Bactérias anaeróbias

Principais patógenos de importância clínica

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Bactérias anaeróbias

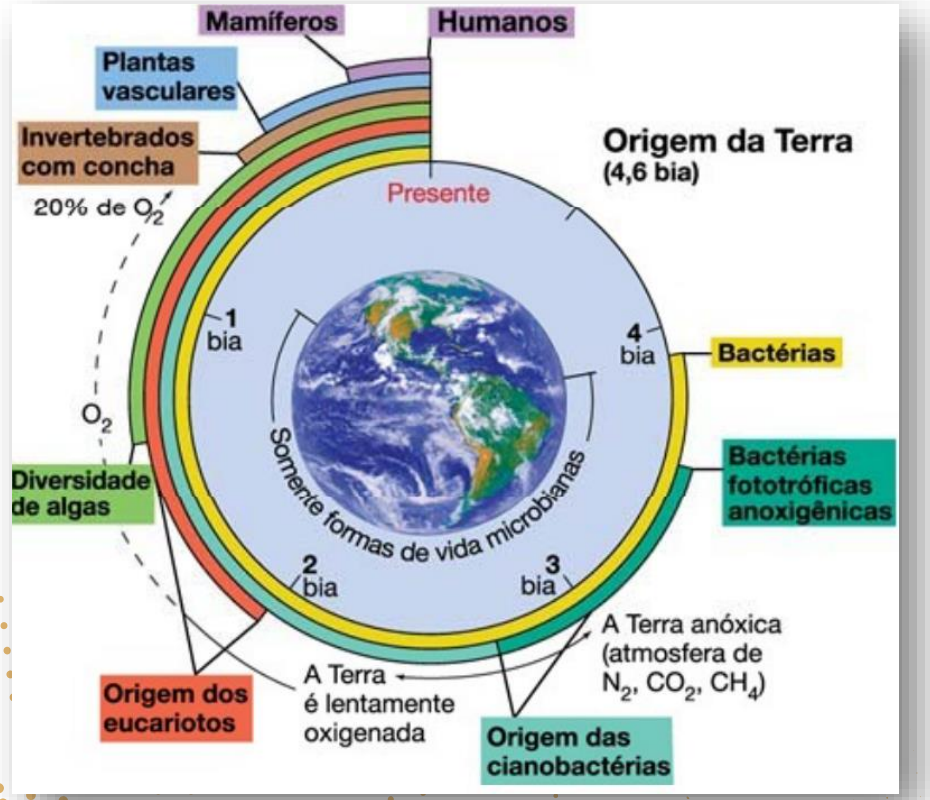
01

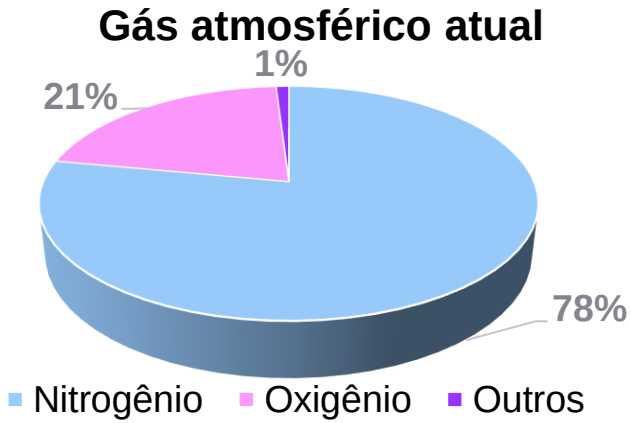
Introdução

Anaerobiose e metabolismo energético

Anaeróbios

- Primeiras formas de vida do planeta (Gest, 1980)
- Aumento da concentração de oxigênio - evolução dos sistemas biológicos
  - Desenvolvimento de cadeias transportadoras de elétrons e de complexos enzimáticos capazes de utilizar eficientemente o O_2 como aceptor final dos elétrons.





Metabolismo energético

Respiração aeróbica $\mathbf{C_6H_{12}O_6} + 6\mathbf{O_2} \rightarrow 6CO_2 + 6H_2O + \mathbf{energia}$

Fotossíntese $6CO_2 + 12H_2O + Luz \rightarrow \mathbf{C_6H_{12}O_6} + 6\mathbf{O_2} + 6H_2O$

Fermentação alcoólica $\mathbf{C_6H_{12}O_6} \rightarrow 2C_2H_5OH + 2CO_2 + \mathbf{energia}$

Fermentação lática $\mathbf{C_6H_{12}O_6} \rightarrow 2C_3H_6O_3 + \mathbf{energia}$

Respiração anaeróbica $\mathbf{C_6H_{12}O_6} + 4NO_3 \rightarrow 2CO_2 + 6H_2O + 2N_2 + \mathbf{energia}$

Metabolismo energético

Respiração aeróbica $\mathbf{C_6H_{12}O_6} + 6\mathbf{O_2} \rightarrow 6CO_2 + 6H_2O + \mathbf{energia}$

Fotossíntese $6CO_2 + 12H_2O + Luz \rightarrow \mathbf{C_6H_{12}O_6} + 6\mathbf{O_2} + 6H_2O$

Fermentação alcoólica $\mathbf{C_6H_{12}O_6} \rightarrow 2C_2H_5OH + 2CO_2 + \mathbf{energia}$

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Respiração anaeróbica $\mathbf{C_6H_{12}O_6} + 4NO_3 \rightarrow 2CO_2 + 6H_2O + 2N_2 + \mathbf{energia}$

Metabolismo energético

- Produção de energia a partir de glicose:

Produção de energia	Condição de crescimento	Aceptor final de elétrons	Produção de ATP por molécula de glicose
Respiração aeróbica	Aerobiose	Oxigênio	38
Fermentação	Aeróbica ou anaeróbica	Molécula orgânica	2
Respiração anaeróbica	Anaerobiose	Molécula inorgânica exceto o oxigênio (NO_3, SO_4, CO_3)	>2 - <38

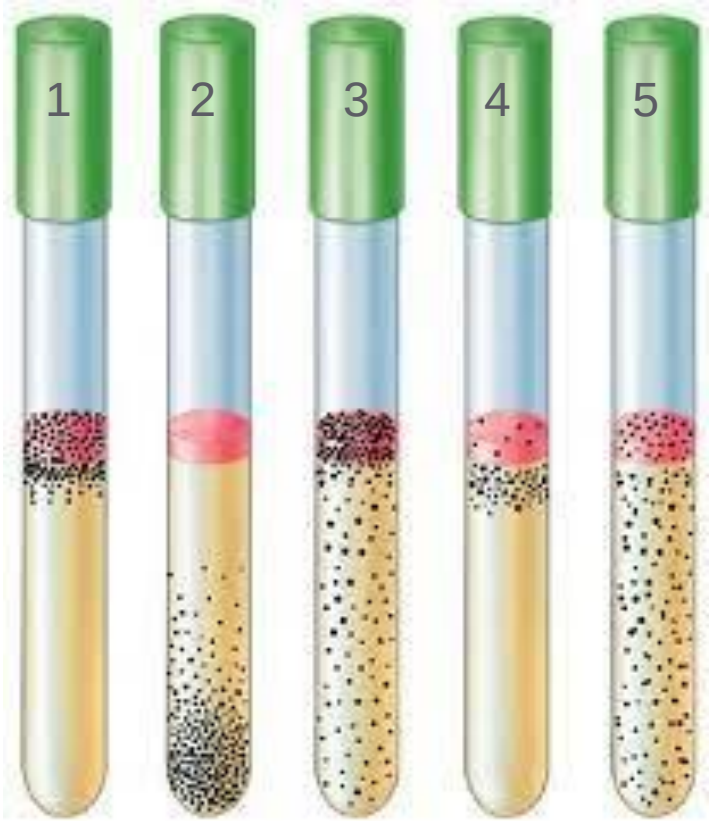
Classificação de bactérias quanto a tolerância ao O_2

- Facultativas
- Microaerófilos: O_2 (5 - 10%), crescem mal em anaerobiose
- Anaeróbias obrigatórias: ambiente com baixo potencial de oxirredução (ex. tecido necrótico e não vascularizado
  - Estritas: ≤ 0,5% de oxigênio
  - Moderadas: de 2% a 8% de oxigênio
- Anaeróbias aerotolerantes: Não requerem O_2 mas toleram oxigênio atmosférico por tempo limitado

Geralmente, bactérias anaeróbias obrigatórias que causam infecção toleram níveis de oxigênio por 8-72 h.

Classificação de bactérias quanto a tolerância ao O2

1. Aeróbias estritas (*P. aeruginosa*)
2. Anaeróbias estritas (*C. botulinum*)
3. Facultativas (Enterobactérias)
4. Aerotolerantes (*Bacteroides*)
5. Microaerófilas (*Campylobacter jejuni*)



Radicais livres

- O oxigênio excessivo é tão perigoso quanto a sua deficiência” (Lavoisier, 1785)
- Subprodutos do metabolismo que oxidam proteínas, lipídeos e DNA:
  - Ânion superóxido: O_2-
  - Radical hidroxila: OH
  - Peróxido de hidrogênio: H_2O_2
  - Óxido nítrico: NO
- Oxidação de lipídeos – lise celular
- Oxidação enzimática – inibição do metabolismo

} Morte celular

Inibição de radicais livres

O_2 → Metabolismo → Radicais tóxicos

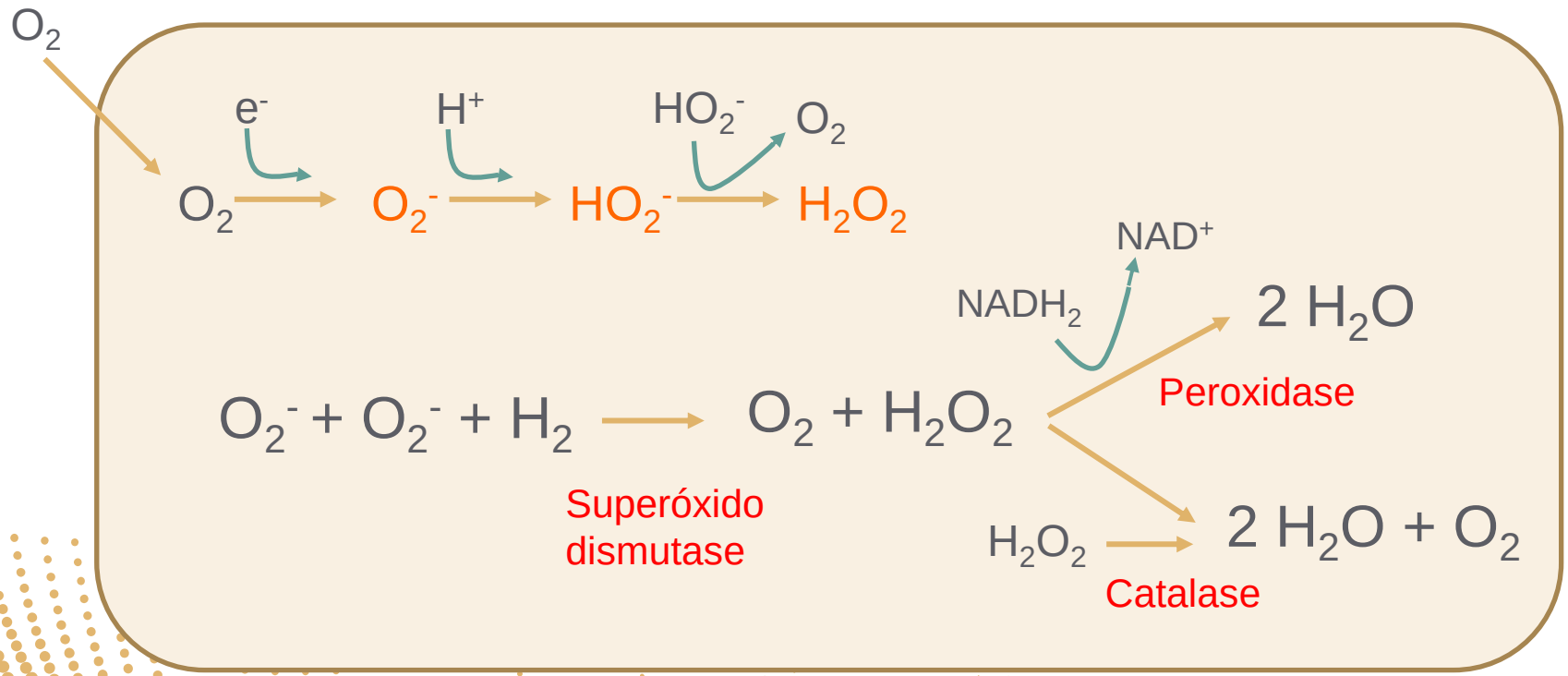
O_2^-, HO_2^-, H_2O_2

Superóxido dismutase
Catalase
Peroxidase

→ Desintoxicação

Ausência das enzimas →

Morte

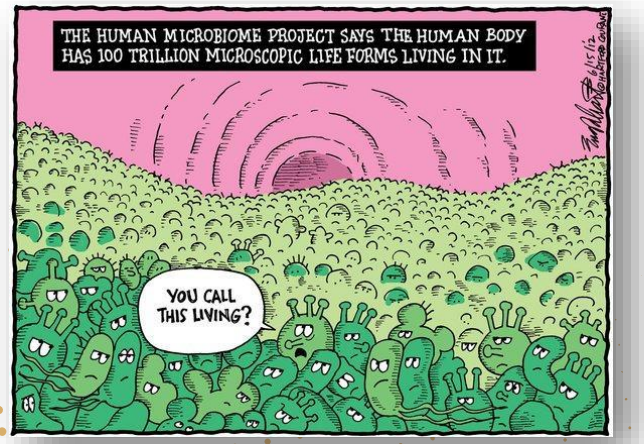


02

Microbiota
Anaeróbios oportunistas

Microbiota

- Microrganismos normalmente encontrados colonizando determinados sítios do organismo convivendo harmoniosamente com o hospedeiro
- Relação benéfica, neutra ou prejudicial
- Residente x transitória



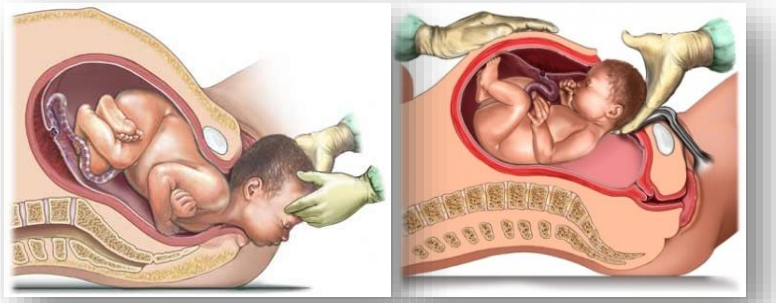
Microbiota - importância

- Manutenção dos ecossistemas
  - Níveis tróficos – Produtores, consumidores e decompositores
- Indústria alimentícia
- Industria farmacêutica
- Biorremediação
- Biotecnologia

Microbioma humano

- 40 trilhões de células
  - ~1.3x
- >10.000 espécies
- 3 milhões de genes
  - 150:1
- Trato gastrointestinal

Formação da microbiota



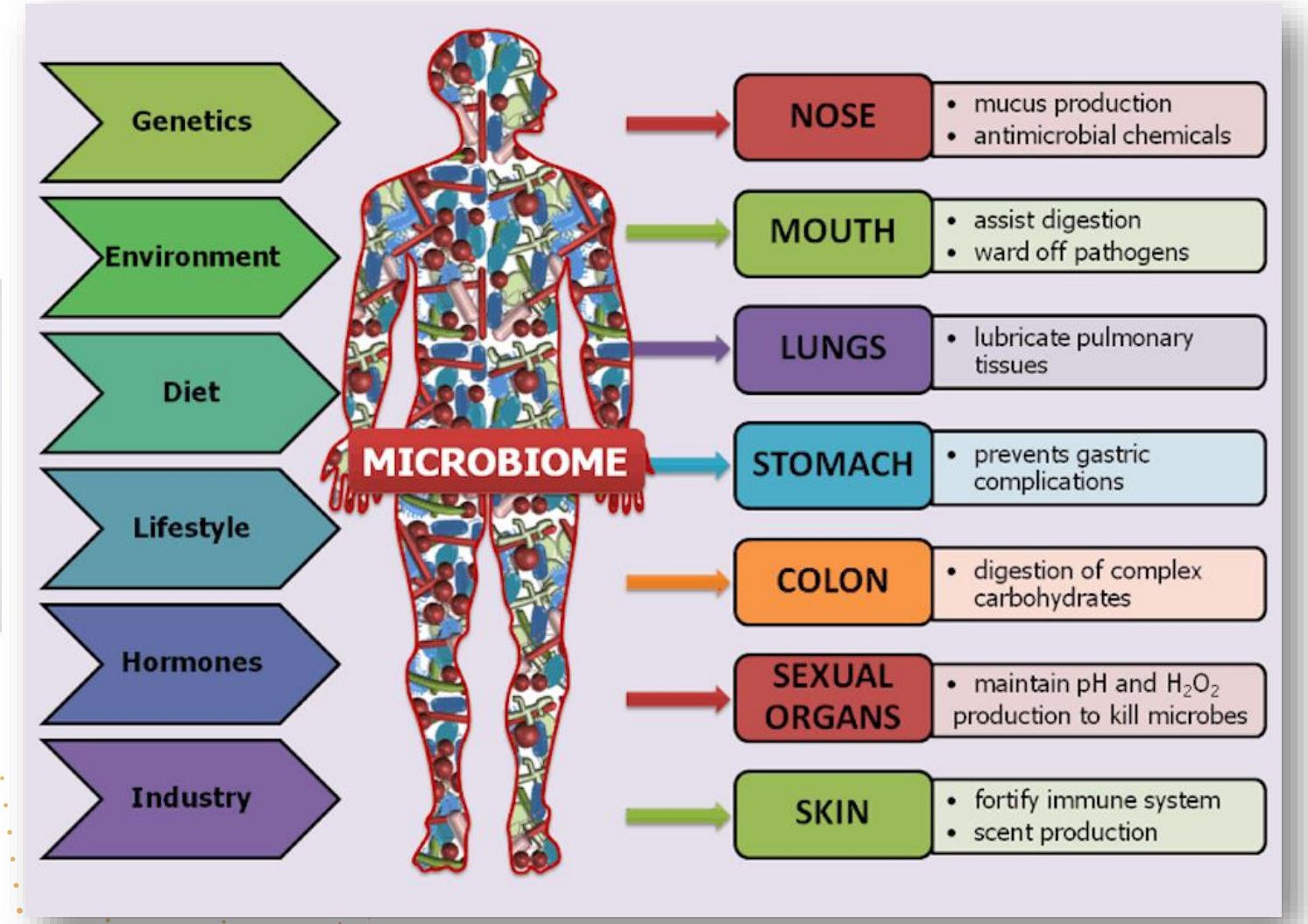
- Pele
- Trato respiratório
- Trato gastrointestinal
- Trato geniturinário

Características específicas → Seleção de populações

Microbiota de um mesmo sítio do corpo é mais similar entre indivíduos diferentes do que microbiota de regiões distintas de um mesmo indivíduo.

Microbiota


Ruffles
Cheetos
Pringles
OREO


Genetics
Environment
Diet
Lifestyle
Hormones
Industry
MICROBIOME
NOSE
• mucus production
• antimicrobial chemicals
MOUTH
• assist digestion
• ward off pathogens
LUNGS
• lubricate pulmonary tissues
STOMACH
• prevents gastric complications
COLON
• digestion of complex carbohydrates
SEXUAL ORGANS
• maintain pH and H_2O_2 production to kill microbes
SKIN
• fortify immune system
• scent production

Microbiota - Anaeróbios

- Bactérias anaeróbicas são abundantes na microbiota em diversas partes do corpo
- A maioria das infecções é endógena

- Infecções mistas – diagnóstico dificultado
- Técnicas de incubação anaeróbicas insuficientes
- Isolamento dos patógenos mais comuns (ex. *Bacteroides fragilis* ou *Clostridium perfringens*) - (O_2 : 2% - 8%)

$\downarrow O_2$

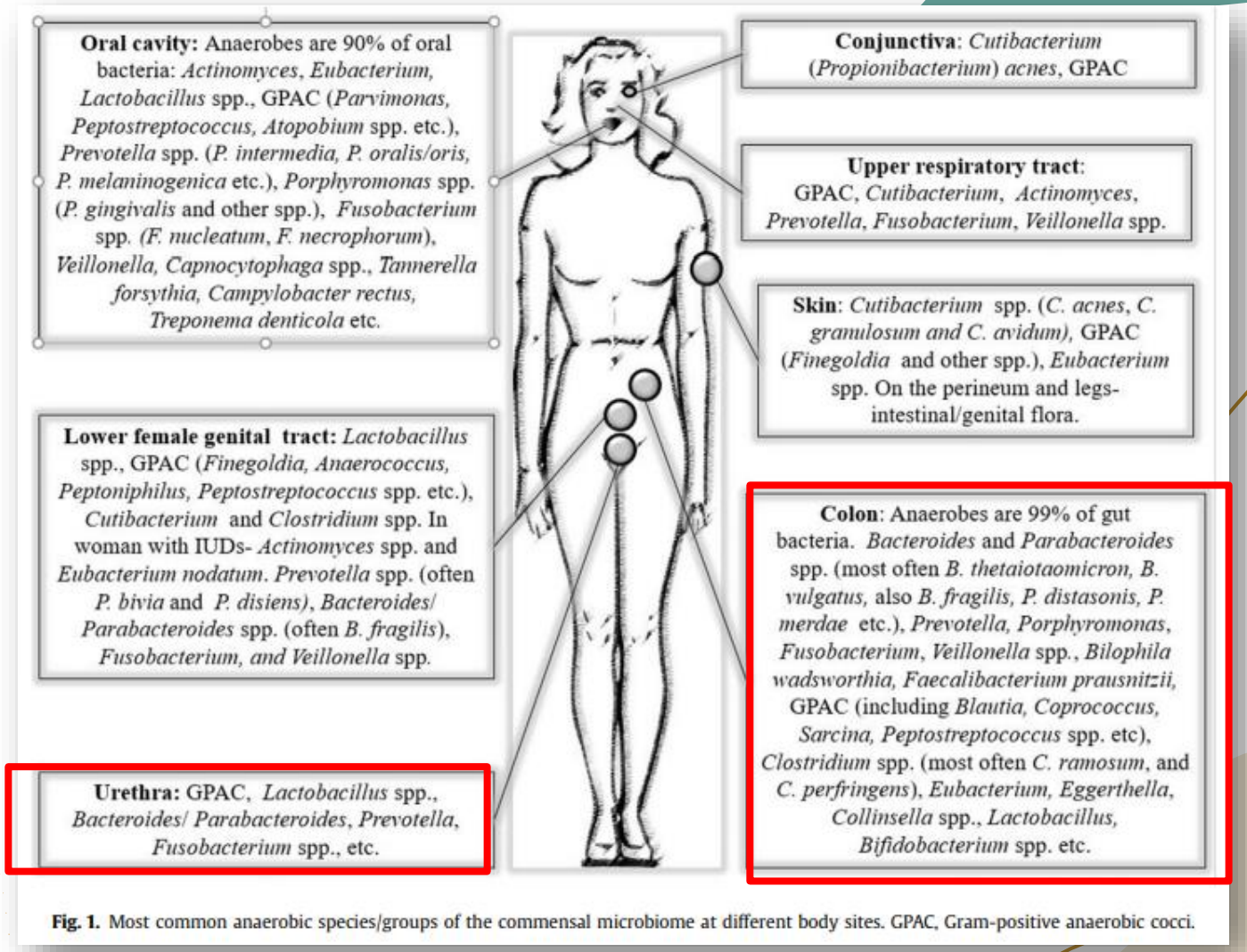
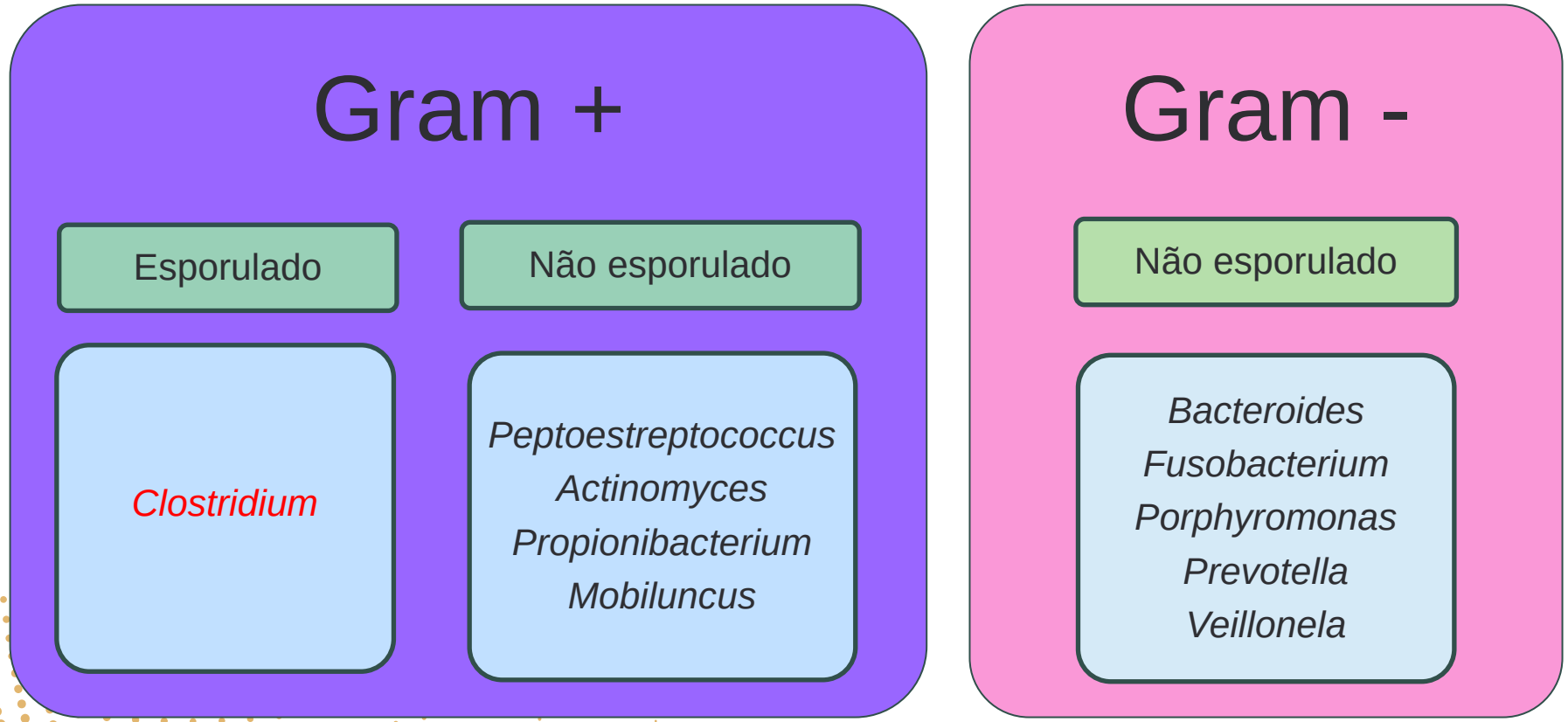


Fig. 1. Most common anaerobic species/groups of the commensal microbiome at different body sites. GPAC, Gram-positive anaerobic cocci.

Bactérias anaeróbicas – principais gêneros

- Principais componentes da microbiota (TGI e vagina), oportunistas



03

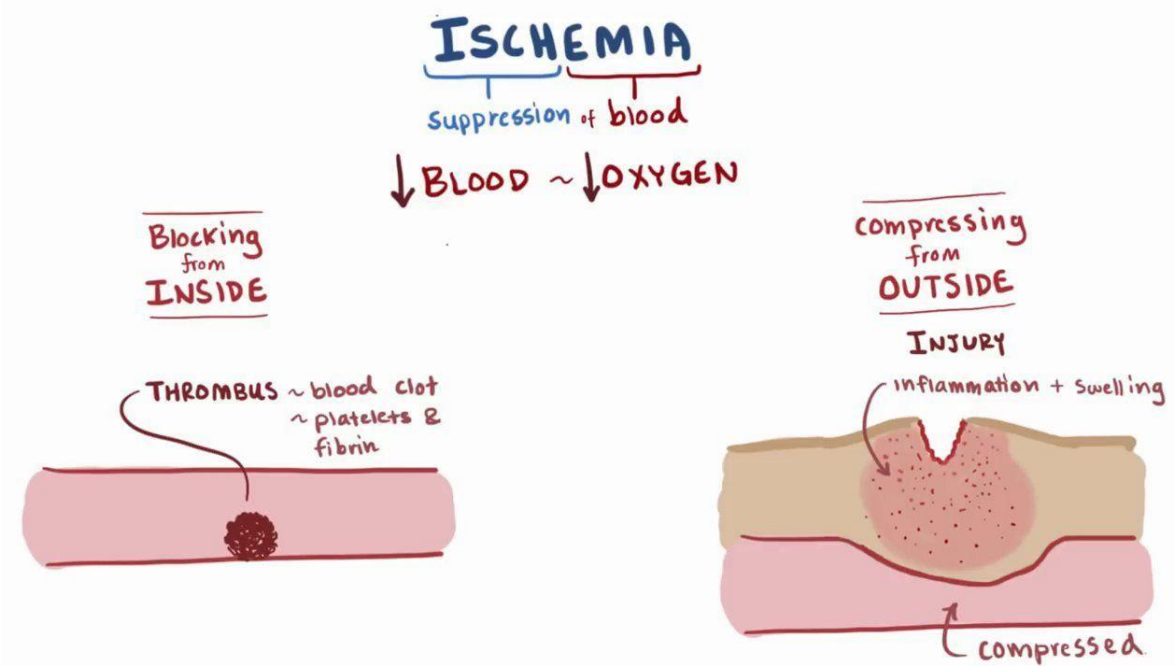
Diagnóstico
Infecções por anaeróbios

Infecções por bactérias anaeróbicas

- Geralmente são infecções endógenas
- Caracteristicamente supurativas, formam abscessos e necrose de tecidos e, às vezes, tromboflebite séptica e/ou formação de gás.
- Muitos anaeróbios produzem enzimas que desvitalizam os tecidos e algumas das mais potentes toxinas paralíticas conhecidas.
- Geralmente causam infecções mistas

Fatores de risco para infecções por anaeróbios

- Processos obstrutivos
  - Isquemia tecidual
- Dano tecidual
  - Mordidas
  - Trauma
  - Cirurgia
  - Corpo estranho
- Necrose tecidual
- Infecção prévia por outras bactérias
- Monoterapia com aminoglicosídeos



Características sugestivas de infecção por anaeróbios

- Resultados polimicrobianos na microscopia ou cultura
- Visível na lâmina de microscopia, cultura aeróbica negativa

Laboratório

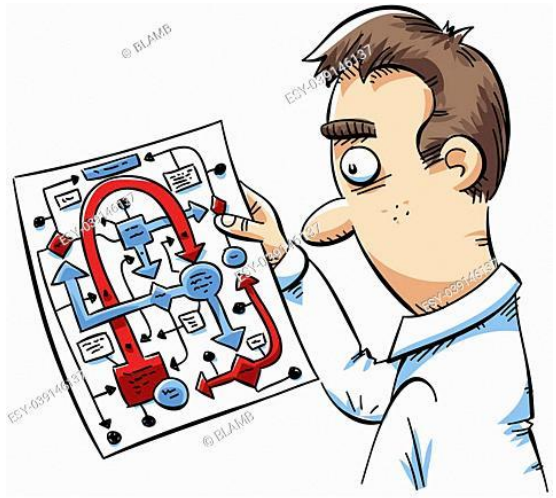
- Ineficácia de aminoglicosídeos
- Odor fétido, formação de abcesso
- Necrose tecidual
- Produção de gás em tecidos
- Infecção próxima a superfície de mucosas - (microbiota)
- Infecção após mordida
- Infecção associada a tumor maligno sólido, cirurgia intestinal ou ginecológica

Clínica

Dificuldade no diagnóstico de anaeróbios

- Microrganismos fastidiosos
- Dificuldade de cultivo

- Identificação é feita geralmente até Gram (+ ou -) anaeróbio ou até gênero
- Antibiótico de amplo espectro – infecções mistas



Coleta

- Antes do início da antibioticoterapia
- Assepsia do local
- No local da infecção, onde as bactérias se multiplicam
  - X Pus ou espécimes superficiais
- Aspirados e biópsias de tecido ao invés de swab
  - Com agulha ou seringa

OBS: Swab não é indicado pois é facilmente contaminado, fica mais exposto ao O_2 e à dissecação, colhe pouco volume de amostra e dificulta a preparação de um bom esfregaço.

Amostras consideradas para pesquisa de anaeróbios

- Retiradas de locais normalmente estéreis
  - Hemocultura, LCF, líquido sinovial, tórax e cavidade abdominal
  - X Cateter, ponta de cateter
- Local cirúrgico
- Feridas profundas
- Abcessos
- Periorais e gengivais
- Úlcera de pé diabético
- Urina (aspiração suprapúbica)
- Fezes (*Clostridium/ Clostridioides*)

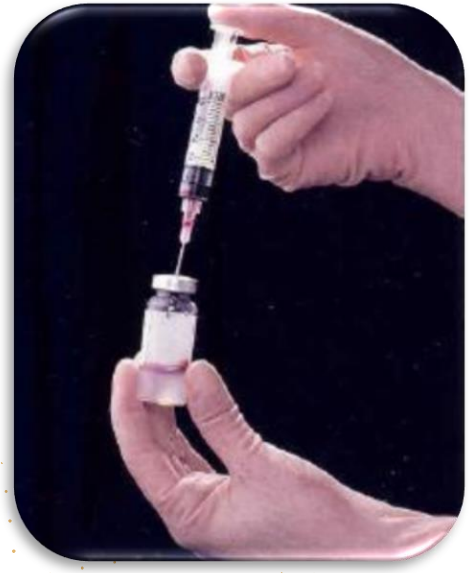
Acceptable and unacceptable specimens for anaerobic microbiology [18,19,21,26,27,29,33]

Infection site	Acceptable specimens	Unacceptable specimens
Blood	Blood (8–10 mL/bottle or acc. to the weight) in anaerobic blood bottles	Catheter/catheter-tip samples
Central nervous system	Tissue biopsies or needle aspirates through intact decontaminated surface	Surface swabs
Head and neck	Percutaneous needle aspirates, surgical specimens. For Lemierre syndrome aspirates, tissue biopsies. For actinomycosis sulphur granules as well	Oral, nose and throat swabs except for Lemierre syndrome
Periodontal	Abscess aspirates, subgingival pocket samples (by periodontal curettes or sterile paper points in the canal)	Surface gingival and oral swabs
Ear	In otitis media: aspirates by tympanocentesis (with sterile micropipettes)	Surface material
Eye	Corneal scraping, vitreous fluid needle aspirates, conjunctival swabs	As above
Abscesses	Closed abscess: needle aspirates through intact decontaminated tissue, surgical samples; fistulas/sinuses: deep plastic catheter aspirates after disinfected skin opening; open abscesses: see Wounds	Skin/mucosal surface swabs, pus
Pulmonary	Pleural fluid, lung and transtracheal aspirates, lung-tissue biopsies, deep bronchial secretions taken with double-lumen (protected) catheter	Nasopharyngeal swabs, sputum
Abdominal cavity	Peritoneal and ascites fluid aspirates, surgical biopsies, bile aspirates	Ileostomy/colostomy samples
Stool	Only for *Clostridium difficile* or *Clostridium botulinum*	For other anaerobes
Female genital tract	Tissue biopsies, pelvic infection aspirates (by culdocentesis) peritoneal fluid, endometrial specimens (by protected catheters), surgical specimens	Cervical/vaginal swabs (except for bacterial vaginosis)
Bone	Aspirate, bone biopsies. Taking several biopsies is recommended	Swabs, soft-tissue samples
Joint, prosthetic joint	Synovial fluid aspirates in anaerobic blood culture bottles, periprosthetic biopsies in anaerobic broth media	Surface swabs of wounds/fistulas
Wounds/soft tissues	Deep biopsy sampling, deep wound aspirates at the advancing wound edge after debridement and cleaning the surface with sterile saline or alcohol	Surface swabs, pus, sinus tracts
Decubitus or skin ulcers	Needle aspirates or tissue biopsies. Deep sampling from the base of lesion	Surface material, swabs
Diabetic foot ulcers	Bone biopsies (surgical or after debridement and surface disinfection)	Tissue samples less suitable
Urine	Bladder urine (suprapubic bladder aspirates)	Voided and catheterized urine

Nagy et al. (2018)

Transporte de anaeróbios

- Frasco de transporte anaeróbico
  - Amostras aspiradas
- Meio de cultura sólido pré reduzido
- A temperatura ambiente



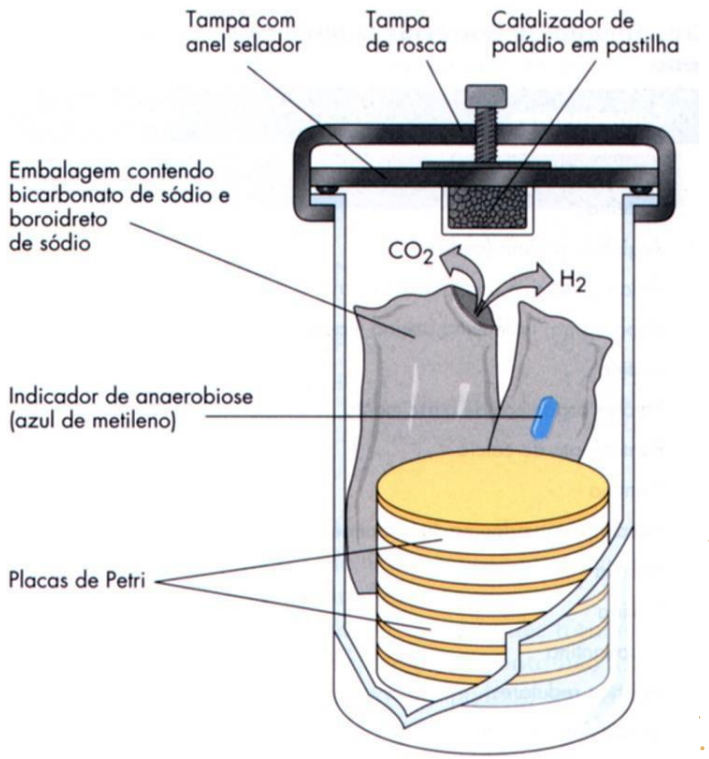
Anaeróbios

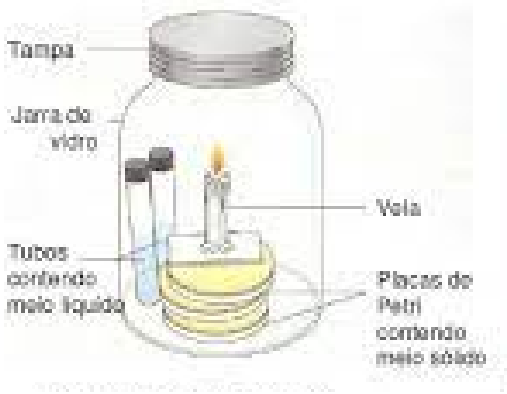
- Embalagem de anaerobiose
- Amostras teciduais
- Mistura de CO_2, H e N:
  - **Indicador**, como a resazurina (condições anaeróbias)
  - **Redutor**, como a cisteína (eliminar pequenas quantidades de oxigênio)




Cultivo de anaeróbios

- Jarra de anaerobiose

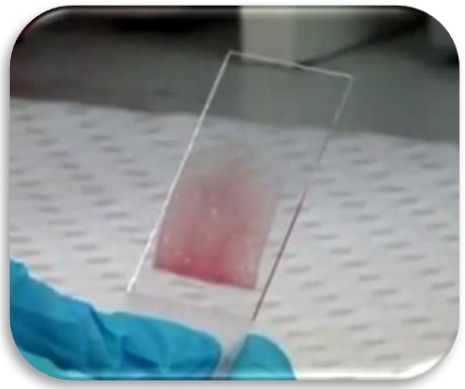




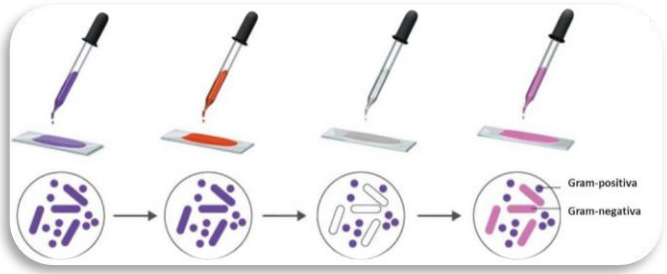
(a) Tubo indicador de CO_2, a esquerda tubo negativo (coloração bege), indica ausência de gás carbônico e a direita, tubo positivo (coloração rosa), indica presença de gás carbônico.

(b) Fita indicadora de anaerobiose, a esquerda fita negativa (coloração azul), indica presença de Oxigênio e a direita fita positiva (coloração branca) indica ausência de Oxigênio.

Diagnóstico de anaeróbios



Coloração de gram direta



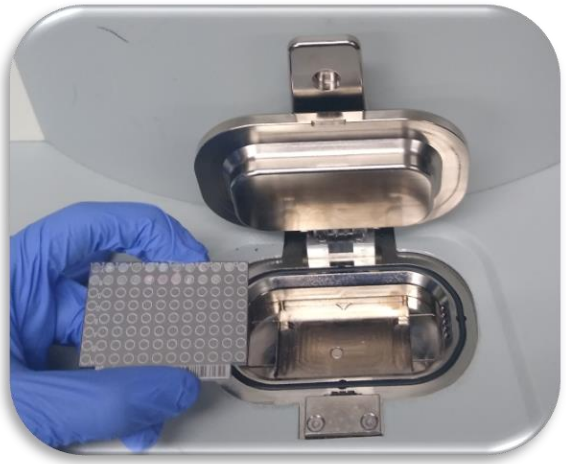
- Avalia contaminação
- Morfologia única:

Ex. *Fusobacterium nucleatum*

Meio seletivo + ágar sangue e meio líquido

48h (até 3-5 dias)

MALDI-TOFF MS

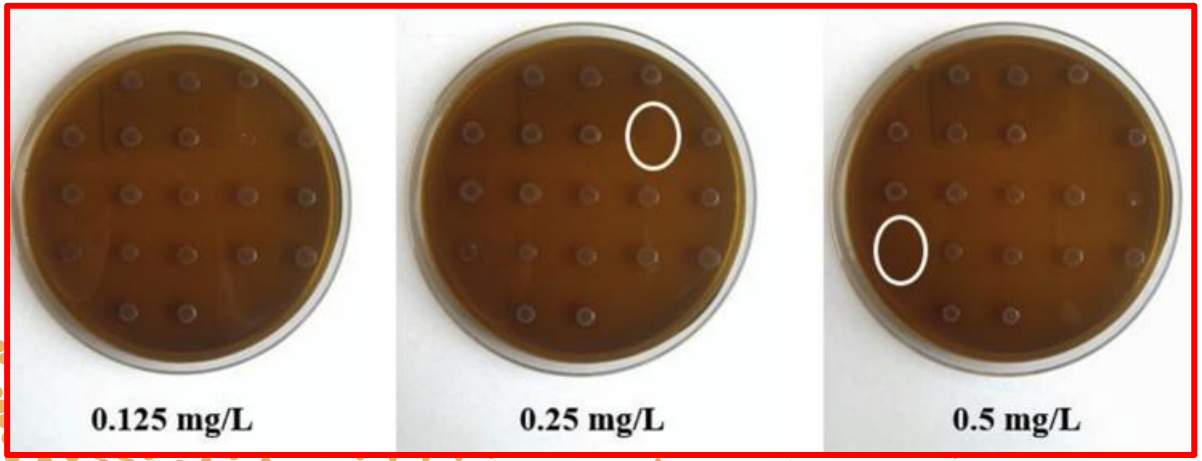


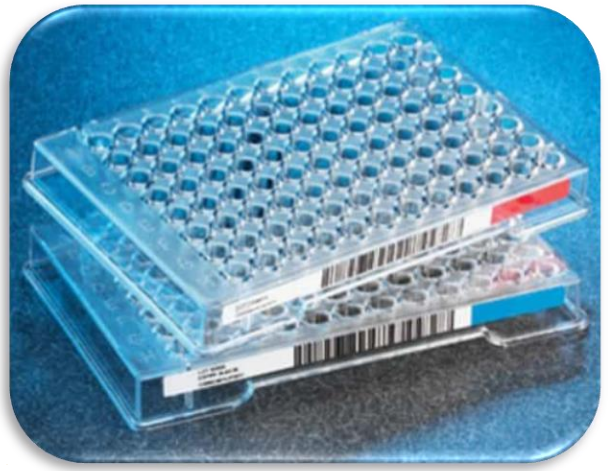
Teste de susceptibilidade aos antimicrobianos

- Ainda não há uma metodologia fácil, barata e flexível de TSA para rotina

The available methods for antimicrobial susceptibility testing of anaerobic bacteria [19,56,58,62]

Method	Pros	Cons	Comment
Agar dilution	Validated method. Cost effective if many isolates are examined at the same time	Labour intensive	Reference standard
Broth microdilution	Commercial assays are available, multiple antibiotics in one microtiter tray, relatively inexpensive	Fixed antibiotics in commercial products, medium labour intensive, only suitable for the *Bacteroides fragilis* group	Limited number of studies on commercial products
Gradient strips	Easy and flexible, can detect heteroresistance to some antibiotics	Expensive	Concerns about performance and warnings on specific agents
Disc diffusion	Inexpensive, easy, flexible	No validated method, studied mainly fast-growing anaerobic species	EUCAST development project





04

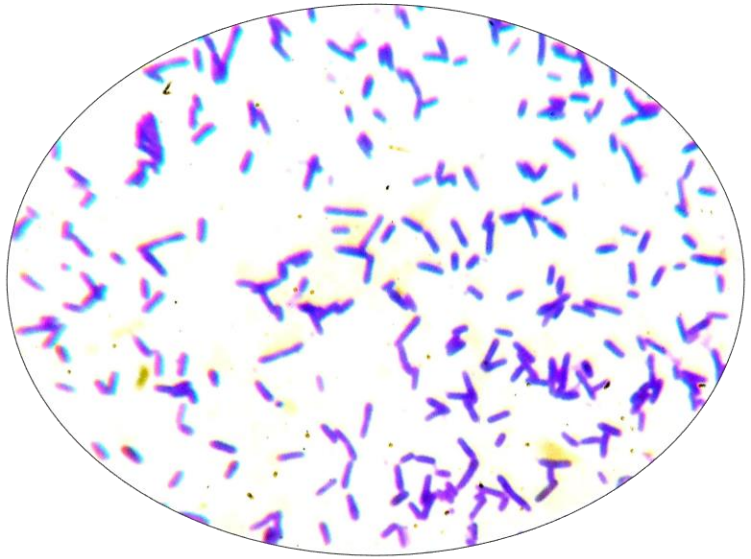
Exemplos

Infecções por bactérias Anaeróbias

Bactérias anaeróbias gram positivas

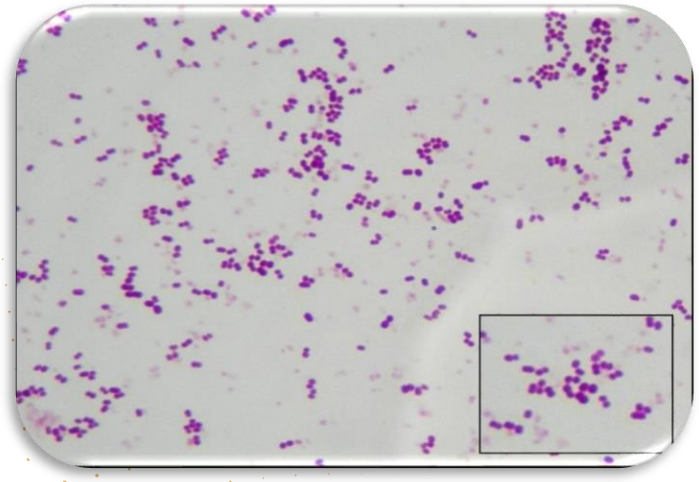
Gram +

Esporulado	Não esporulado
Clostridium	*Peptoestreptococcus* *Actinomyces* *Propionibacterium* *Mobiluncus*



Peptostreptococcus

- Cocos gram +
- Colonizam cavidade oral, TGI, TGU e pele
- Abcessos no cérebro, bacteremia, infecção no trato genital feminino
- Geralmente a identificação até coco gram + anaeróbio



Relato de caso

Case Report | Journal of Orthopaedic Case Reports 2018 May-June : 8(3):Page 7-9

A Case Report of Vertebral Osteomyelitis Caused by Peptostreptococcus micros

Junya Shimizu[1], Mitsunori Yoshimoto[1], Tsuneo Takebayashi[1], Yoshinori Terashima[1], Toshihiko Yamashita[1]

Learning Point for the Article:

If a patient who was in immunodepression status develops severe back pain, the clinician should be suspicious of the possibility of spondylitis by P. micros and start antibiotic therapy after undergoing sample collection.

Abstract

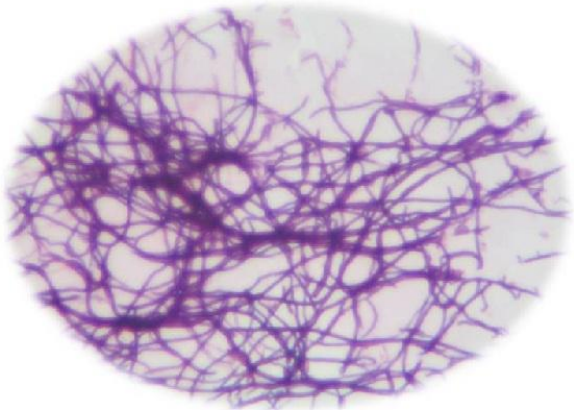
Introduction: Anaerobic vertebral osteomyelitis has been reported rarely. In this report, we describe an extremely rare case of a patient who suffered from vertebral osteomyelitis caused by Peptostreptococcus micros.

Case Report: A 73-year-old man with a history of diabetes mellitus was admitted to our hospital with a 5-month history of severe low back pain. A radiograph of the lumbar spine demonstrated intervertebral disc space narrowing with indistinct end plates at the L3-L4 level. T2-weighted magnetic resonance image showed high signal intensity at L3-L4 intervertebral disc space. We suspected pyogenic spondylitis and performed percutaneous posterolateral endoscopic debridement. The results of intraoperative sample cultures were positive for P. micros, an anaerobic Gram-positive coccus. He was treated by the antibiotic therapy. Low back pain resolved and his white blood cell count and C-reactive protein levels remained normal with the combination therapy. During 2-year follow-up, he reported no low back pain and had no signs of infection recurrence.

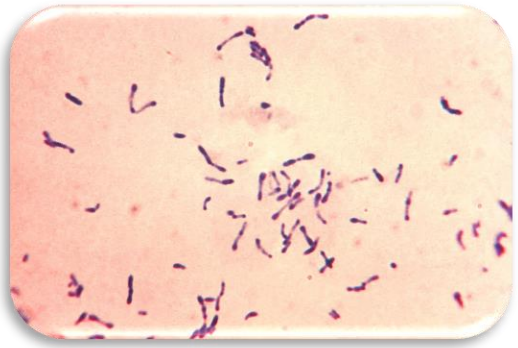
Conclusion: If a patient who was in immunodepression status develops severe back pain, the clinician should be suspicious of the possibility of spondylitis by P. micros and start antibiotic therapy after undergoing sample collection.

Keywords: Vertebral osteomyelitis, Peptostreptococcus micros, endoscopic debridement, anaerobic Gram-positive cocci.

Actinomyces



- Bactéria filamentosa
  - Aspecto semelhante às hifas de fungos
- Colonizam mucosas mas não a pele, oportunistas
- Lesão granulomatosa em formato de “grãos”
- Infecções de orofaringe, abdômen, endocardite, pneumonia por aspiração, actinomicose (*A. israelli*)
- Identificação apenas a nível de gênero



Pediatr Infect Dis J. 2022 Aug 31. doi: 10.1097/INF.0000000000003679. Online ahead of print.

Actinomycosis of the Middle Ear in Children: Case Report and Literature Review

Takuma Ohnishi [1], Satoshi Sato [1], Satoshi Asanuma [2], Yoji Uejima [1], Eisuke Suganuma [1]

Affiliations + expand

PMID: 36102698 DOI: 10.1097/INF.0000000000003679

Abstract

Actinomycosis of the middle ear is a rare infectious disease, characterized by a slowly progressive clinical course. We report the case of a 9-year-old girl with recurrent otitis media, who presented with clinical signs of a cholesteatoma. She underwent tympanoplasty and ossiculoplasty. After surgery, actinomycosis was diagnosed histologically. We also provide a review of 16 published pediatric cases.

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Case Report

A case of otitis media complicated by intracranial infection with *Actinomyces turicensis*

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Introduction: Actinomycosis is a granulomatous suppurative infection caused by filamentous Gram-positive anaerobic bacteria from the family *Actinomycetaceae*. To our knowledge, this is the first reported case of otogenic brain abscess associated with *Actinomyces turicensis*.

Case presentation: We report the case of an immunocompetent 5-year-old boy with recurrent otitis media who re-presented to the emergency department with a 3-week history of otorrhoea, progressive anorexia, vomiting and lethargy. He was admitted with a working diagnosis of otitis media and dehydration, and was treated with intravenous fluids and oral co-trimoxazole. He subsequently developed abnormal posturing with a reduced Glasgow coma score and seizures. Urgent computed tomography revealed a cerebellar abscess with obstructive hydrocephalus for which he underwent urgent neurosurgical intervention. Tissue and aspirate cultures revealed a polymicrobial infection with *A. turicensis*. The patient has since undergone long-term antibiotic treatment and has made a good recovery.

Conclusion: This case demonstrates the successful use of long-term antibiotic therapy and neurosurgical intervention to treat otogenic brain abscess associated with *A. turicensis* infection. To the best of our knowledge, this is the first such documented case. Our report also provides a timely reminder that, despite a reduced incidence in the developed world, intracranial complications of otitis media continue to occur and a high index of suspicion is required.

Keywords: *Actinomyces turicensis*; antibiotics; cerebellar abscess; neurosurgery; otitis media.

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Case Report

Actinomycosis of the Lower Lip: Report of a Case

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Case Reports

Ann Med Surg (Lond). 2022 Oct;82:104525. doi: 10.1016/j.amsu.2022.104525. Epub 2022 Sep 6.

Case report of actinomycotic liver abscess following COVID-19 infection

Klára Lévay [1], Noémi Daradics [1], Tibor Horváth [2], Tibor Kovács [3], András Fülöp [1], Attila Oláh [3], Attila Szijártó [1]

Affiliations + expand

PMID: 36092857 PMCID: PMC9444312 DOI: 10.1016/j.amsu.2022.104525

Abstract

Introduction and importance: In the last few years, the novel coronavirus, named severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2), generated a large health care problem worldwide. Due to the immunomodulation effect of the virus the number of opportunistic infections has also increased.

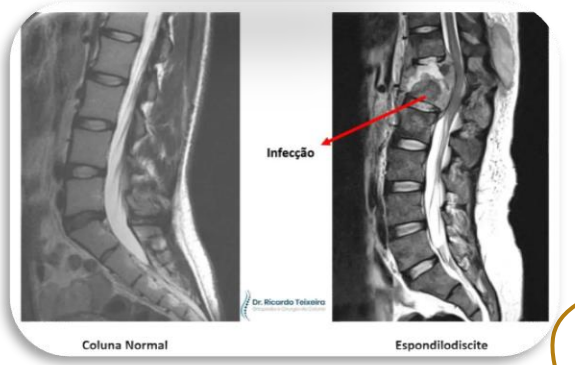
Case presentation: We present the unique case of a patient who was diagnosed with an actinomycotic liver abscess after coronavirus disease 2019 (COVID-19) without the presence of any chronic disease or mucosal injury.

Clinical discussion: According to the results of the computer tomography (CT scan) and the liver biopsy, the patient was treated with antibiotics and ultrasound-guided drainage.

Conclusion: With this case we would like to draw attention to the possible occurrence of liver abscesses caused by an opportunistic pathogen following COVID-19.

Cultibacterium (*Propionibacterium*)

- Bastão em forma de clave
- *Cultibacterium acnes*
- Colonizam pele, conjuntiva, ouvido externo, orofaringe e trato genital feminino
- Acne, infecções relacionadas a próteses (válvulas cardíacas, articulações artificiais, etc), bacteremia e espondilodiscite
  - Acne: Resposta inflamatória no folículo piloso. Bact. libera mediadores quimioatrativos para neutrófilos
  - Espondilodiscite: Processo inflamatório, geralmente infeccioso, que acomete os discos intervertebrais e vertebras associadas



Relato de caso

Contents lists available at ScienceDirect

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

Case report

Cutibacterium acnes: An emerging pathogen in culture negative bacterial prosthetic valve infective endocarditis (IE)

Premalkumar M. Patel [*,1], Nicholas S. Camps [1], Cynthia I. Rivera [1], Isabel Gomez [1], Claudio D. Tuda [1]

Mount Sinai Medical Center, United States

ABSTRACT

Cutibacterium acnes (previously known as *Propionibacterium*) infections are reportedly increasing in patients with implanted foreign material. Though it is a rare cause of bacterial endocarditis, patients with implanted prosthetic valves and devices have potential increased risk. Cutibacterium species are an ubiquitous environmental surface contaminant and typically difficult to culture, in case of high suspicion for infective endocarditis extended duration incubation of blood or any tissue sample and 16S RNA sequencing of any tissue sample is helpful for a microbiological identification. We report a case of a 50 year old male with culture negative prosthetic valve endocarditis in which the pathogen was identified by molecular testing 16S RNA gene sequencing.

Case Report

A Case of Coccidioidal Meningitis With Biofilm Obstructing VP Shunt Due to *Cutibacterium acnes*

Journal of Investigative Medicine High Impact Case Reports
Volume 11: 1–3

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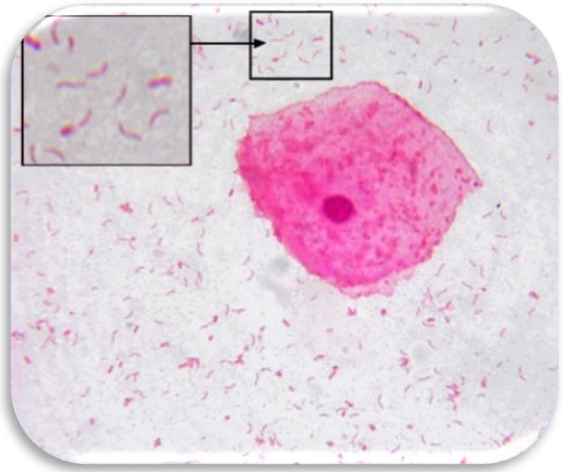
SAGE

Rupam Sharma, MD[1,2], Royce H. Johnson, MD[1,2], Gerard R. David, MD[3], Majid Rahimifar, MD[4], and Arash Heidari, MD[1,2]

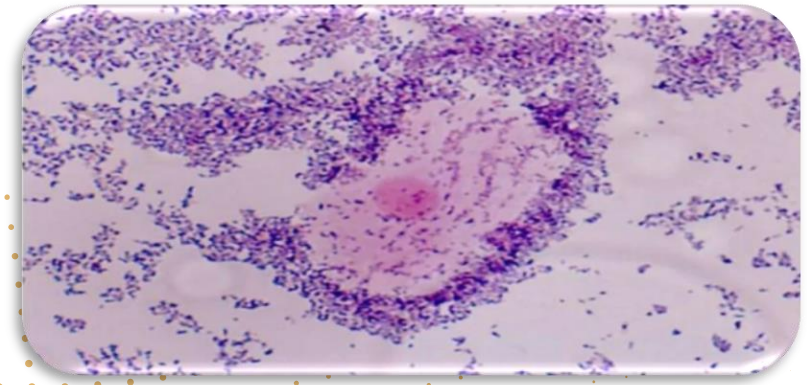
Abstract

Herein described is a case of biofilm obstructing ventriculoperitoneal shunt due to *Cutibacteirum acnes* infection in a patient with coccidioidal meningitis. *Cutibacterium acnes* infects and obstructs cerebral shunts by the production of biofilm; however, diagnosis is usually missed by routine aerobic cultures. Obtaining anaerobic cultures routinely in patients with foreign body implants leading to central nervous system infections could prevent a missed diagnosis of this pathogen. Penicillin G is the first-line treatment.

Mobiluncus



- Bastonetes curvos com extremidades afiladas
- Gram lábil (-)
- Extremamente fastidioso
- *M. curtisii* e *M. mulieres*
- Colonizam trato genital feminino em baixo número, mas aumentam em mulheres com vaginose bacteriana
- Flagelos, toxina citotóxica
- Abcesso umbilical e no couro cabeludo de neonatos, septicemia, ruptura de membranas (parto prematuro e aborto)



Célula epitelial vaginal recoberta de bactéria

Relato de caso

infectious disease reports

MDPI

Case Report

Mobiluncus curtisii Bacteremia: Case Study and Literature Review

Cade Arries * and Patricia Ferrieri

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Abstract: Background: There are few reports of bacteremia caused by *Mobiluncus curtisii* in the literature. We present a review of the literature in addition to a case study. Method: We describe the case of an 82-year-old patient who underwent gastrointestinal surgery and subsequently presented with dehydration, nausea, and hyperkalemia secondary to diarrhea. Further clinical work included blood cultures, and the patient was started empirically on piperacillin/tazobactam. Results: After five days, the blood culture bottle showed growth of a gram-variable, curved rod-shaped organism. After culture under anaerobic conditions on sheep blood agar, the organism was identified as *Mobiluncus curtisii* by MALDI-TOF mass spectrometry and enzymatic technology. A review of the literature reveals five additional cases of *Mobiluncus curtisii* bacteremia. Conclusions: This is the sixth case in the literature describing *Mobiluncus* species bacteremia. This organism is rarely identified in blood culture and is most often thought of in the context of bacterial vaginosis. However, the reported cases of bacteremia show gastrointestinal symptoms and presumed gastrointestinal source of infection. The pathogenesis of infection of this organism requires further investigation.

Keywords: *Mobiluncus curtisii*; bacteremia; microbiology; anaerobic; blood culture

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ORIGINAL RESEARCH
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Genomic Insights Into the Interspecific Diversity and Evolution of *Mobiluncus*, a Pathogen Associated With Bacterial Vaginosis

*Yisong Li, Ying Wang and Jie Liu**

School of Public Health, Qingdao University, Qingdao, China

Bacterial vaginosis (BV) is a common vaginal infection and has been associated with increased risk for a wide array of health issues. BV is linked with a variety of heterogeneous pathogenic anaerobic bacteria, among which *Mobiluncus* is strongly associated with BV diagnosis. However, their genetic features, pathogenicity, interspecific diversity, and evolutionary characters have not been illustrated at genomic level. The current study performed phylogenomic and comparative genomic analyses of *Mobiluncus*. Phylogenomic analyses revealed remarkable phylogenetic distinctions among different species. Compared with *M. curtisii*, *M. mulieris* had a larger genome and pangenome size with more insertion sequences but less CRISPR-Cas systems. In addition, these two species were diverse in profile of virulence factors, but harbored similar antibiotic resistance genes. Statistically different functional genome profiles between strains from the two species were determined, as well as correlations of some functional genes/pathways with putative pathogenicity. We also showed that high levels of horizontal gene transfer might be an important strategy for species diversification and pathogenicity. Collectively, this study provides the first genome sequence level description of *Mobiluncus*, and may shed light on its virulence/pathogenicity, functional diversification, and evolutionary dynamics. Our study could facilitate the further investigations of this important pathogen, and might improve the future treatment of BV.

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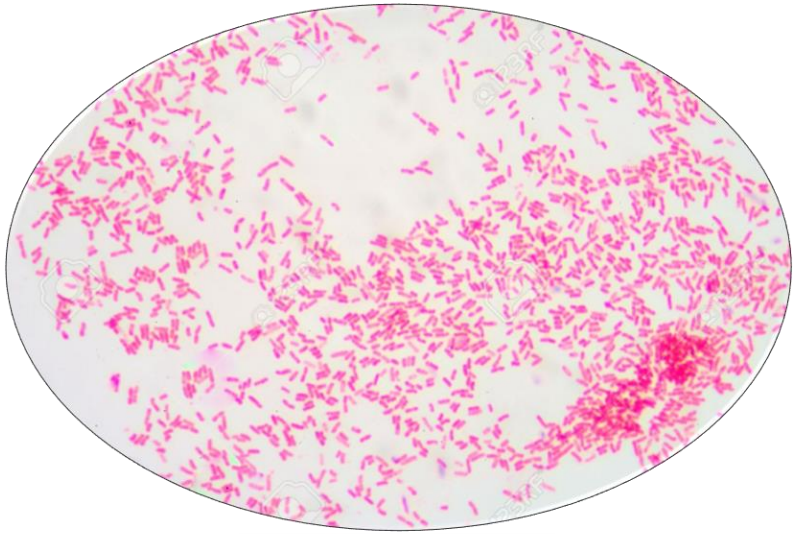
Bactérias anaeróbias gram negativas

Gram -

Não esporulado

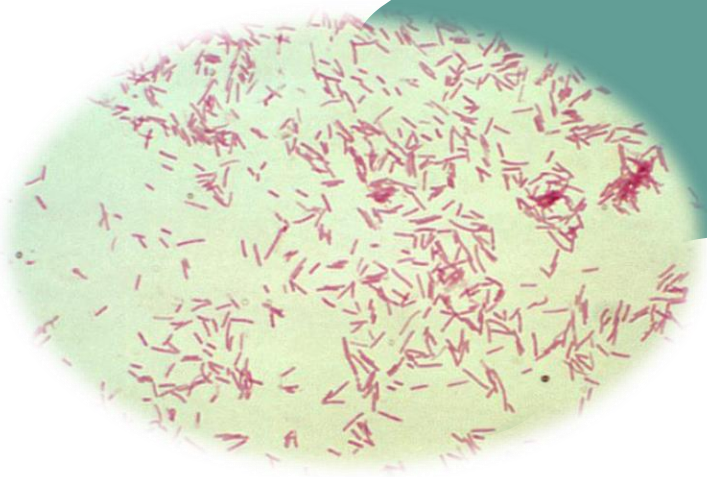
Bacteroides
Fusobacterium
Porphyromonas
Prevotella
Veillonela



Gram negativos anaeróbios

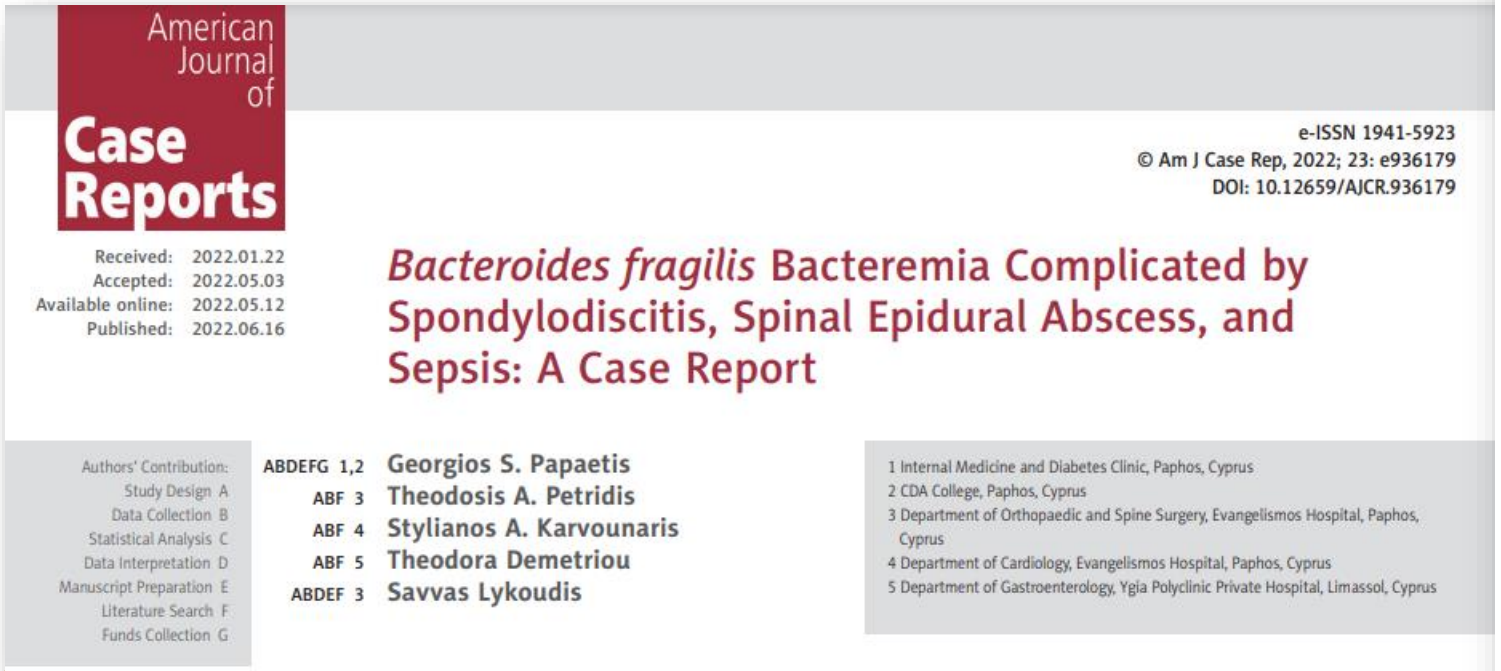
- Colonizam trato respiratório superior, TGI e trato geniturinário
- Muito abundantes
- Infecções introduzidas por trauma
- Rico arsenal enzimático
- Infecções crônicas de seios paranasais, ouvido interno, infecções periodontais. Abcessos cerebrais, infecções intra-abdominais, infecções ginecológicas, septicemias, gastroenterites, infecções de pele e tecidos moles, infecções dentárias.
- Secreção fétida e formação de abcessos são características típicas

Bacteroides



- Uma das bactérias mais abundantes no intestino
- Bastão gram -, Pleomórfico (formas maiores e menores)
- *B. fragilis*
- Bacteremia, endocardite, infecções pulmonares, intra-abdominais
- Principal anaeróbio relacionado a septicemia (+-40%)
- Cresce rapidamente em cultura
- LPS com pouca ou nenhuma atividade endotóxica
- FV: Cápsula, fímbria, ác. graxos de cadeia curta produzidos durante o crescimento anaeróbio inibem a fagocitose, toxina enterotoxigênica – quadros de diarreia assossiada a bacteroides

Relato de caso



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Bacteroides fragilis Bacteremia Complicated by Spondylodiscitis, Spinal Epidural Abscess, and Sepsis: A Case Report

Authors' Contribution:
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Data Collection B
Statistical Analysis C
Data Interpretation D
Manuscript Preparation E
Literature Search F
Funds Collection G

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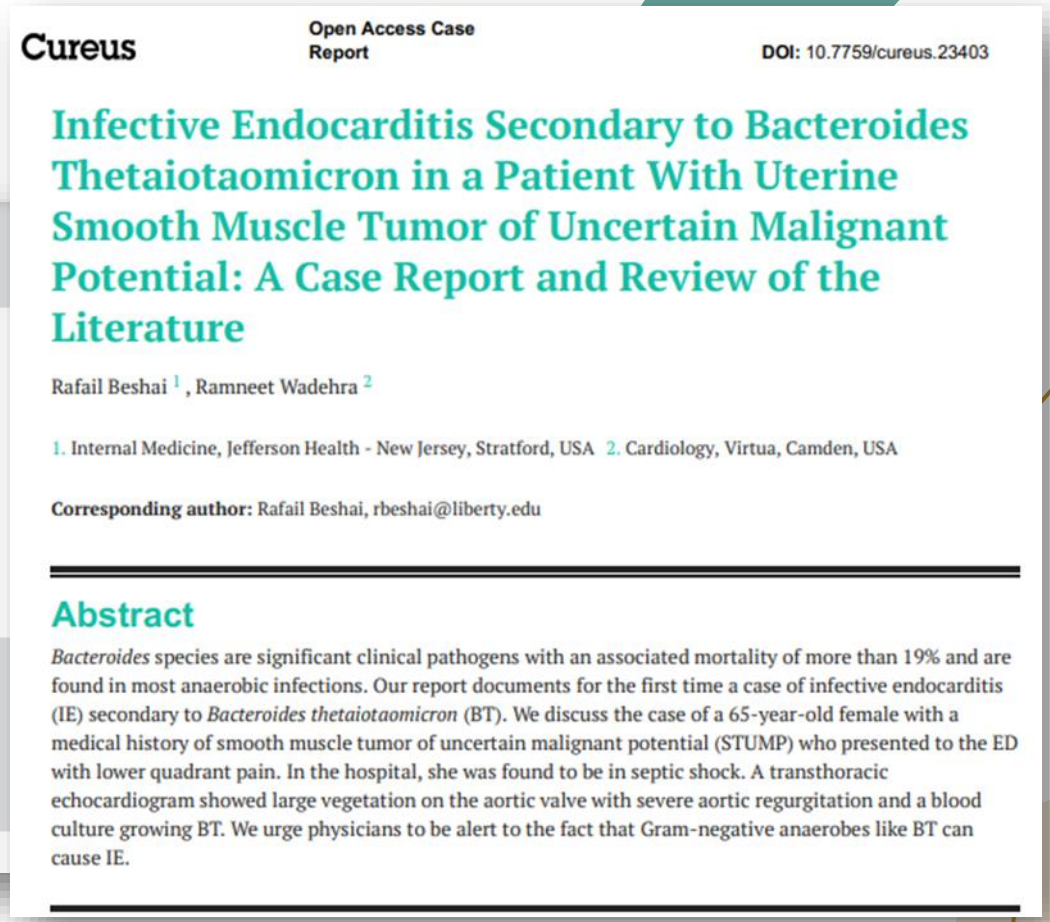

Cureus

Open Access Case Report

DOI: 10.7759/cureus.23403

Infective Endocarditis Secondary to Bacteroides Thetaiotaomicron in a Patient With Uterine Smooth Muscle Tumor of Uncertain Malignant Potential: A Case Report and Review of the Literature

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Abstract

Bacteroides species are significant clinical pathogens with an associated mortality of more than 19% and are found in most anaerobic infections. Our report documents for the first time a case of infective endocarditis (IE) secondary to *Bacteroides thetaiotaomicron* (BT). We discuss the case of a 65-year-old female with a medical history of smooth muscle tumor of uncertain malignant potential (STUMP) who presented to the ED with lower quadrant pain. In the hospital, she was found to be in septic shock. A transthoracic echocardiogram showed large vegetation on the aortic valve with severe aortic regurgitation and a blood culture growing BT. We urge physicians to be alert to the fact that Gram-negative anaerobes like BT can cause IE.

Fusobacterium

- Bacilos gram negativos delgados em forma de bastonetes com extremidades pontiagudas
- Cavidade oral, trato genital, gastrointestinal e respiratório superior
- Abscessos, infecções de orofaringe, feridas, pulmonares e intracraniais
- *F. necrophorum* e *F. nucleatum*

Relato de caso

Cureus

Open Access Case Report

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Fusobacterium Necrophorum Septicemia Secondary to an Ovarian Abscess: A Case Report

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Abstract

Fusobacterium necrophorum is part of the normal oropharyngeal flora and can result in a life-threatening systemic infection known as Lemierre's syndrome. A rare presentation of *F. necrophorum* infection is seen in the female genital tract and is typically due to obstetric infections. Here we present a unique case of *F. necrophorum* without traditional features of Lemierre's syndrome with the female genital tract as a primary site.

A 50-year-old female presents with a two-month history of nausea, vomiting, abdominal pain, and weight loss. She ultimately developed bilateral lower extremity necrotizing fasciitis, colonic perforation, and a left chest wall abscess. Blood and wound cultures were found to be positive for *Fusobacterium necrophorum*. Imaging revealed a left ovarian mass along with a left upper lobe nodule. She had no history of oropharyngeal infections or symptoms. Imaging was also negative for deep neck space abscesses or thrombophlebitis. The patient was treated with ceftriaxone and metronidazole and clinically improved. In conclusion, *F. necrophorum* is a potentially life threatening infection and should be considered when dealing with ovarian abscesses or masses.

JOURNAL OF MEDICAL MICROBIOLOGY

Volume 71, Issue 9

Research Article

Peritonsillar abscess: an 8-year retrospective, culture based evaluation of 208 cases

Zsolt Bella[1], Eszter Erdelyi[1], Ágnes Szalenko-Tőkés[1], Ágnes Kiricsi[1], Veronika Gaál[2], Pálma Benedek[3], László Rovó[1], Elisabeth Nagy[4]

View Affiliations

Published: 14 September 2022 | **https://doi.org/10.1099/jmm.0.001576**

Introduction. Peritonsillar abscess (PTA) is a common infection which requires surgical intervention and suitable antibiotic therapy.

Hypotheses/Gap Statement. Beside *Streptococcus pyogenes* and *Fusobacterium necrophorum* several other mostly anaerobic bacteria can be cultured from the properly taken pus samples of PTA, the clinical significance of which is still not fully understood.

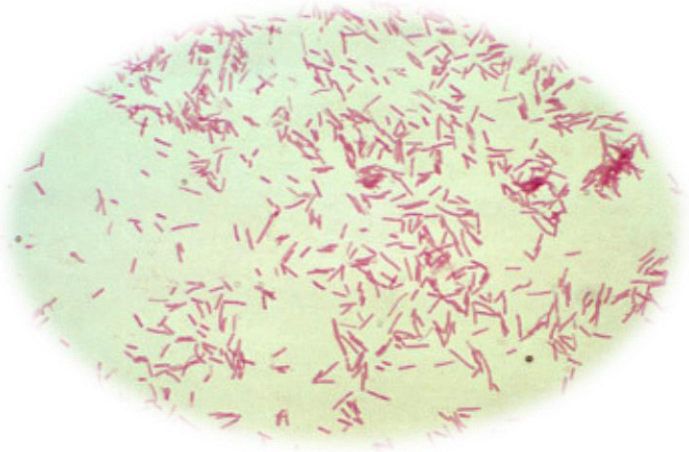
Aim. This study focused on the culture-based microbiological evaluation of PTA cases, compared to surgical intervention and empirical antibiotic management.

Methodology. A retrospective analysis of PTA cases was performed between 2012 and 2019. Data about the aerobic and anaerobic culture results of the samples taken during different surgical interventions were summarized and the coverage of the empirically selected antibiotics was evaluated. The patient's history, the development of complications and the recurrence rate were also evaluated.

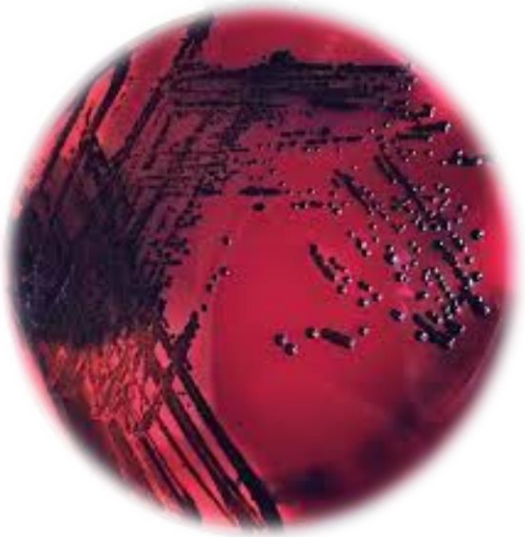
Results. The microbiological culture results were available for 208 of 320 patients with clinically diagnosed PTA. Incision and drainage (I and D) and immediate tonsillectomy were the leading surgical interventions. Ninety-five *Fusobacterium* species (including 44 *Fusobacterium necrophorum*), 52 *Actinomyces* species and 47 *Streptococcus pyogenes* were obtained from PTA samples alone or together with polymicrobial flora. *S. pyogenes* (33.7%, *n*=28) and *F. necrophorum* (22.9%, *n*=19) were the dominating pathogens in the 83 monobacterial PTA samples. In >60% of the patients polymicrobial infection was demonstrated, involving a great variety of anaerobic bacteria. In 22 out of 42 cases where intravenous cefuroxime was empirically started, the therapy should be changed to properly cover the culture-proven anaerobic flora. There were no serious complications, abscess recurrence was detected in two cases (0.96%).

Conclusion. PTAs are often polymicrobial infections including a great variety of anaerobes. Targeted antibiotic therapy, in conjunction with adequate surgical drainage eliminating the anaerobic milieu, can accelerate the healing process and radically reduce the complication and recurrence rate.

Porphyromonas



- Bacilo gram negativo
- Colónias escuras em ágar sangue
- Periodontite e pneumonia de aspiração
- *Porphyromonas gingivalis*



Detection and comparison of prevalence of *Porphyromonas gingivalis* through culture and Real Time-polymerase chain reaction in subgingival plaque samples of chronic periodontitis and healthy individuals

Preeti Ingalagi[1], Kishore G Bhat[1], R. D. Kulkarni[2], Vijayalakshmi S. Kotrashetti[3], Vijay Kumbar[1], Manohar Kugaji[1]

[1]Department of Microbiology, Mandal's Nathajirao G. Halgekar Institute of Dental Sciences and research Centre, Belgaum, [2]Department of Microbiology, SDM Medical College, Dharwad, [3]Department of Oral Pathology and Microbiology, Maratha Mandal's NGH Institute of Dental Sciences and Research Centre, Belgaum, Karnataka, India

Abstract

Introduction: The micro-flora of oral cavity is a myriad of micro-organism. Any infection of oral cavity leads to diseased condition which is a transitional transformation of the micro-organism in a specific paradigm depending upon the diseased condition. Periodontitis is one of the predominant chronic diseases which is a multifactorial infection. *Porphyromonas gingivalis* is a key etiological agent in causing periodontitis. To study the predominance of these bacteria in the diseased condition is important to detect, quantify and to find its efficacy by comparing different methods for identification.

Aim and Objectives: The aim of the study is to determine the prevalence of *P. gingivalis* by anerobic culture and by real-time polymerase chain reaction (PCR) from subgingival plaque samples of chronic periodontitis and healthy individual and to compare efficacy of two methods.

Materials and Methods: A total of 400 subjects were considered, and subgingival plaque was collected using paper points. Individual were equally divided into two groups: chronic periodontitis (200) and healthy individuals (200). Each plaque sample collected was divided into two aliquots of which the first aliquot was subjected for anerobic culture to isolate *P. gingivalis*. Phenotypical identification was done morphologically and biochemically further quantification of *P. gingivalis* was done by colony-forming unit. The second aliquot was subjected for DNA extraction and real-time PCR was conducted to detect and quantify *P. gingivalis* using specific primer.

Results: Out of 400 samples, 73% showed detection of *P. gingivalis* by culture method and through reverse transcription-PCR (RT-PCR), the detection was 75%. Individual detection of *P. gingivalis* by culture in chronic periodontitis was 89.5% and 54.4% in healthy individuals, while detection by RT-PCR was found to be 91.5%

Prevotella

- *Bacteroides melaninogenicus -> Prevotella melaninogenica* e *Prevotella intermedia*
- Microbiota do trato respiratório superior, vaginal e intestinal
- Infecções de tecido mole e intra-abdominais

Prevotella melaninogenica

JOURNAL ARTICLE

Prevotella merdae sp. nov., a new bacterial species isolated from human faeces

Get access >

Mossaab Maaloum, Pamela Afouda, Cheikh Ibrahima Lo, Gregory Dubourg, Thi Tien Nguyen, Anthony Levasseur, Rachid Saile, Didier Raoult, Pierre-Edouard Fournier ✉

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Abstract

Strain Marseille-P4119^T was isolated from a faecal sample of a healthy 32-year-old faecal transplant donor. The bacterium was anaerobic, Gram-negative, rod-shaped, non-motile, and did not produce spores. We studied its phenotypic characteristics and sequenced its whole genome. The major fatty acids were $C_{15:0anteiso}$ and $C_{15:0iso}$. The final genome assembly was 3912650 bp long with a 44.4 mol% G + C content, 3094 protein-coding genes and 74 RNA genes. Strain Marseille-P4119^T exhibited a 97.10% 16S rRNA sequence identity and a 29.0% dDDH with *Prevotella stercorea* CB35^T, OrthoANI values ranged from 68.5% with *Prevotella enoeca* to 77.4% with *Prevotella stercorea*, the phylogenetically closest bacterial species with standing in nomenclature. Based on the phylogenetic, phenotypic and genomic analyses, we propose the creation of the novel species *Prevotella merdae* sp. nov. The type strain is Marseille-P4119^T (= CSUR P4119^T = CECT 9566^T).

antibiotics

MDPI

Article

Antibiotic Susceptibility and Resistance Genes in Oral Clinical Isolates of *Prevotella intermedia*, *Prevotella nigrescens*, and *Prevotella melaninogenica*

Yormaris Castillo [1], Nathaly Andrea Delgadillo [1], Yineth Neuta [1], Andrés Hernández [2], Tania Acevedo [2], Edwin Cárdenas [2], Andrea Montaño [2], Gloria Inés Lafaurie [1] and Diana Marcela Castillo [1,*]

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Abstract: The *Prevotella* genus is a normal constituent of the oral microbiota, and is commonly isolated from mechanically treated polymicrobial infections. However, antibiotic treatment is necessary for some patients. This study compared the antibiotic susceptibility and the presence of resistance genes in clinical oral isolates of *P. intermedia*, *P. nigrescens*, and *P. melaninogenica*. Antibiotic susceptibility was assessed using the agar dilution method. PCR confirmed the species and resistance gene frequency in the *Prevotella* species. The frequencies of species *P. intermedia*, *P. nigrescens*, and *P. melaninogenica* were 30.2%, 45.7%, and 24.1%, respectively. No isolates of *P. intermedia* were resistant to amoxicillin/clavulanic acid, tetracycline, or clindamycin. *P. nigrescens* and *P. melaninogenica* were resistant to amoxicillin/clavulanic acid and tetracycline at frequencies of 40% and 20%, respectively. *P. intermedia* was resistant to metronidazole at a frequency of 30%, *P. nigrescens* at 20%, and *P. melaninogenica* at 40%. *P. nigrescens* and *P. melaninogenica* were resistant to 50% and 10% clindamycin, respectively. The gene most frequently detected was *tetQ*, at 43.3%, followed by *tetM* at 36.6%, bla_{TEM} at 26.6%, *ermF* at 20%, *cfxA*, $cfxA_2$, and *nimAB* at 16.6%, and *nimAEFI* at 3.3%. *P. nigrescens* was the species with the highest resistance to antibiotics such as amoxicillin/clavulanic acid, amoxicillin, and clindamycin, in addition to being the species with the largest number of genes compared to *P. intermedia* and *P. melaninogenica*.

check for updates

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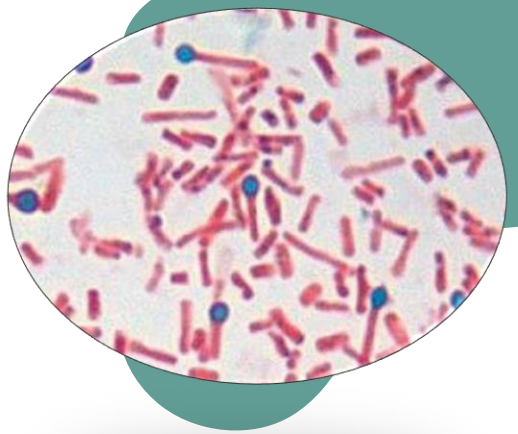
Clostridium tetani



- Bacilo anaeróbio estrito formador de esporos
- Presente no solo
- Ferida profunda
- Tétano – Neurotoxina – bloqueia inibidores de neurotransmissores – rigidez e espasmos
- Mortalidade pode chegar a 90% sem tratamento
- Tétano relacionado a ferida ocorre geralmente em idosos
- Vacina (Td) – contra as toxinas
  - Aos 2, 4, 6, 12-18 meses de idade, e aos 4-6, 11-12 anos de idade com reforço a cada 10 anos

Relato de caso

Neonatal and postneonatal tetanus at a referral hospital in Kamsar, Guinea: a retrospective audit of paediatric records (2014–2018)

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Background: Tetanus is a vaccine-preventable disease caused by the bacterium *Clostridium tetani*. In 2018, all of Guinea was considered to be at risk of the disease and the country is currently in the elimination phase.

Methods: A 5-y audit (1 January 2014–31 December 2018) of all admissions to the neonatal and general paediatric units of Kamsar Hospital (Western Guinea) was undertaken to identify cases of neonatal tetanus (NNT) and postneonatal tetanus (PNNT).

Results: There were 5670 admissions during the study period, of which 39 (0.7%) were due to tetanus (22 NNT and 17 PNNT). Among NNT patients, the bacterial entry site was the umbilical cord (n=20) or wound following circumcision (n=2). For PNNT, the entry site was surface wound (n=12), limb fracture (n=1) or could not be established (n=4). A majority of the patients (36/39, 92.3%) were born to unvaccinated mothers or those who received suboptimal vaccination during pregnancy. Overall, 21 (53.8%) children died within 7 d of admission with a higher mortality observed among neonates (16/22, 72.7%) compared with postneonates (5/17, 29.4%).

Conclusions: Tetanus was a rare cause of admission at Kamsar Hospital with a very high case fatality rate. The disease primarily occurred among children born to mothers who were unvaccinated/inadequately vaccinated during pregnancy.

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Case Report

Tetanus; a forgotten infection disease: a report of two cases

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ABSTRACT

Background. Tetanus is an infectious disease that can be seen in all age groups in underdeveloped and developing countries, where vaccination programs are inadequate. In developed countries, it is reported more frequently in the adult age group, where the protection of vaccination is diminished and the doses are delayed.

Case. In this report, we present generalized tetanus, which was observed in two male patients aged 12 and 6 years, admitted at different times, together with clinical course and treatment approaches. Both patients belong to different nationalities, who immigrated a couple of months before their application to our hospital. They applied with similar histories and complaints and were not vaccinated during infancy.

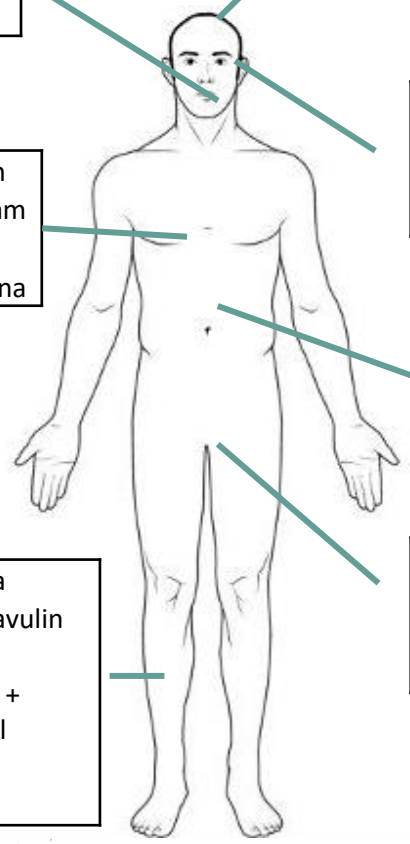
Conclusion. With the development of vaccination programs, this disease with high morbidity and mortality can be prevented.

Terapêutica

Infecções periodontais	Actinomyces spp. Microbiota oral	Amoxicilina + Clavulin Clindamicina
Gengivite	*Fusobacterium spp.*	Amoxicilina

Pneumonia	*Prevotella spp.* *Porphyromonas spp.* *Fusobacterium spp.* *Peptostreptococcus spp.*	Amoxicilina + Clavulin Piperaciclina-tazobactam Carbapenêmico Clindamicina + quinolona

Pele e tecidos moles	*B. fragilis* *Clostridium spp.* *Prevotella spp.* *Porphyromonas spp.* *Fusobacterium spp.* *Peptostreptococcus spp.*	Clindamicina Amoxiciclina + clavulin Tigeciclina Metronidazol + cotrimoxazol



Abcesso cerebral	*Bacteroides spp.* *C. perfringes* *Fusobacterium spp.* *Peptostreptococcus spp.* *Porphyromonas spp.* *Prevotella spp.*	Metronidazol + Penicilina G
Meningite	Microbiota da pele *C. perfringes*	Penicilina Vancomicina

Otite média	*Peptostreptococcus spp.* *C. acnes* *Bacilos anaeróbios Gram-*	Clindamicina Amoxicilina + Clavulin Metronidazol + Macrolídeo Cefoxitina

Intra abdominais	*B. fragilis* *Peptostreptococcus spp.* *Clostridium spp.* *Fusobacterium spp.*	Piperaciclina-tazobactam Tigeciclina Carbapenêmico Metronidazol + quinolona

Trato genital	*Prevotella spp.* *Peptostreptococcus spp.* *Porphyromonas spp.* *Clostridium spp.*	Clindamicina + aminoglicosídeo Metronidazol + doxiciclina Amoxicilina + Clavulin + doxicilina

Conclusões

- Aumento do conhecimento sobre a grande variedade de bactérias anaeróbias que convivem com humanos (infecções graves) -> Rotina laboratorial desafiadora
- Fornecer excelentes condições de cultura (meio e ambiente anaeróbio)
- Diagnóstico - Patógenos x microbiota comensal nas superfícies das mucosas
- Papel do clínico – Suspeita de anaeróbio; Coleta adequada.

Conclusões

- A aplicação de métodos avançados de diagnóstico (DNA e proteínas), cria a necessidade de mudanças taxonômicas
  - Novos nomes de anaeróbios como *Clostridioides* (*Clostridium*) *difficile* ou *Cutibacterium* (*Propionibacterium*) acnes e os recentemente descritos como patógenos isolados de locais normalmente estéreis do corpo (como *Bacteroides dorei*, *Oscillibacter ruminantium*, *Robinsoniella peoriensis* , *Ruminococcus gnavus*, *Sneathia sanguinegens*, *Solobacterium moorei*, *Turicibacter sanguinis*, etc.)

- Vacinas

Obrigada!

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