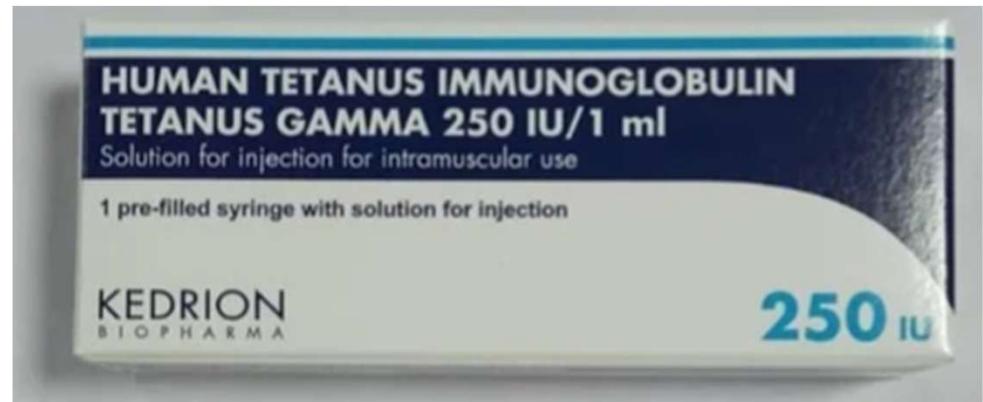
- Not widely used until WWII.
- It was administered to all U.S. soldiers in World War II
- It was then used for the vaccine that was administered to the general public.

Tetanus Antitoxin vs Tetanus Vaccine

- The use of antitoxin gives protection for 1 to 3 weeks only and is administered after an injury.
- Tetanus vaccine gives long time immunity and is cheaper and practically free from reactions.
- A booster is recommended every ten years.

Tetanus immunoglobulin replaced horse serum

- Tetanus immunoglobulin (TIG) is made from human plasma that contains antibodies to tetanus.



Incidence of Tetanus in the United States

- About 30 cases of tetanus are reported in the U.S. each year.
- Between 2013 and 2022, there were 13 deaths from tetanus in the United States.

Thanks to pharmaceutical companies like Parke-Davis and horses like Tess. Tetanus has almost been eradicated in the United States

Success!

Thank You for Your Attention

Questions?

Making Horse Serum - The Process



Parke-Davis Tetanus Serum Production

- This biologics pioneer was the first laboratory to be granted a licence for TAS production [13]. Over 600 horses were bred and immunized in order to fulfil the demand [14]. The horses were immunized with increasing doses of virulent *C. tetani* culture bouillon every 8 days “until no reaction to the culture is manifested and the blood shows the highest number of immunity units obtainable from that individual animal” [15].

Research Laboratory

The first industrial laboratory devoted exclusively to pharmacological research was built by Parke-Davis in 1902



Tetanus Antitoxin Serum (ATS)

Making Tetanus Toxoid Used for Vaccine

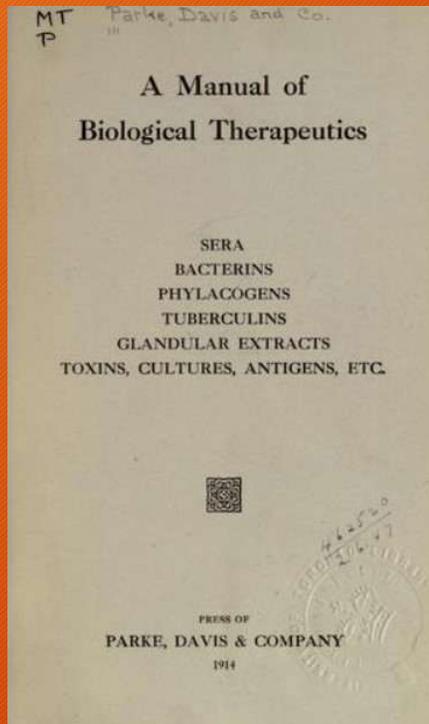
- Tetanus toxoid is made by growing *Clostridium tetani* bacteria in liquid media, purifying the toxin, and treating it with formaldehyde to inactivate it. The resulting toxoid is then combined with aluminum or calcium salts and injected intramuscularly.

Clostridium Tetani



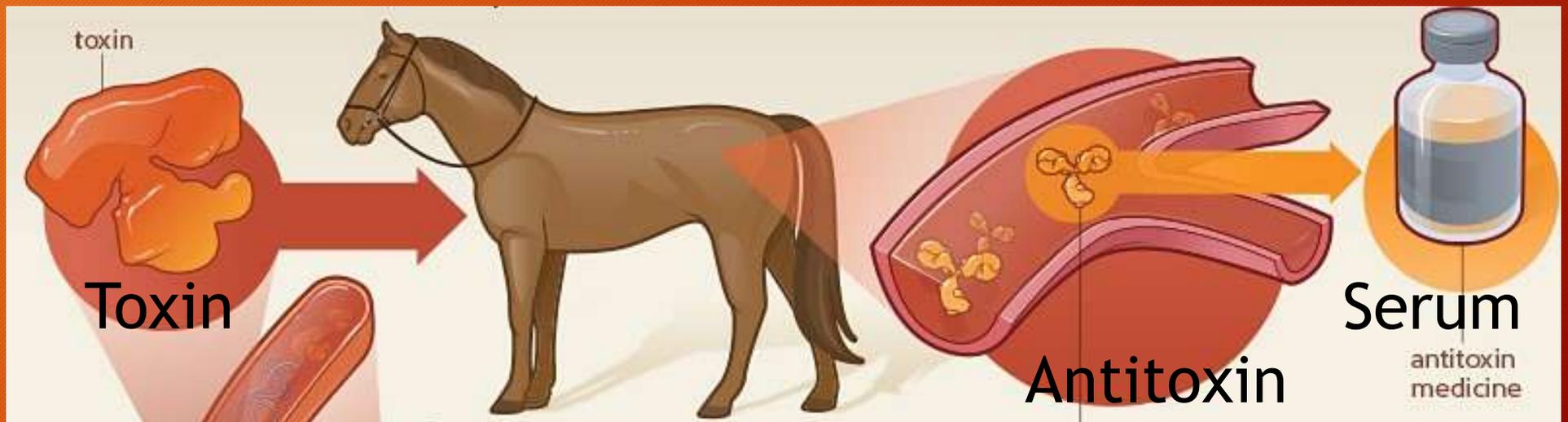
The spores are found everywhere in the environment, particularly in soil, ash, and feces of animals.

Tetanus Anti-Toxin - The Parke-Davis Manual

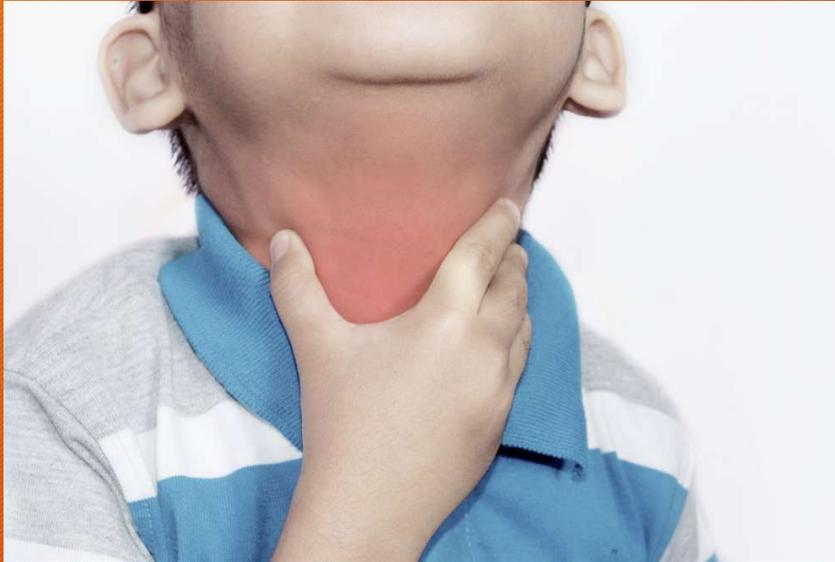


- “Some clinicians deny that its results are curative, although there is abundant evidence that its timely administration does prevent tetanus”

Making Horse Serum - Early 1900s



Diphtheria and Horse Serum



- The infection works in a horrifying way, simultaneously poisoning the victim and slowly suffocating him or her as the bacteria grow into a thick film in the throat.

Making Horse Serum

What was the process for making
Tetanus Anti-toxin?

Parke, Davis & Co.

- Small drug store at Woodward & Gratiot owned by Samuel Duffield
- Pharmacists formulated medicines on site
- In 1862, Duffield began making some items ahead of time and putting them on the shelf.