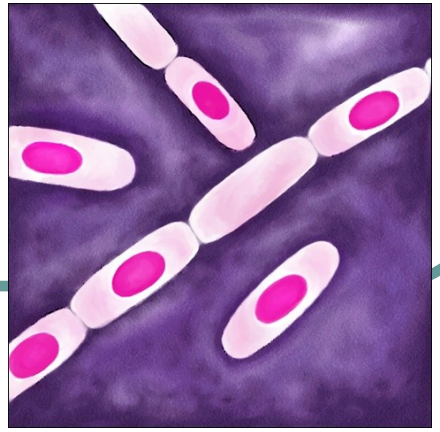
11. Bastones *Firmicutes* Esporulados

- *Bacillus*
- *Paenibacillus*
- *Clostridium*



Bacillus

Dominio: *Bacteria*

Phylum: *Firmicutes*

Clase: *Bacilli*

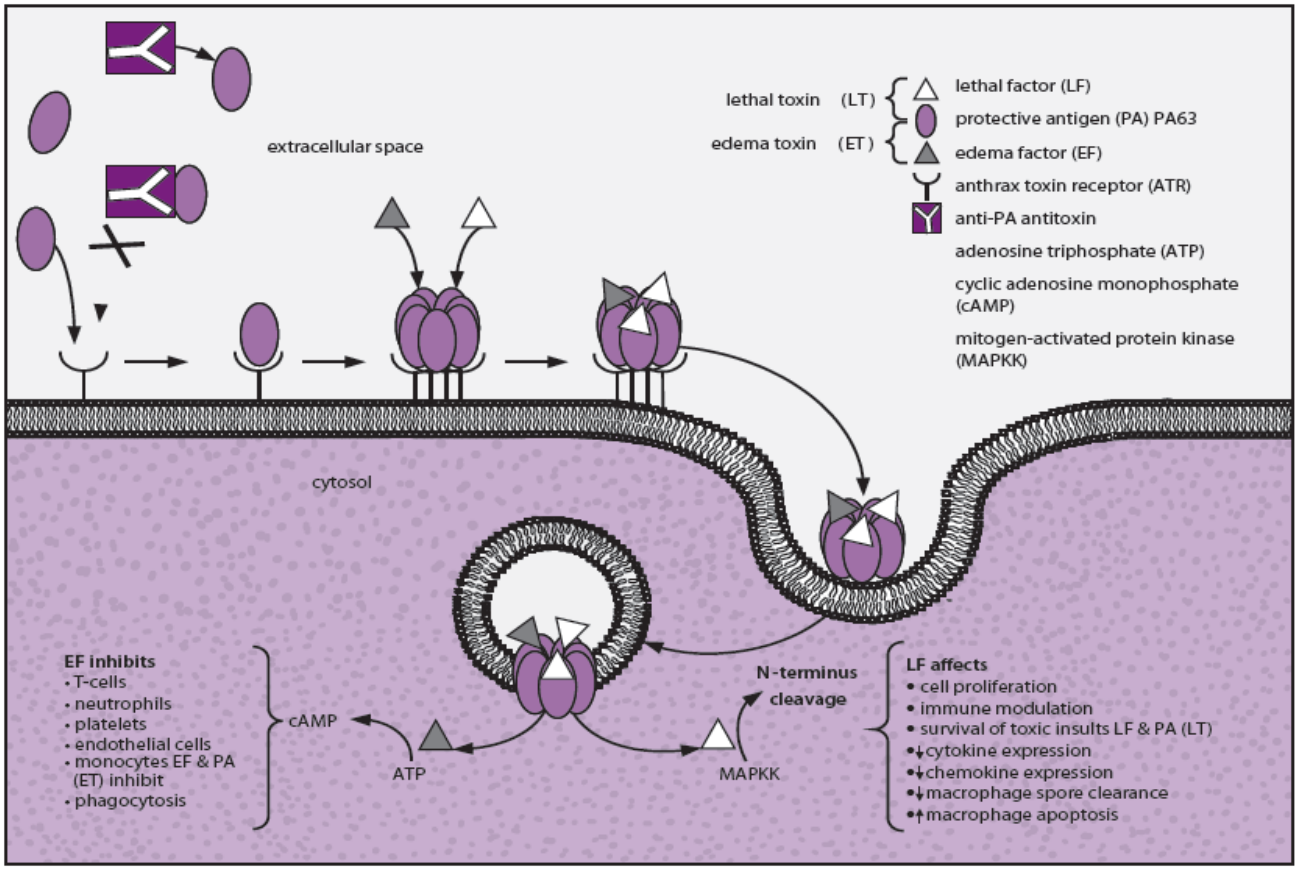
Orden: *Bacillales*

Familia: *Bacillaceae*

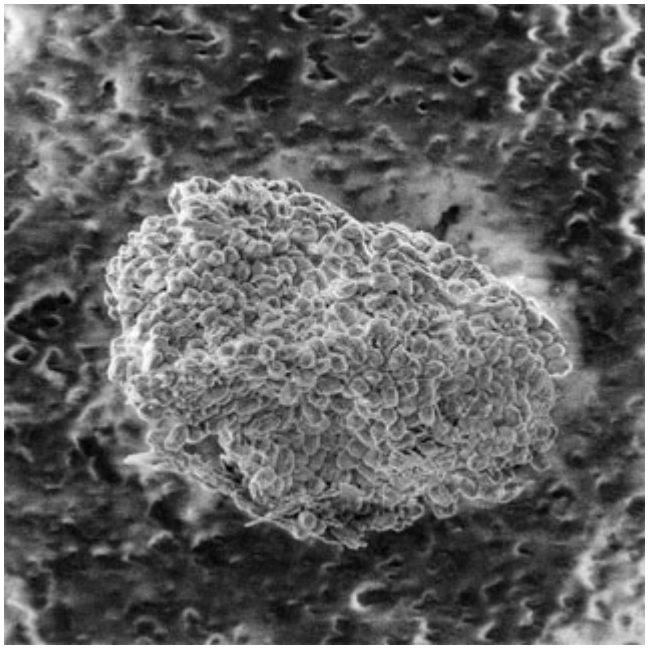
Genero: *Bacillus*

Fig. 3. *Bacillus anthracis* colonies in semi-selective agar (TSPB). It can notice the typical aspect with indented margins.

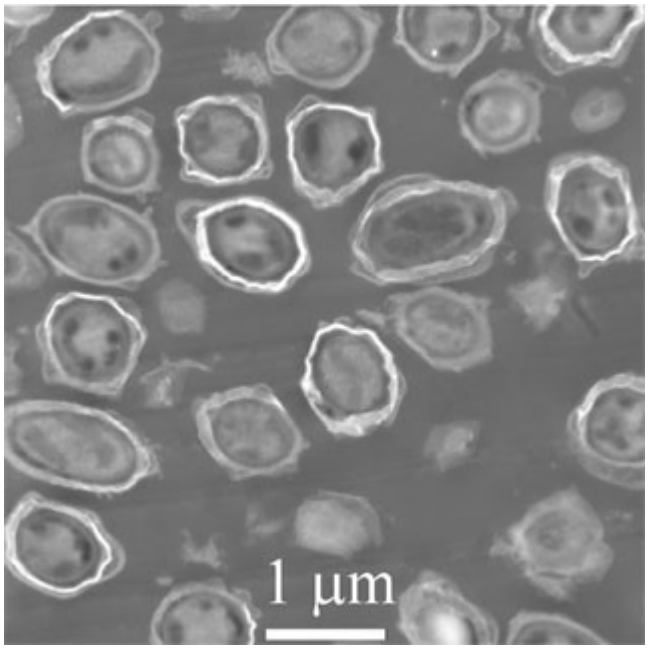
Toxina de *B. anthracis*



Esporas de *B. anthracis*
(Scientific American Septiembre 19, 2008)



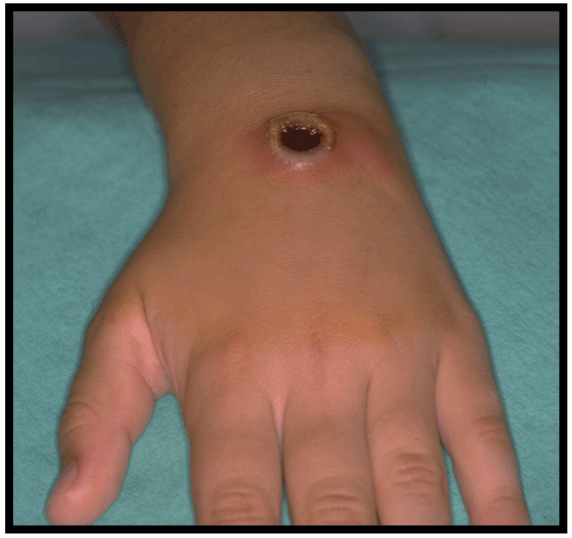
SPORE: An image of a spore of *Bacillus anthracis*, the bacterium that causes the disease anthrax, as viewed via scanning electron microscopy (SEM).



INVASION: Michael and his team studied *Bacillus anthracis* spores using a scanning transmission electron microscope (STEM) to determine that silica particles grew within the spores organically rather than being placed there in an attempt to "weaponize" the anthrax.

B. anthracis: Infección en el humano

- La infección en el hombre se manifiesta dependiendo de la vía de entrada; las más comunes son por inhalación (usualmente letal) o cutánea (pústula maligna); puede presentarse una forma intestinal por ingestión de algún alimento contaminado.



anthracis = carbón

B. anthracis: Inmunización

Veterinary Microbiology 140 (2010) 318–331

Contents lists available at ScienceDirect

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journal homepage: www.elsevier.com/locate/vetmic

Review

Anthrax undervalued zoonosis

Antonio Fasanella [a,*], Domenico Galante [a], Giuliano Garofolo [a], Martin Hugh Jones [b]

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Bacillus anthracis
Animal
Disease
Zoonosis

ABSTRACT

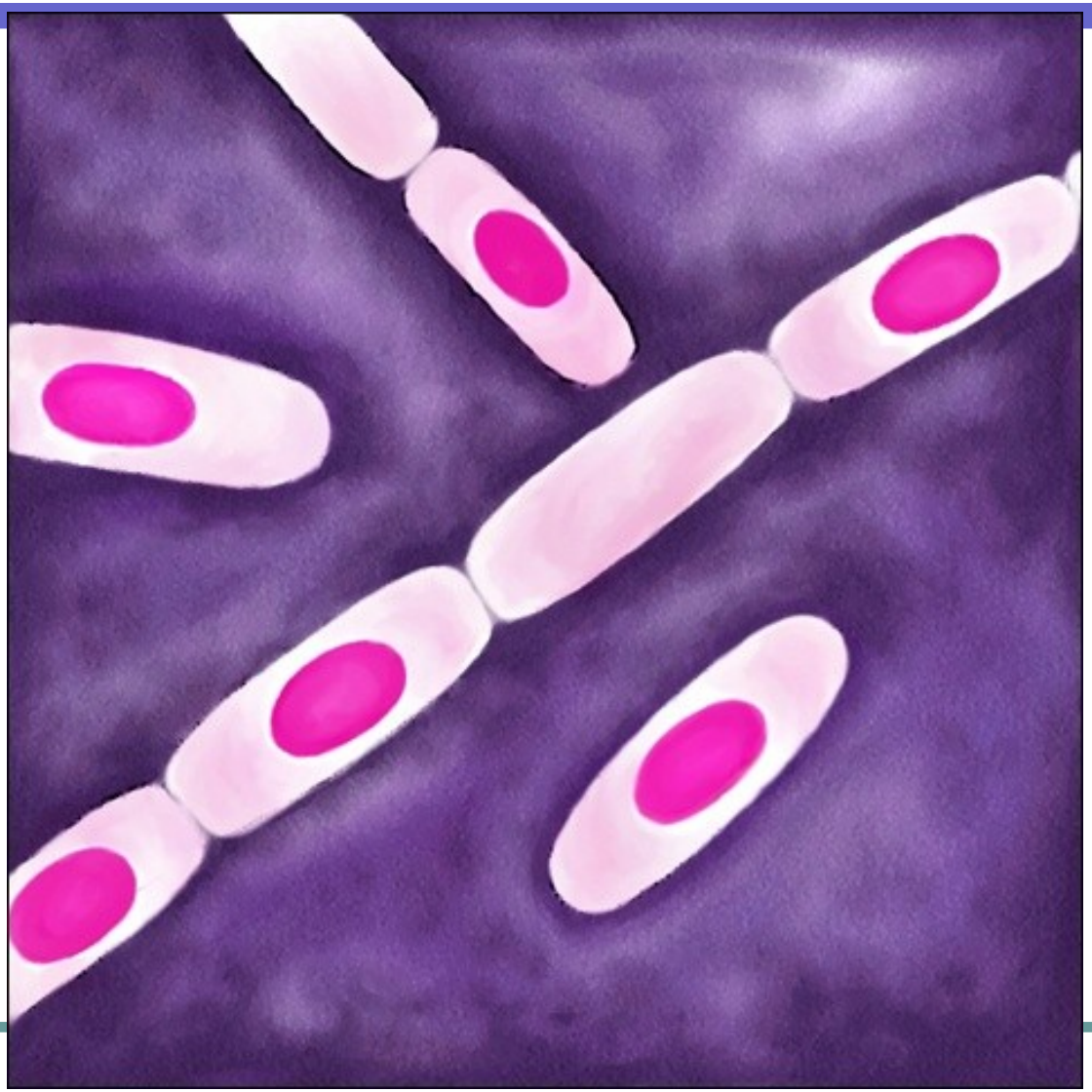
Anthrax is a non-contagious disease, known since ancient times. However, it became a matter of global public interest after the bioterrorist attacks in the U.S.A. during the autumn of 2001. The concern of politicians and civil authorities everywhere towards this emergency necessitated a significant research effort and the prevention of new bioterrorist acts. Anthrax is primarily a disease that affects livestock and wildlife; its distribution is worldwide; and it can represent a danger to humans but especially more so when it occurs in areas considered to be free and in atypical seasons and climatic conditions. The atypicality of the phenomenon may lead health workers to misdiagnose and, consequently, an inappropriately manage of affected carcasses with a consequent and inevitable increase in the risk of human infection. This article emphasises the importance of paying increasing attention to this zoonosis. The biggest risk is its underestimation.

B. cereus y Antrax

Anthrax cousin wreaks havoc in the rainforest. *Bacillus cereus*, a microbe widely seen as benign, is a mass killer of mammals

SCIENCE

4 AUGUST 2017 • VOL 357 ISSUE 6350



Paenibacillus

Dominio: *Bacteria*

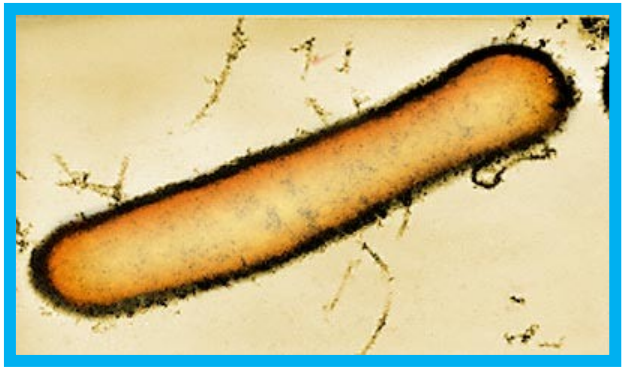
Phylum: *Firmicutes*

Clase: *Bacilli*

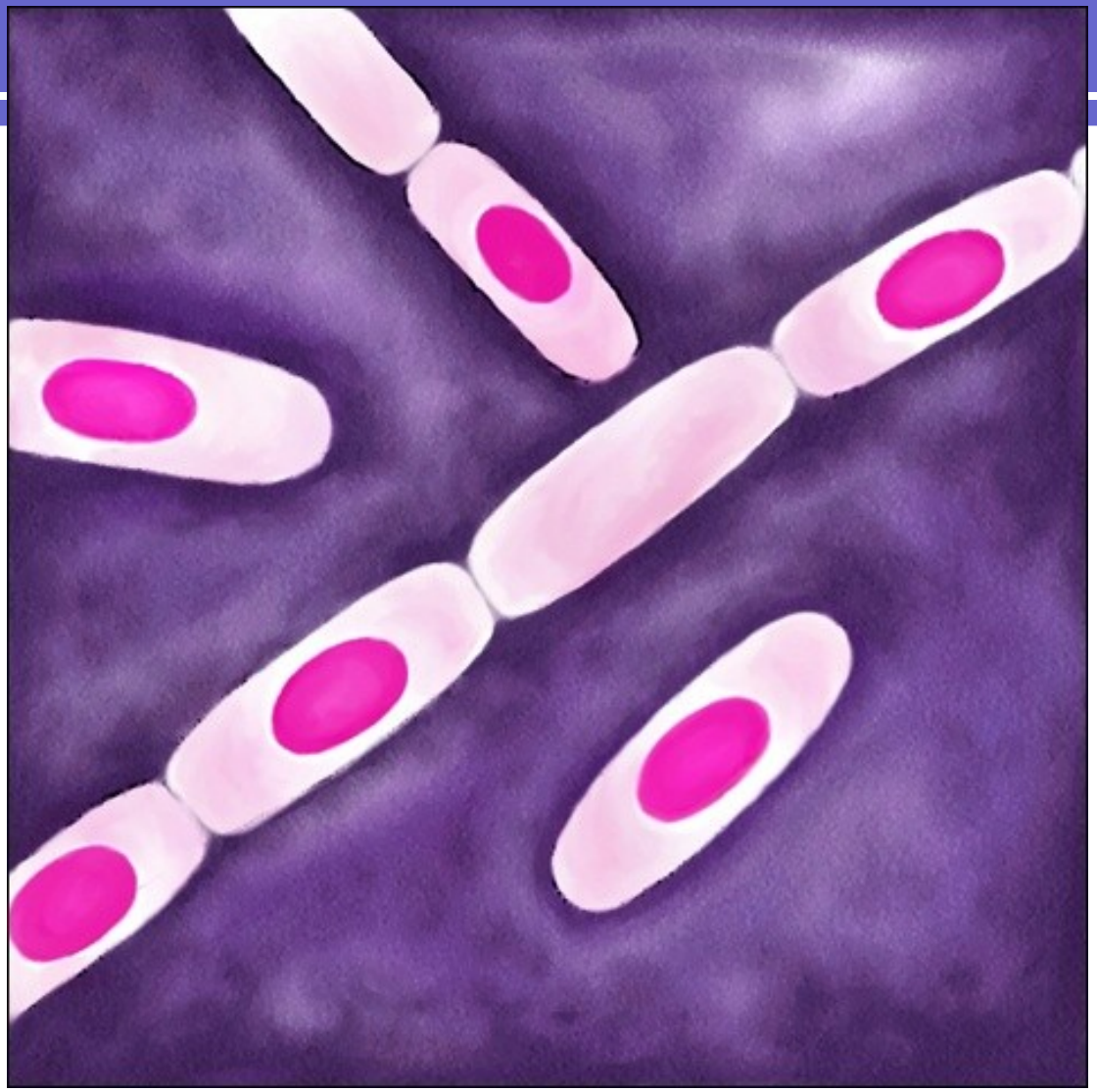
Orden: *Bacillales*

Familia: *Paenibacillaceae*

Genero: *Paenibacillus*



	B. anthracis	***B. cereus***	***P. larvae***
Motilidad	-	+	+
Hemolisis β	-	+	-
Penicilina	Sensible	Resistente	?
7% NaCl	+	-	-
VP	+	+	-
Inoculación en animales	Muerte en 24-48 h	Sin efecto	NA



Clostridium

Dominio: *Bacteria*

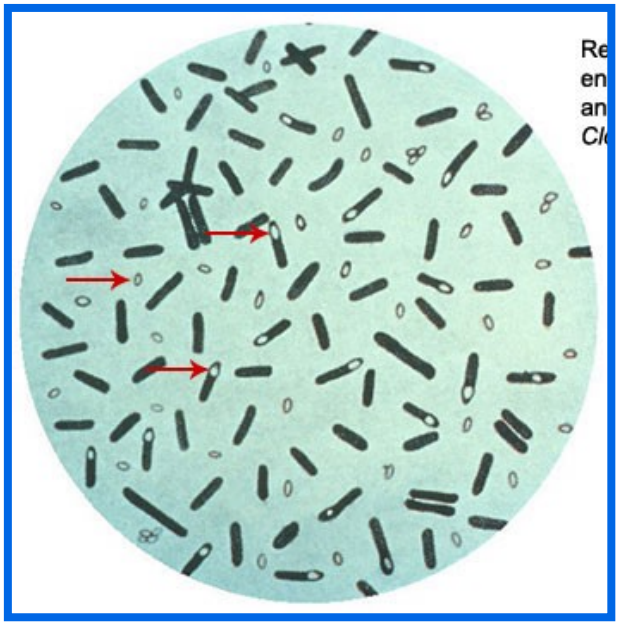
Phylum: *Firmicutes*

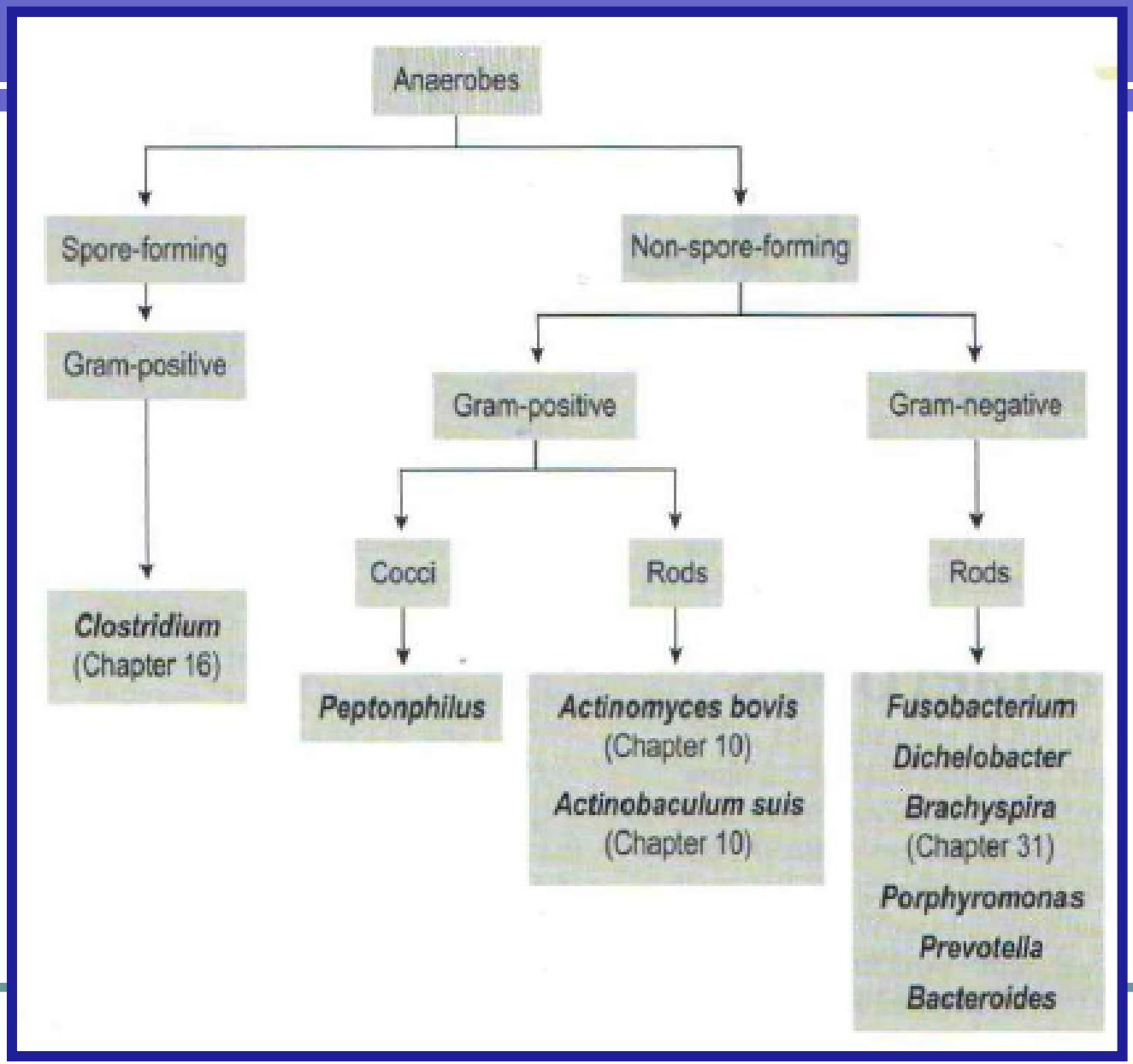
Clase: *Clostridia*

Orden: *Clostridiales*

Familia*: Clostridiaceae*

Género: *Clostridium*

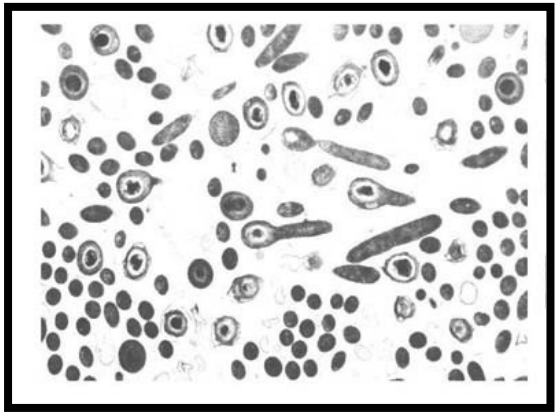



Anaerobes
Spore-forming
Non-spore-forming
Gram-positive
Gram-positive
Gram-negative
Cocci
Rods
Rods
Clostridium
(Chapter 16)
Peptonphilus
Actinomyces bovis
(Chapter 10)
Actinobaculum suis
(Chapter 10)
Fusobacterium
Dichelobacter
Brachyspira
(Chapter 31)
Porphyromonas
Prevotella
Bacteroides

/media/juan/ADATA UFD/Gram positivos 2019/Tareas Bacter 2019-2/Clostridium tetani, equipo 7 gpo 2401.pdf

C. tetani: Tetanos

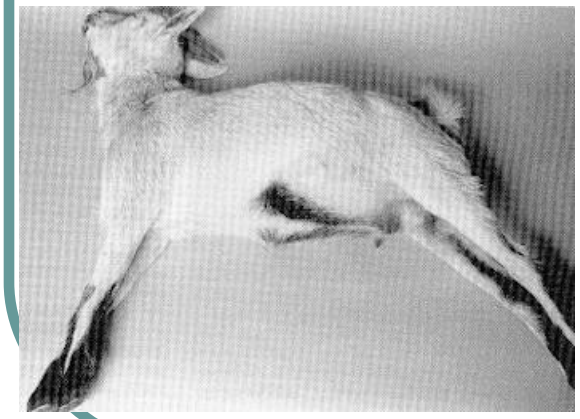
- *In vitro* exhibe un crecimiento expandido (“swarming”) y hemolítico (tetanolisina).
- Se reconocen hasta 10 serotipos (Ags flagelares); todos producen el mismo tipo antigénico de tetanoespasmina
- El equino (por las heridas en el casco) y el hombre son las especies más susceptibles; después le siguen los rumiantes y el cerdo; los carnívoros son comparativamente resistentes, y las aves no son susceptibles

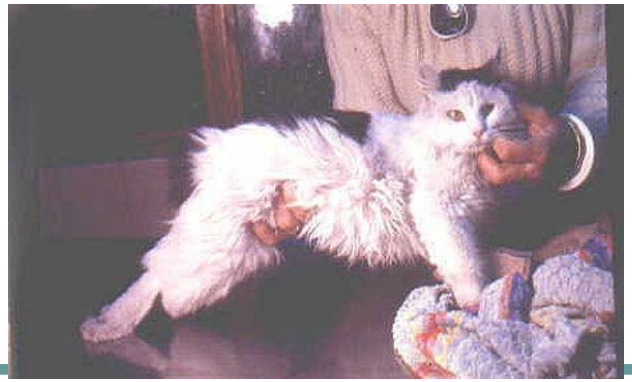


Bacilos en forma de “raqueta” o “baquetas de tambor”

C. tetani: Tétanos

- Las esporas usualmente germinan en heridas mal atendidas y con algún grado de necrosis.
- Algunas prácticas de manejo como descole, descorne, castración pueden dar lugar a la enfermedad. Otra posibilidad es la infección del cordón umbilical.
- La característica clínica es la contracción espasmódica de los músculos estriados. La muerte puede sobrevenir por el involucramiento de los músculos asociados con la respiración.





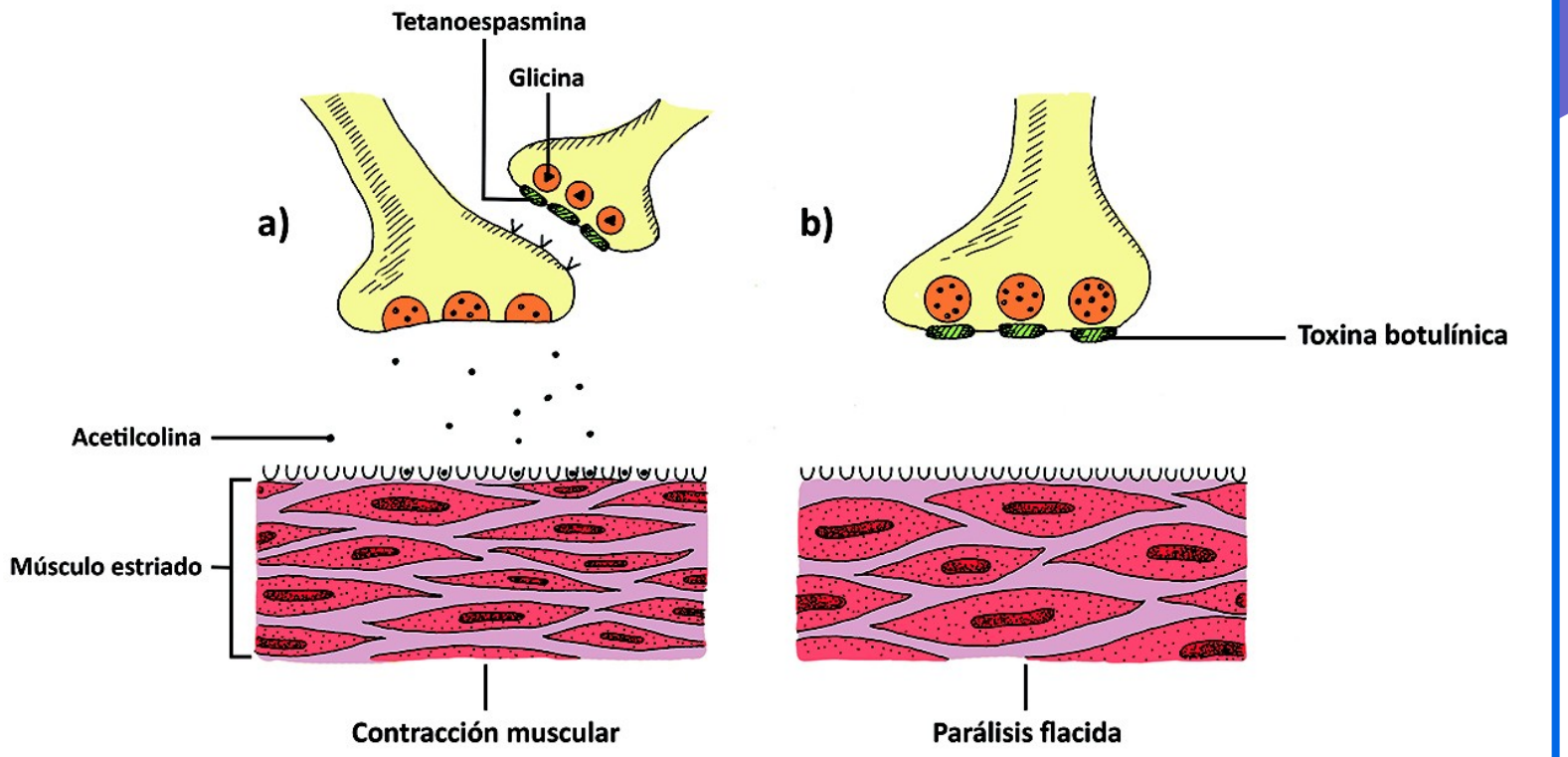
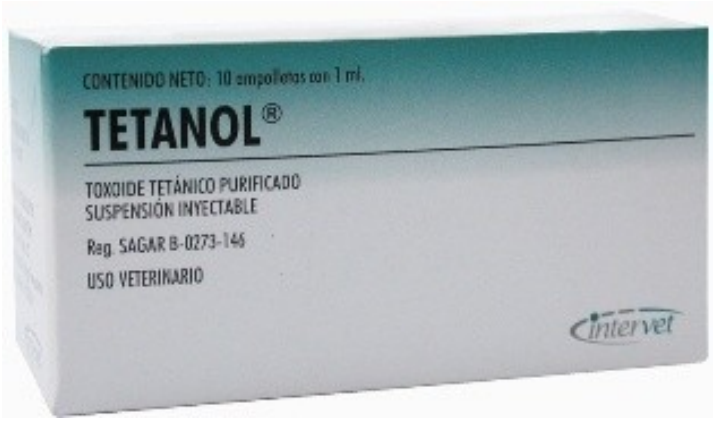


Figura 11.1. Mecanismo de acción de las neurotoxinas de *Clostridium*: a) Tetanoespasmina de *C. tetani*: La toxina impide la liberación de glicina que a su vez deja de inhibir la liberación del neurotransmisor acetilcolina por parte de la membrana motora; lo anterior resulta en contracción persistente de los músculos estriados. b) Toxina botulínica: La toxina impide la liberación de acetilcolina por parte de la neurona motora lo que resulta en una parálisis flácida del músculo estriado.

C. tetani: Inmunización

- Inmunización terapeútica: Se utiliza antitoxina (equina) o inmunoglobulina (humana); se puede acompañar con la administración de penicilina.
- Inmunización preventiva: Toxoide tetánico.



/media/juan/ADATA UFD/Gram positivos 2019/Tareas Bacter 2019-2/c. Botulinum.pdf

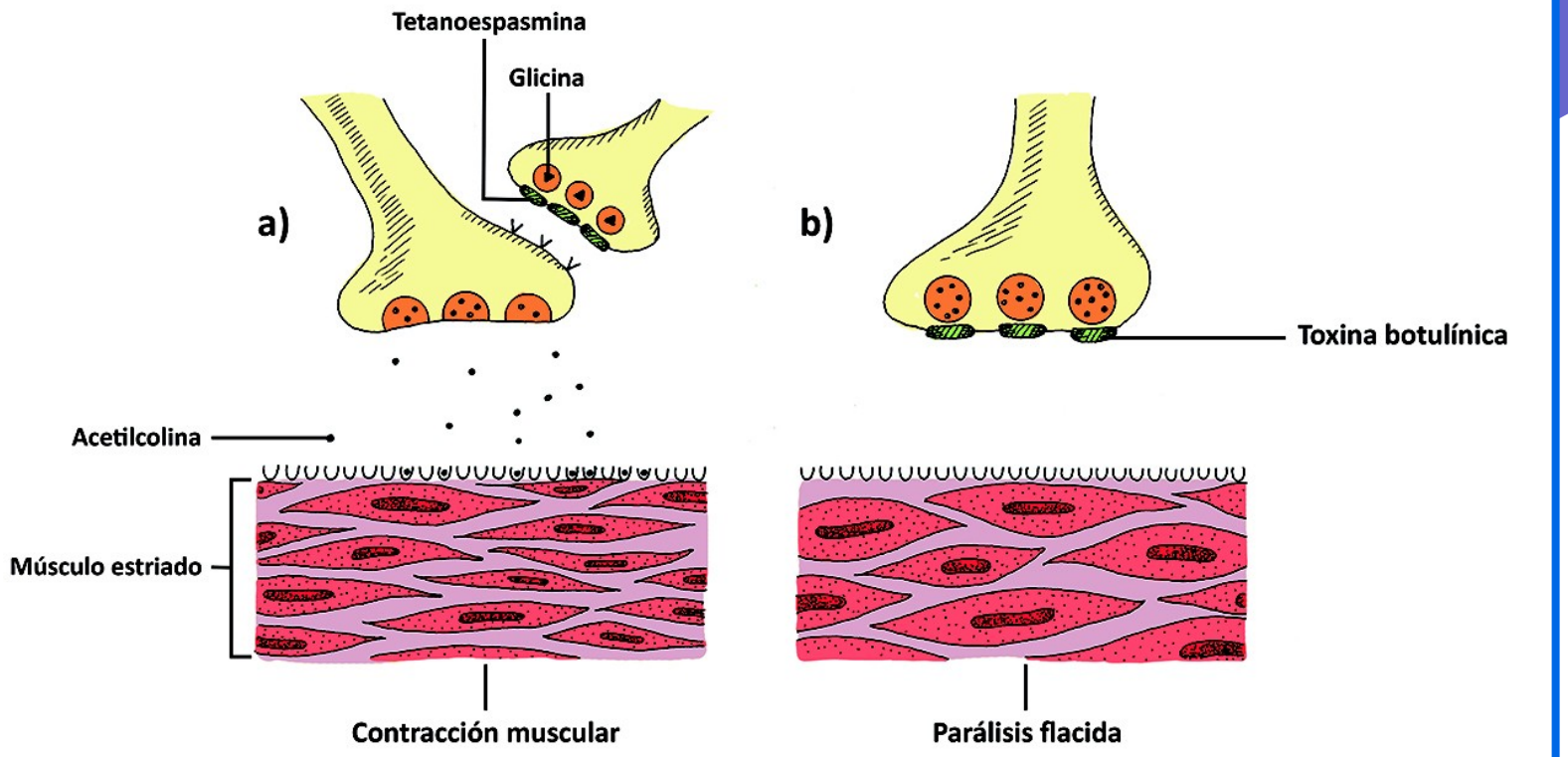
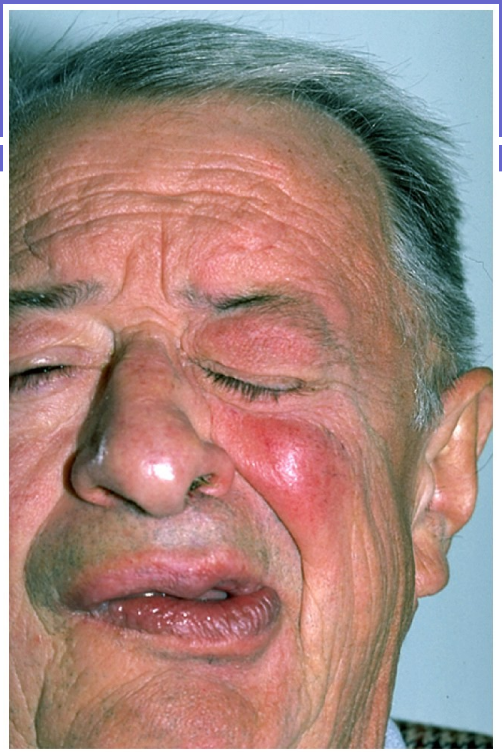
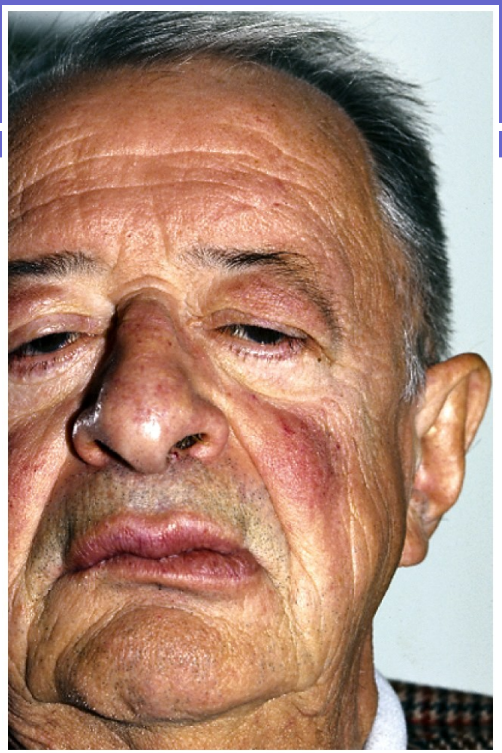


Figura 11.1. Mecanismo de acción de las neurotoxinas de *Clostridium*: a) Tetanoespasmina de *C. tetani*: La toxina impide la liberación de glicina que a su vez deja de inhibir la liberación del neurotransmisor acetilcolina por parte de la membrana motora; lo anterior resulta en contracción persistente de los músculos estriados. b) Toxina botulínica: La toxina impide la liberación de acetilcolina por parte de la neurona motora lo que resulta en una parálisis flácida del músculo estriado.



Unnumbered 14 p412a Microbiology, 7/e
Courtesy Albert W. Biglan, M.D., University of Pittsburgh School of Medicine



Unnumbered 14 p412b Microbiology, 7/e
Courtesy Albert W. Biglan, M.D., University of Pittsburgh School of Medicine

Botulism in a cow associated with the spreading of poultry manure – one of a number of disease incidents discussed in the VLA's surveillance report for July (pp 283-286)


CUIDADO:
BACTERIAS
TRABAJANDO

Inmunofluorescencia

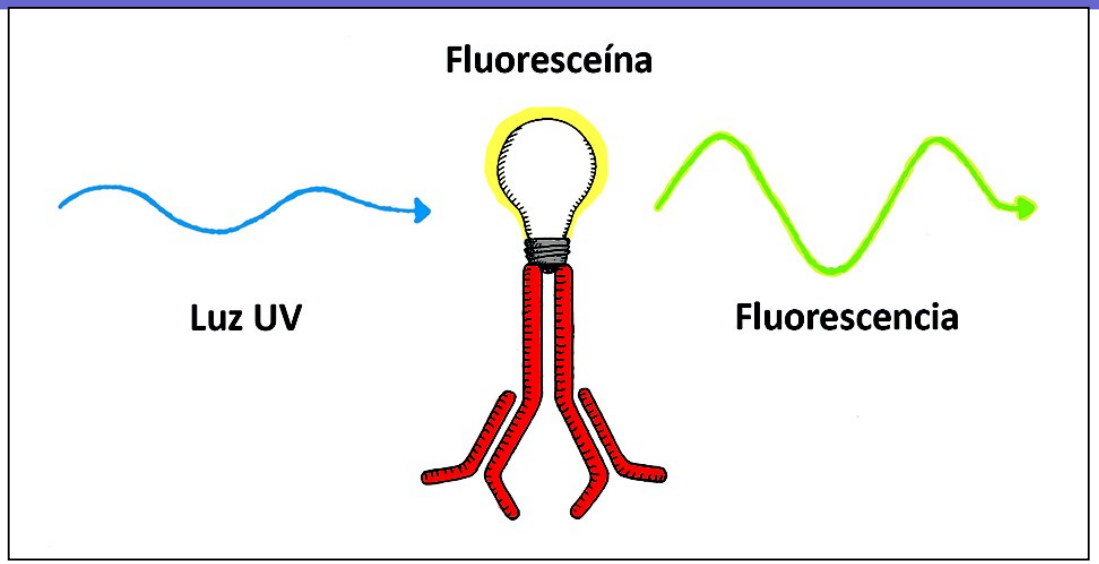


Figure 16.3 Direct fluorescent antibody technique showing *C. chauvoei* in muscle tissue from a case of blackleg in a heifer. (×400)

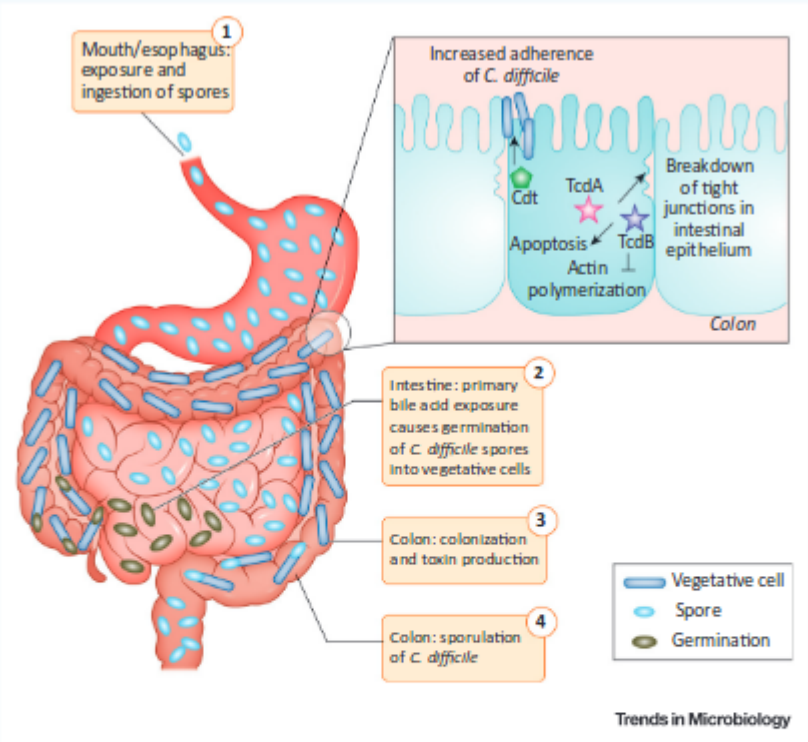

CUIDADO:
BACTERIAS
TRABAJANDO

C. perfringens

Tipo	α	β	ε	ι	Enterotoxina
A	+	-	-	-	+
B	+	+	+	-	+
C	+	+	-	-	+
D	+	-	+	-	+
E	+	-	-	+	+

C. difficile

- Se le ha asociado con cuadros diarreicos en lechones y en terneros; y enterocolitis en caballos.
- En humanos se asocia con tratamientos antibacterianos que transtornan la flora normal.
- Produce dos tipos de toxinas: Toxina A (enterotoxina) y Toxina B (citotoxina y enterotoxina).



Clostridioides difficile is a spore-forming, anaerobic, intestinal pathogen that causes severe diarrhea that can lead to death. In 2011, *C. difficile* infected ~500 000 people in the USA and killed ~29 000 people. *C. difficile* infection (CDI) is the most common healthcare-related infection in the USA, leading to increased healthcare costs of $4.8 billion. This pathogen transmits via the oral–fecal route as a highly contagious and resilient spore. Upon exposure to primary bile acids in the intestine, *C. difficile* germinates, and in the absence of colonization resistance from the normal microbiota, the bacterium colonizes the colon and produces toxins. These toxins inhibit actin polymerization in host cells, leading to cell death. *C. difficile* cells can then sporulate in the intestine and exit the body via diarrheal shedding. In culture, sporulation is induced at stationary phase in a nutrient-limiting environment, but the intestinal triggers of sporulation are still unknown.

Veterinary Microbiology 167 (2013) 42–49

Contents lists available at SciVerse ScienceDirect

Veterinary Microbiology

journal homepage: www.elsevier.com/locate/vetmic

Clostridium difficile infection in horses: A review

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Clostridium difficile
Horse
Review

ABSTRACT

Clostridium difficile is considered one of the most important causes of diarrhea and enterocolitis in horses. Foals and adult horses are equally susceptible to the infection. The highly resistant spore of *C. difficile* is the infectious unit of transmission, which occurs primarily via the fecal-oral route, with sources of infection including equine feces, contaminated soil, animal hospitals, and feces of other animals. Two major risk factors for the development of *C. difficile* associated disease (CDAD) in adult horses are hospitalization and antimicrobial treatment, although sporadically, cases of CDAD can occur in horses that have not received antimicrobials or been hospitalized. The most common antibiotics associated with CDAD in horses are erythromycin, trimethoprim/sulfonamides, β-lactam antimicrobials, clindamycin, rifampicin, and gentamicin. Clinical signs and intestinal lesions of CDAD infection are not specific and they cannot be used to distinguish infections by *C. difficile* from infections by other agents, such as *Clostridium perfringens* or *Salmonella* sp. The distribution of lesions throughout the intestinal tract seems to be age-dependent. Small intestine is invariably affected, and colon and cecum may or may not have lesions in foals < 1-month old. Naturally acquired disease in older foals and adult horses has a more aboral distribution, affecting colon and sometimes cecum, but rarely the small intestine. Detection of toxin A, toxin B or both in intestinal contents or feces is considered the most reliable diagnostic criterion for CDAD in horses. Isolation of toxigenic strains of *C. difficile* from horses with intestinal disease is highly suggestive of CDAD. A better understanding of pathogenesis, reservoirs of infection, and vaccines and other methods of control is needed. Also further studies are recommended to investigate other possible predisposing factors and/or etiological agents of enteric diseases of horses.

Veterinary Microbiology 140 (2010) 399–404

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journal homepage: www.elsevier.com/locate/vetmic

Review

Clostridia as agents of zoonotic disease

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ARTICLE INFO

Article history:
Received 2 February 2009
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Keywords:
Clostridium perfringens
Clostridium difficile
Enterotoxin
Beta toxin
Contaminated meat

ABSTRACT

Clostridia are not normally considered to be zoonotic pathogens, although many species affect both humans and domestic animals. Three cases in which organisms occur, possibly via direct or indirect transmission, in both food animals and humans are considered here. Strains of *Clostridium perfringens* that produce enterotoxin (CPE) are typically transmitted to humans in contaminated, improperly handled foods. Pathogenesis is based upon action of CPE in the intestine, and disease is usually self-limiting. Infection of domestic animals by CPE-producing *C. perfringens* is uncommon. *C. perfringens* type C is best known as a pathogen of neonatal domestic animals, which acquire the infection from the dam. The course may be peracute, and prevention by vaccination of the dam is universally advocated. Humans consuming meat contaminated with type C may develop enteritis necroticans, with segmental hemorrhagic and necrotic jejunitis, which must usually be treated by bowel resection. *Clostridium difficile* is a pathogen of both humans and domestic animals. Examination of retail meats by bacteriologic culture has revealed genotypes of *C. difficile* that in many cases are identical to those from food animals and diseased humans. Transmission, food animals to foods to humans, has not been documented.

Veterinary Microbiology 152 (2011) 212–215

Contents lists available at ScienceDirect

Veterinary Microbiology

journal homepage: www.elsevier.com/locate/vetmic

Short communication

Prevalence of *Clostridium difficile* in horses☆

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Accepted 14 April 2011

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Clostridium difficile
Colitis
Horse
Diarrhea
Prevalence

ABSTRACT

Fecal samples were collected to establish the apparent prevalence of *Clostridium difficile* shedding in Standardbred and Thoroughbred racehorses housed at 4 racetracks and 2 breeding facilities, and in horses admitted to a referral large animal clinic. Forty-one (7.59%) of 540 racetrack horses, seven (5.83%) of 120 breeding farm horses, and four (4.88%) out of 82 horses admitted to the referral clinic were culture-positive for *C. difficile*. An overall fecal culture prevalence of 7.01% for *C. difficile* was identified in 742 fecal samples. PCR-ribotyping and toxin gene identification was performed and seventeen 17 PCR-ribotypes were identified among the 52 *C. difficile* isolates.

Veterinary Microbiology 153 (2011) 205–217

Contents lists available at ScienceDirect

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journal homepage: www.elsevier.com/locate/vetmic

Review

Clostridium difficile infection in humans and animals, differences and similarities

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ARTICLE INFO

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Keywords:
Clostridium difficile
Pathogenesis
Clinical signs
Diagnosis
Prevalence

ABSTRACT

Clostridium difficile is well known as the most common cause of nosocomial infections in human patients. In recent years a change in epidemiology towards an increase in incidence and severity of disease, not only inside the hospital, but also in the community, is reported. *C. difficile* is increasingly recognized in veterinary medicine as well and is now considered the most important cause of neonatal diarrhea in swine in North America. Research on the presence of *C. difficile* in production and companion animals revealed a huge overlap with strains implicated in human *C. difficile* infection (CDI). This has lead to the concern that interspecies transmission of this bacterium occurs. In this review *C. difficile* infections in humans and animals are compared. The pathogenesis, clinical signs, diagnosis and prevalence of CDI are described and similarities and differences of CDI between humans and animals are discussed.

GUT INSTINCT

Faecal transplants are an increasingly popular way to treat infections of *Clostridium difficile*, but approaches vary wildly.

Clinic	Route	Stool amount	Stool freshness	Blending method	Patients treated	Claimed success rate
Mayo Clinic, Rochester, Minnesota	Colonoscopy	50 g	< 6 hours old	Lab paddle blender	~40	90–95%
Nebraska Medical Center, Omaha	Nasal tube	30–50 g	< 6 hours old	Blender	17	94%
The Bright Medicine Clinic naturopathic practice, Portland, Oregon	Enema	50–300 g	Frozen or < 6 hours old	Blender	8	88%
Kingston General Hospital, Canada (clinical trial)	Colonoscopy	100 ml (synthetic)	Cultured	Hand-mixed	~30	Planned trial
Thomas Louie's private practice, Calgary, Canada	Capsules	0.47 ml per pill	< 6 hours old	Food mill	33	100%

Nature 498:147, 2013

CIENCIA Y TECNOLOGÍA

Heces para salvar vidas

El primer banco de EE UU ofrece la materia prima para trasplantes fecales como terapia para enfermedades del aparato digestivo. El tratamiento se ensaya en 350 hospitales

JAVIER BARBUZANO, **Boston**

Un edificio corriente de oficinas al norte de Cambridge (Massachusetts, EE UU) es testigo de una actividad bastante inusual. Cada mañana pasan por allí aproximadamente una decena de jóvenes de aspecto saludable. Algunos dejan un paquete y otros pasan dentro con cara de apuro para salir, al cabo de unos minutos, mucho más calmados. Es un banco muy especial. Estas personas vienen a donar sus heces. Se trata del primer banco de este tipo creado en EE UU por la organización sin ánimo de lucro Open Biome.

Pero, ¿por qué es necesario un banco de heces? El cuerpo humano contiene una gran cantidad de microbios, millones de organismos con los que compartimos espacio llamados colectivamente "microbioma". Estos juegan un papel clave en numerosas funciones fisiológicas de nuestro cuerpo, por lo que tienen una gran influencia en nuestro estado de salud. Su estudio es uno de los campos más activos de la biología actual y los científicos apenas están comenzando a rascar la superficie al descubrir las complicadas relaciones que el microbioma de nuestro intestino tiene en ciertas enfermedades del aparato

Una técnico de laboratorio introduce las heces ya procesadas en botes. / OPEN BIOME

patógeno pase inadvertido es real. También hay riesgos asociados al método por el que se realice el trasplante, que suele ser mediante una colonoscopia o una sonda nasogástrica.

Tanto es así, que la agencia americana del medicamento (FDA por sus siglas en inglés) sólo permite su uso para investigación, aunque de hecho ha ofrecido una especie de moratoria humanitaria para los casos de C. diff por la que no perseguirán a quienes utilicen el trasplante fecal para este fin.

40 dólares por muestra

Hasta el momento, sólo el 3% de los candidatos a donantes para Open Biome han sido aceptados. El proceso de selección es muy riguroso y hay multitud de factores que descalifican a un donante: obesidad, viajes a lugares exóticos, haber tomado antibióticos en los últimos seis meses, tener tatuajes recientes y, obviamente, padecer alguna enfermedad infecciosa. Si los donantes cumplen los requisitos se les realizan análisis de sangre y heces en busca de agentes patógenos o parásitos. Una vez aceptados, a los donantes se les facilitan los contenedores para depositar las donaciones y se les paga cuarenta dólares por espécimen. No es necesario que lleven una dieta especial. "Una vez que aceptamos a un donante, se le permite donar durante sesenta días, durante los cuales sus heces se mantienen en cuarentena. Al final de este perio-

Laboratory Testing of Donors and Stool Samples for Fecal Microbiota Transplantation for Recurrent Clostridium difficile Infection

ABSTRACT Fecal microbiota transplantation is an efficacious and inexpensive therapy for recurrent Clostridium difficile infection, yet its safety is thought to depend on appropriate fecal donor screening. FDA guidance for regulation of this procedure is in flux, but screening and manufacture of fecal material from asymptomatic donors present many challenges to clinical laboratories. This minireview summarizes FDA regulatory changes, principles of donor selection, and recommended laboratory screening practices for fecal microbiota transplantation.

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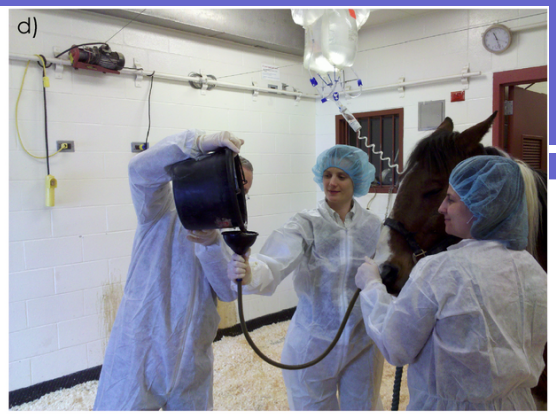
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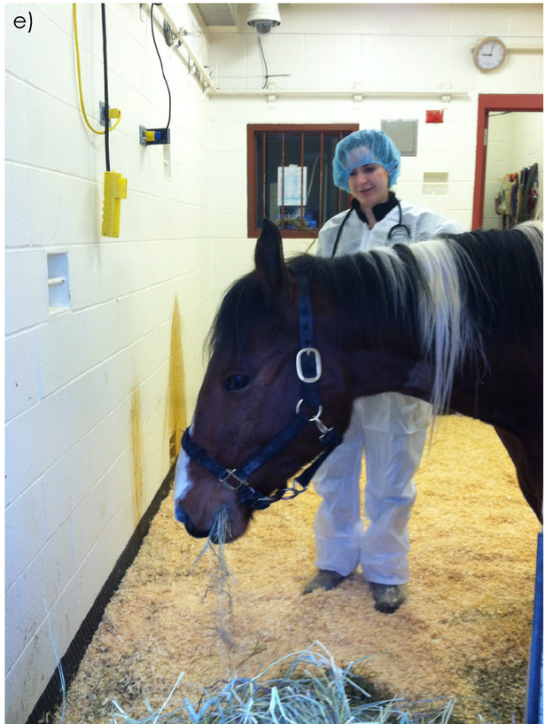
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Review Paper

Fecal microbiota transplantation as a tool to treat and reduce susceptibility to disease in animals

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ABSTRACT

Fecal microbiota transplantation (FMT) is the process by which fecal microbiota are donated from a healthy individual and subsequently transplanted into a diseased or young individual. The mechanism by which FMT is effective is believed to be due to enhanced beneficial microbes, increased microbiome diversity, and restored normal flora. Beneficial gut microorganisms not only play a role in maintaining an intestinal barrier and metabolizing nutrients, but importantly, these microbes help regulate local and systemic immune function. Although FMT has been described for several centuries, only recently has it been utilized as a mainstream therapy in humans and significantly considered for applications in other species. In humans and animals, gastrointestinal diseases are by far the most widely accepted FMT-treatable conditions; however, recent research has shown exceptional promise for FMT being used to treat or prevent other conditions, including those outside of the gastrointestinal tract. Overall, FMT is likely an underutilized, widely-available, and inexpensive tool for improving the health and response to disease in animals. In this review, the effects of FMT on veterinary diseases and potential applications for FMT in animals are discussed.

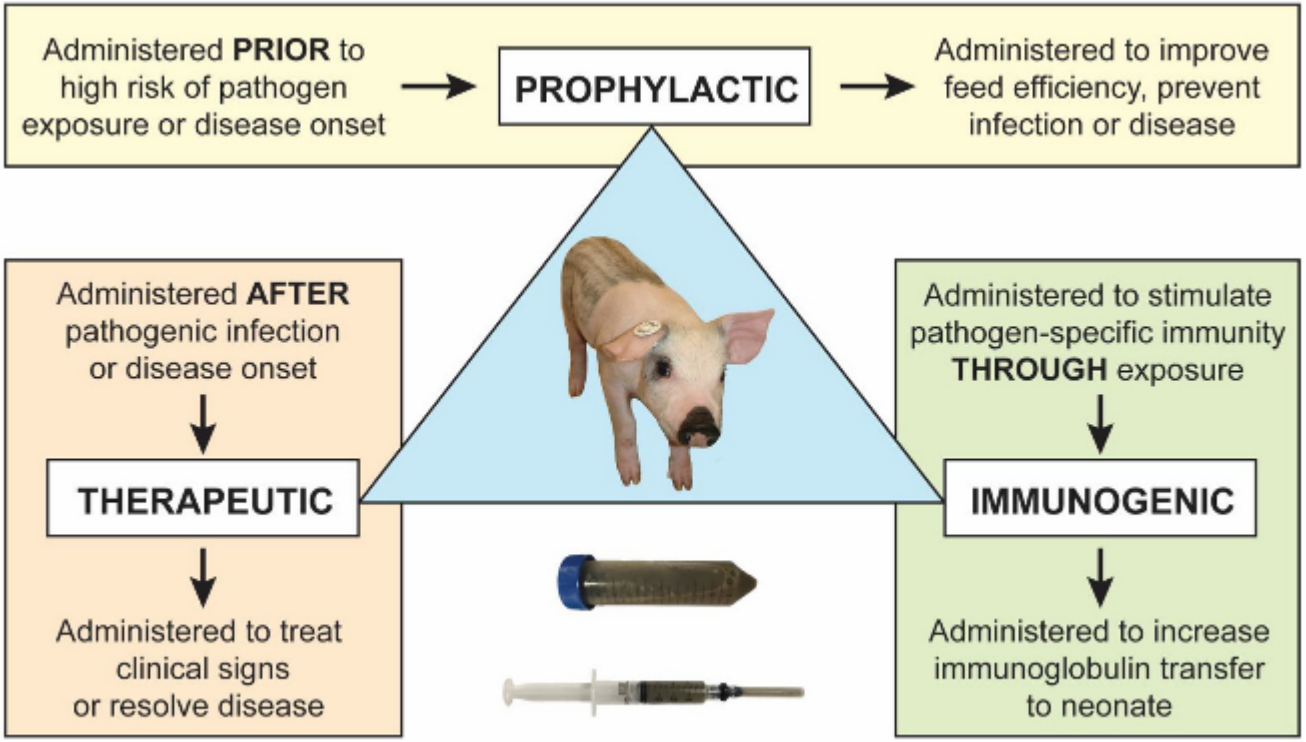

Fig. 1. Applications and intended outcomes for use of fecal microbiota transplantation (FMT) in pigs including therapeutic, prophylactic and immunogenic uses.

“El principal objetivo de la educación es ampliar la conciencia sobre la realidad”. Dalai Lama.