

Gram-negatív Pyogen Coccusok és Pálcák

Füzi Miklós

Neisseria, Haemophilus, Bordetella

1. Neisseria

Pyogen Coccusok GRAM -

Aerob: Oxidase +

Neisseria

N. gonorrhoeae

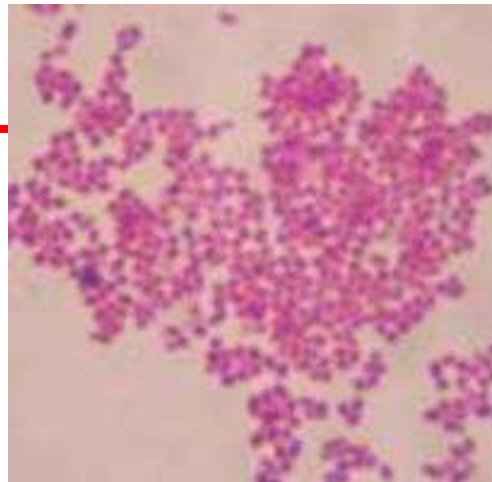
N. meningitidis

egyebek (N. sicca, N. subflava, N. flavescens és
apathogen fajok)

Moraxella

M. catarrhalis

Anaerob:



Veillonella spp.

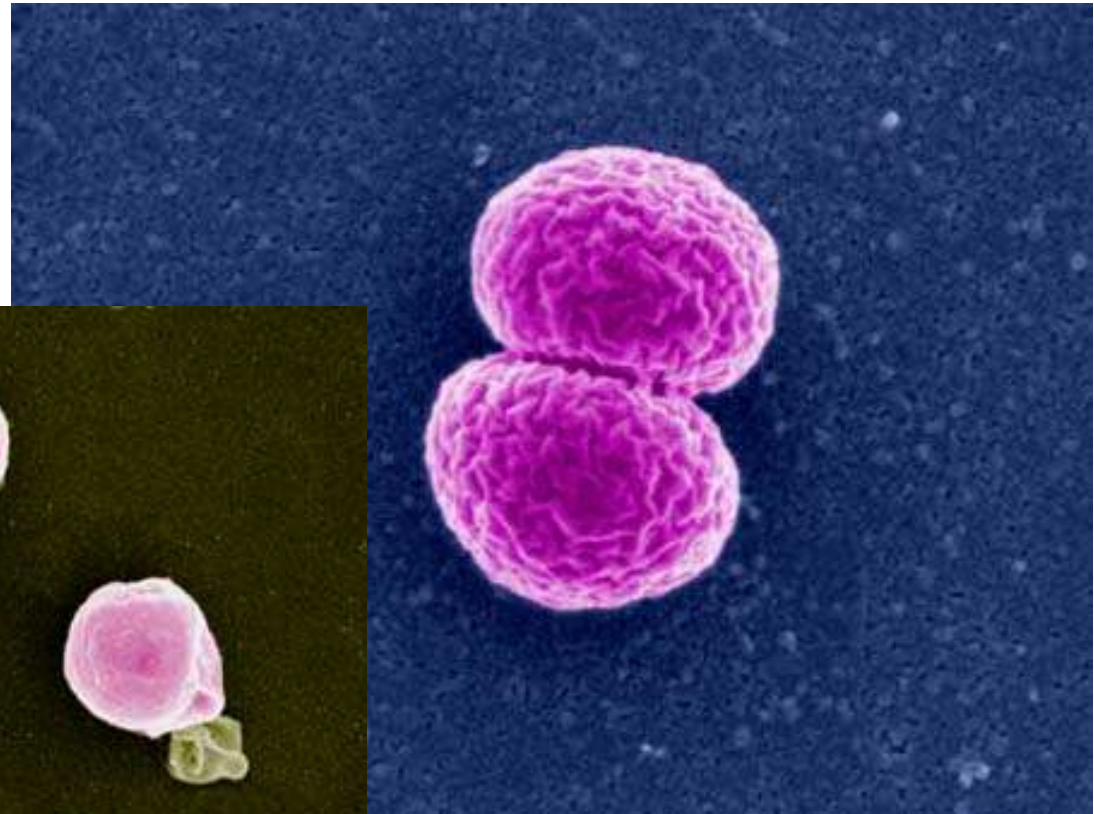
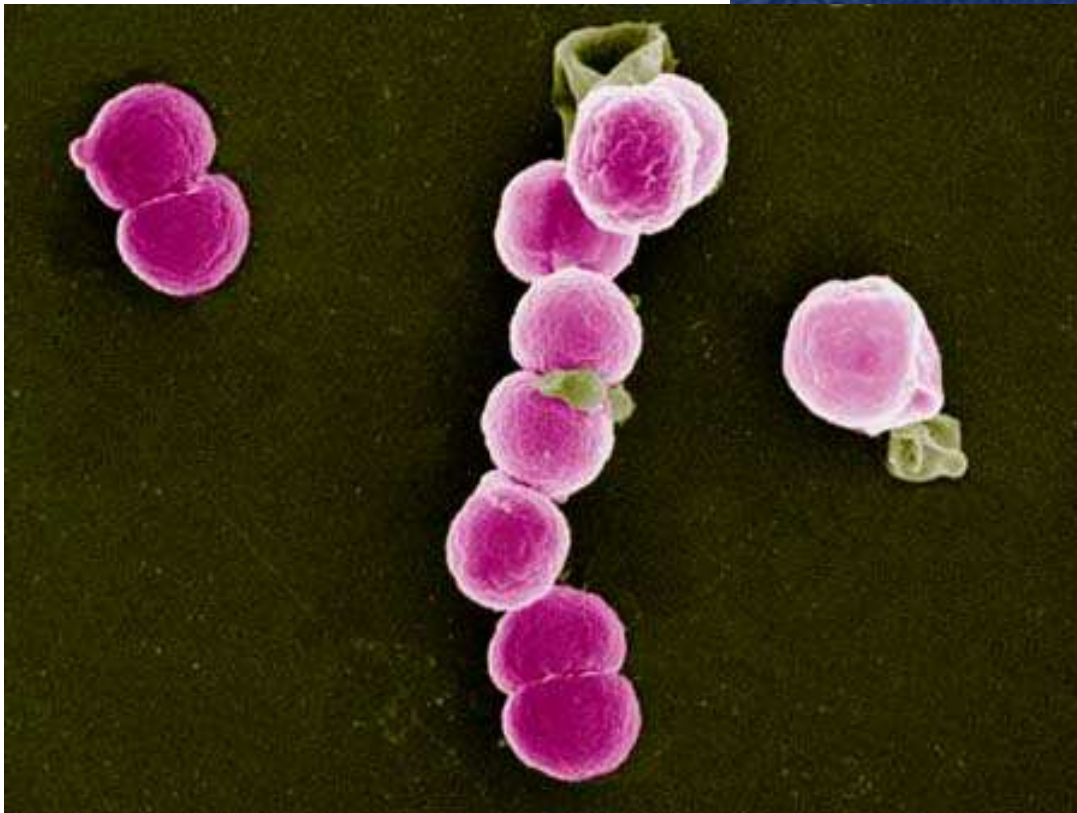
Veillonellae vietsciences.free.fr

N. gonorrhoeae és N. meningitidis

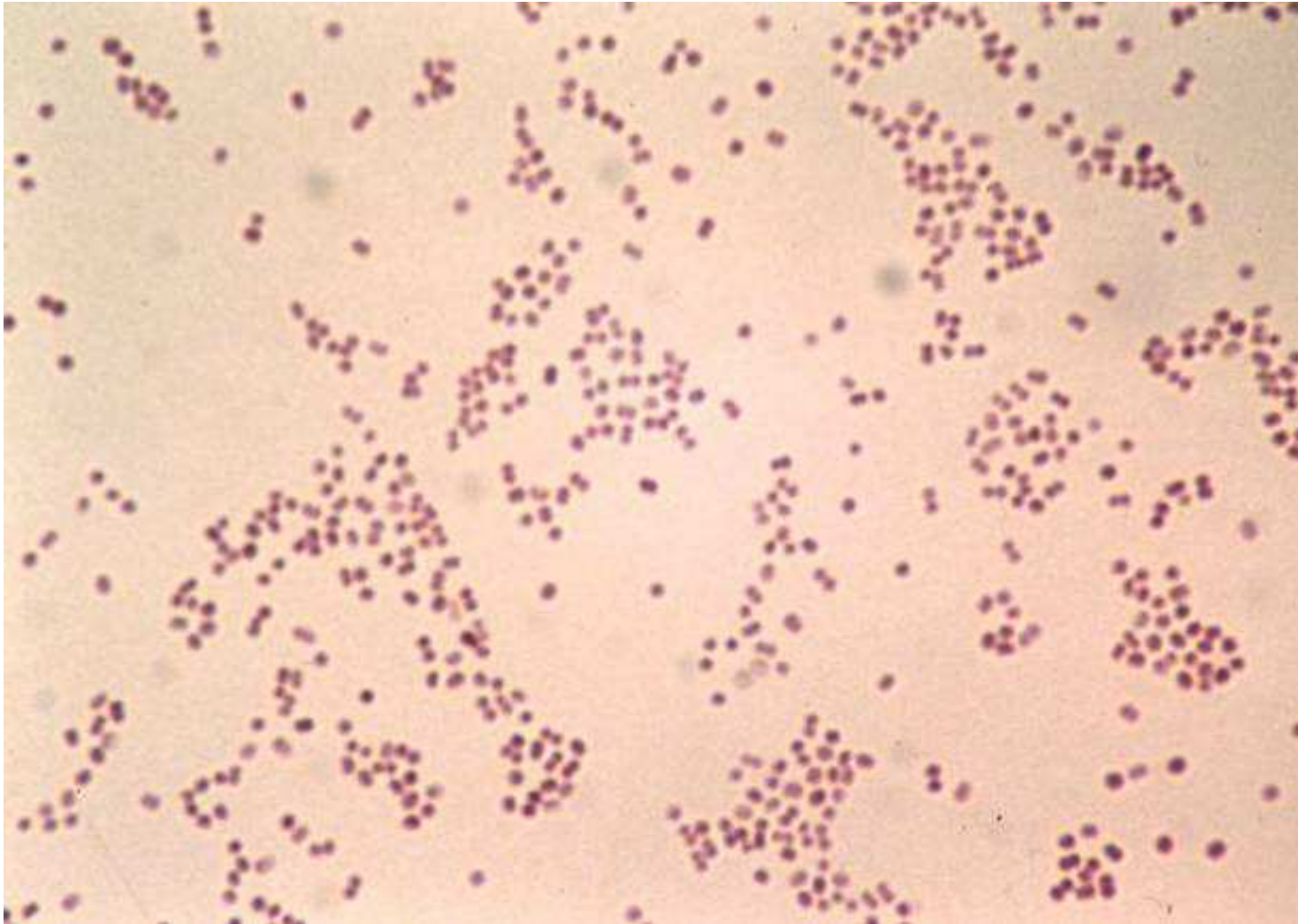
Morphologia

Gram-negatív

Diplococcus



Gram-negativ Diplococcusok



N. gonorrhoeae és N. meningitidis

Tenyésztés:

Speciális, (Csokoládé agar, 5-10% CO₂)

Rezisztencia:

Érzékenyek, kiszáradásra, hőre, dezinficiensekre, antibiotikumokra

Oxidase +



Microscopic Pictures Of Neisseria (Gram-negative Diplococci)

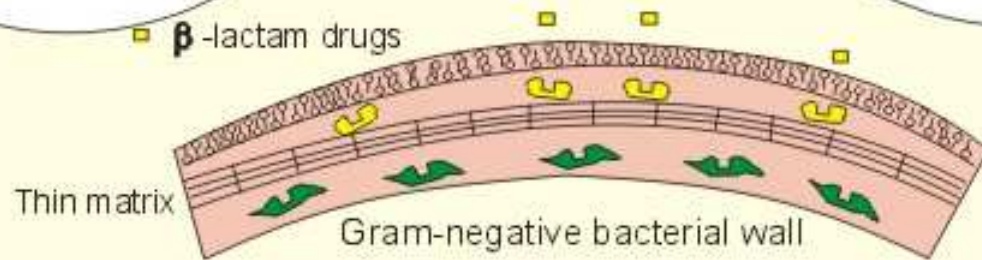
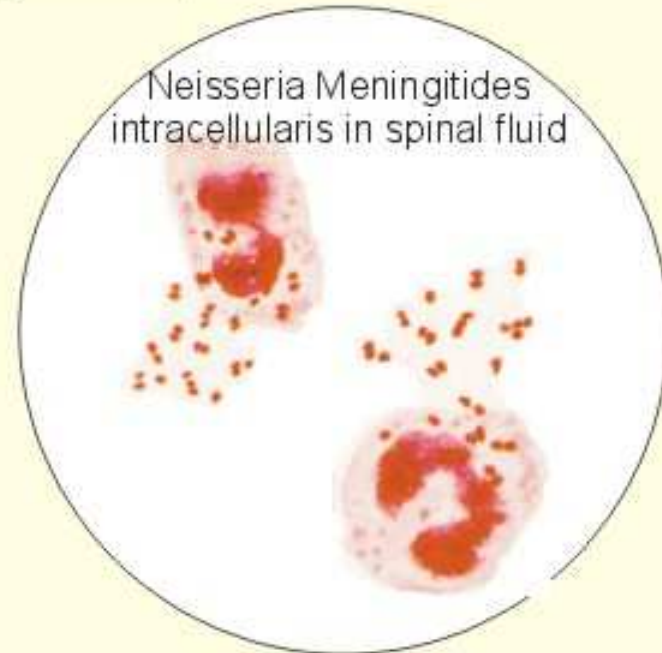
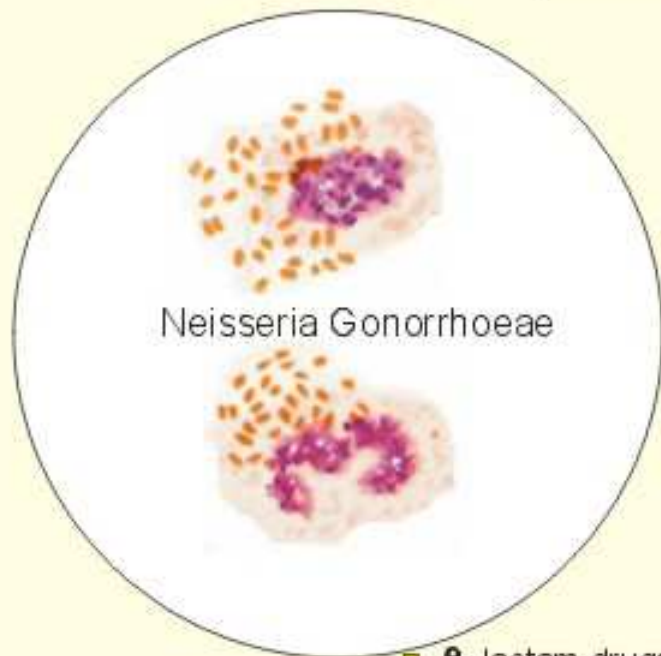


Fig. 33-3

KMc

N. gonorrhoeae = Gonococcus

Antigének és Virulenciafaktorok:

Pili/Fimbriae (Antigen variációk!)

IgA-Protease-ok!

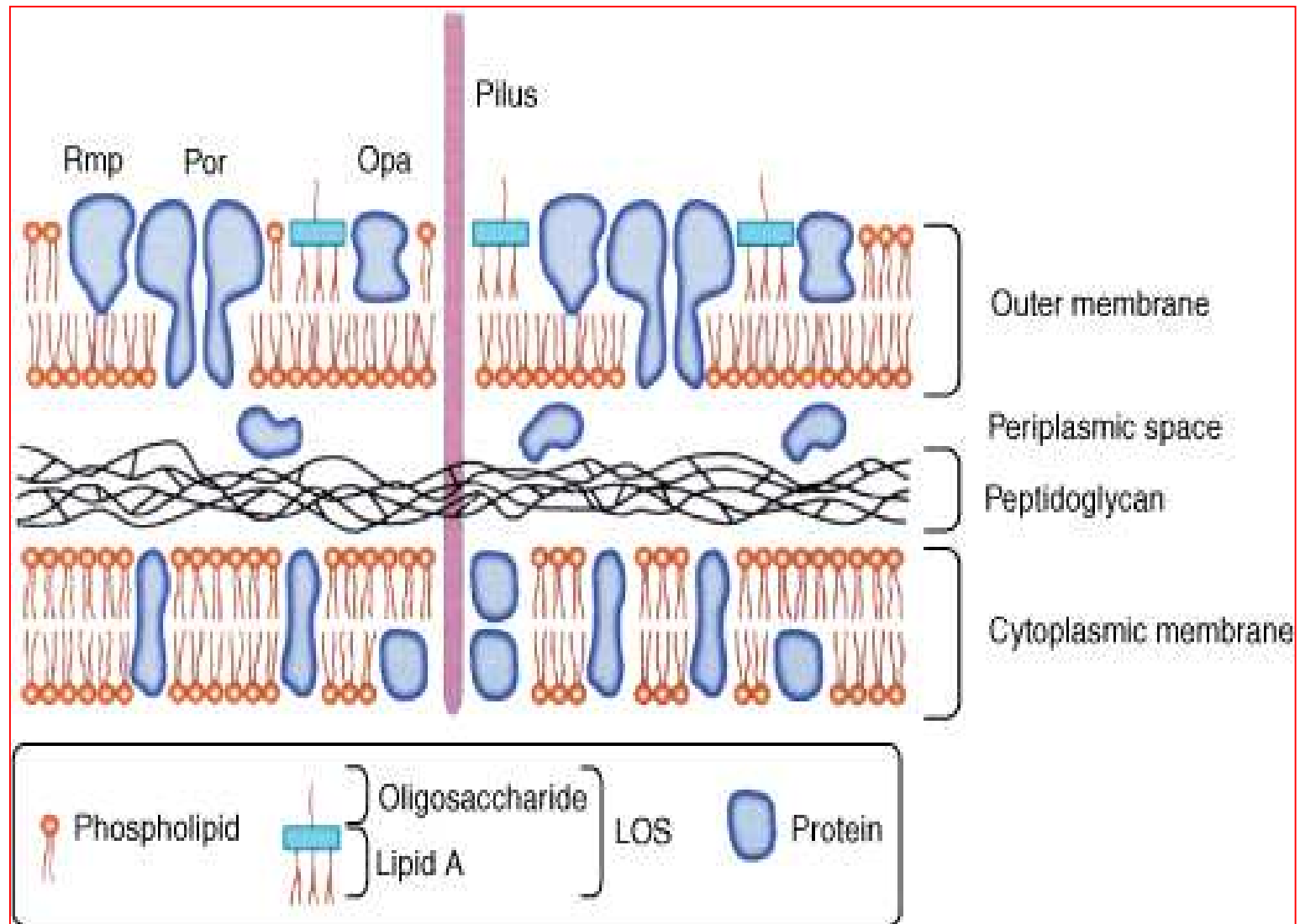
outer membrane proteins (OMP)

(Antigen variációk!)

LOS (Mimikri!)

Sejtfal Peptidoglycan (Toxikus hatás)

N. gonorrhoeae = Gonococcus

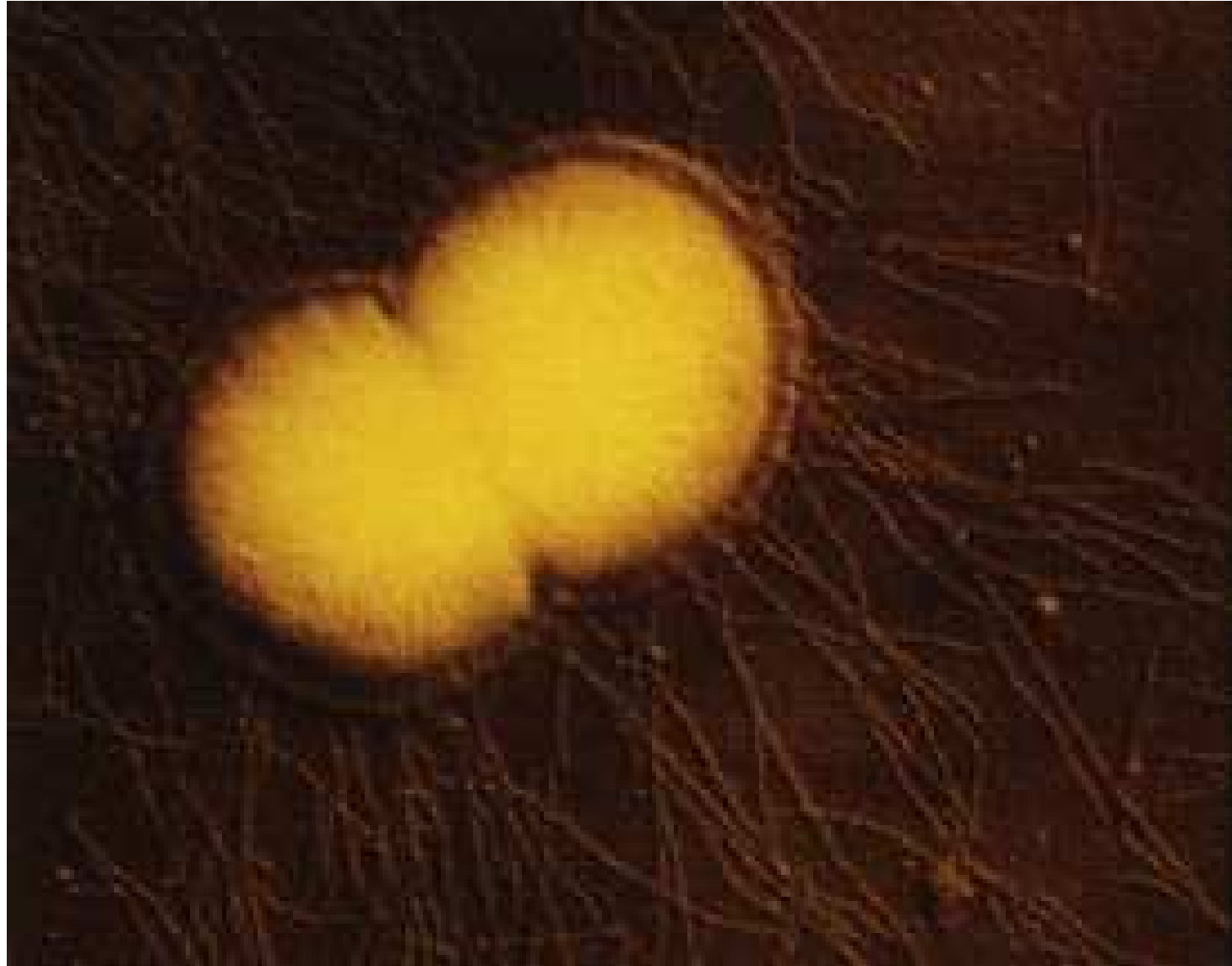


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N. gonorrhoeae = Gonococcus

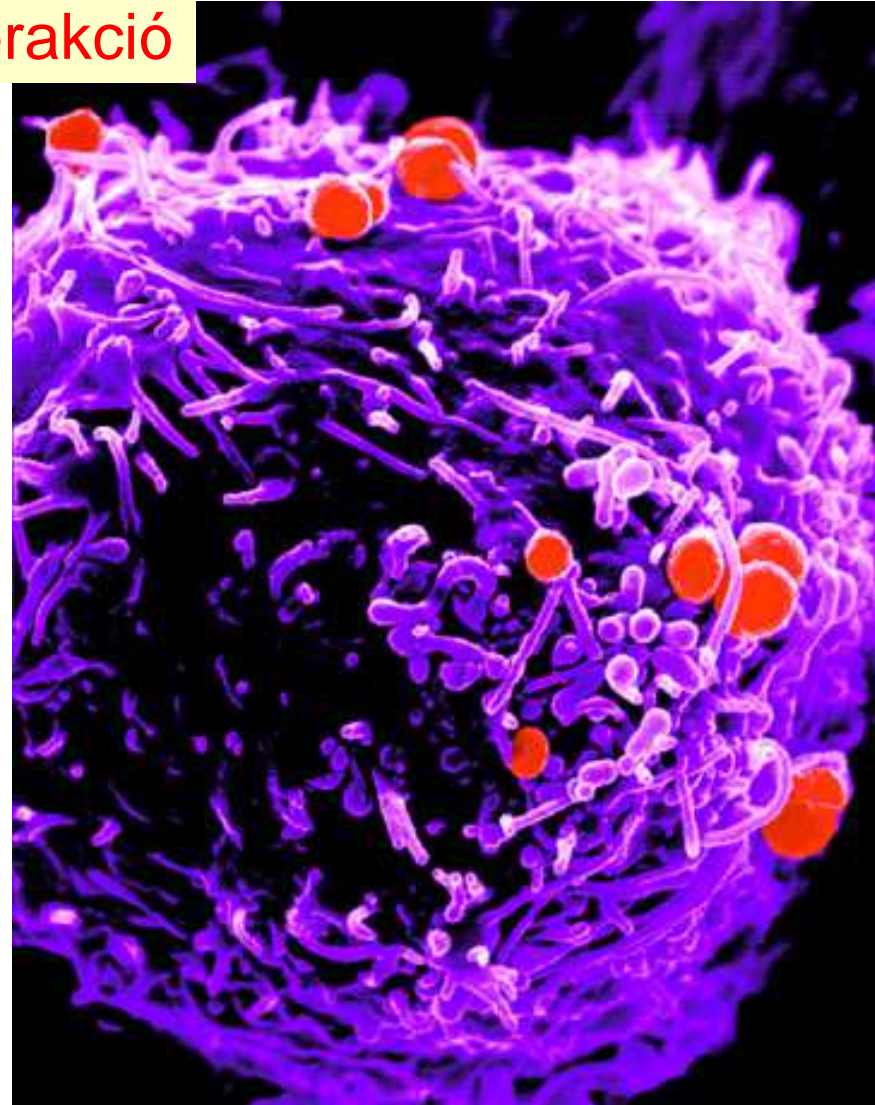
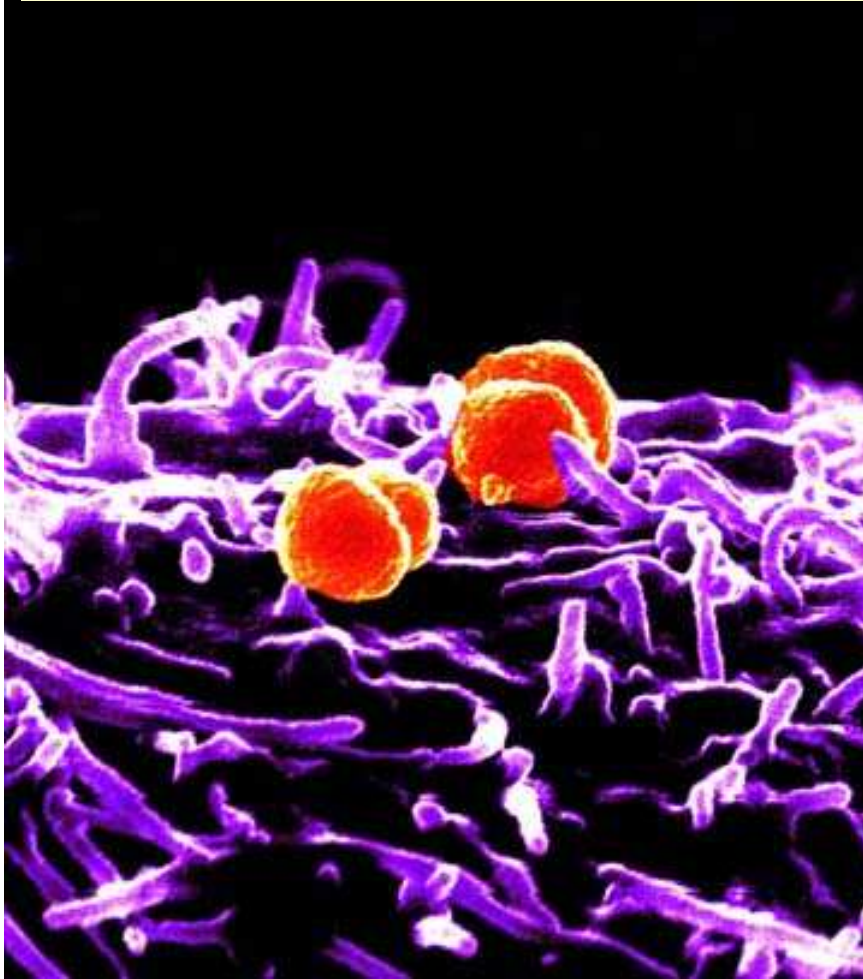
Pili

textbookofbacteriology.net



N. gonorrhoeae = Gonococcus

Gonococcus-Lymphocyta Interakció



N. gonorrhoeae = Gonococcus

Fertőzés forrása

beteg emberek

Átvitel

- Direkt (szexuális) Kontaktus

Kórképek

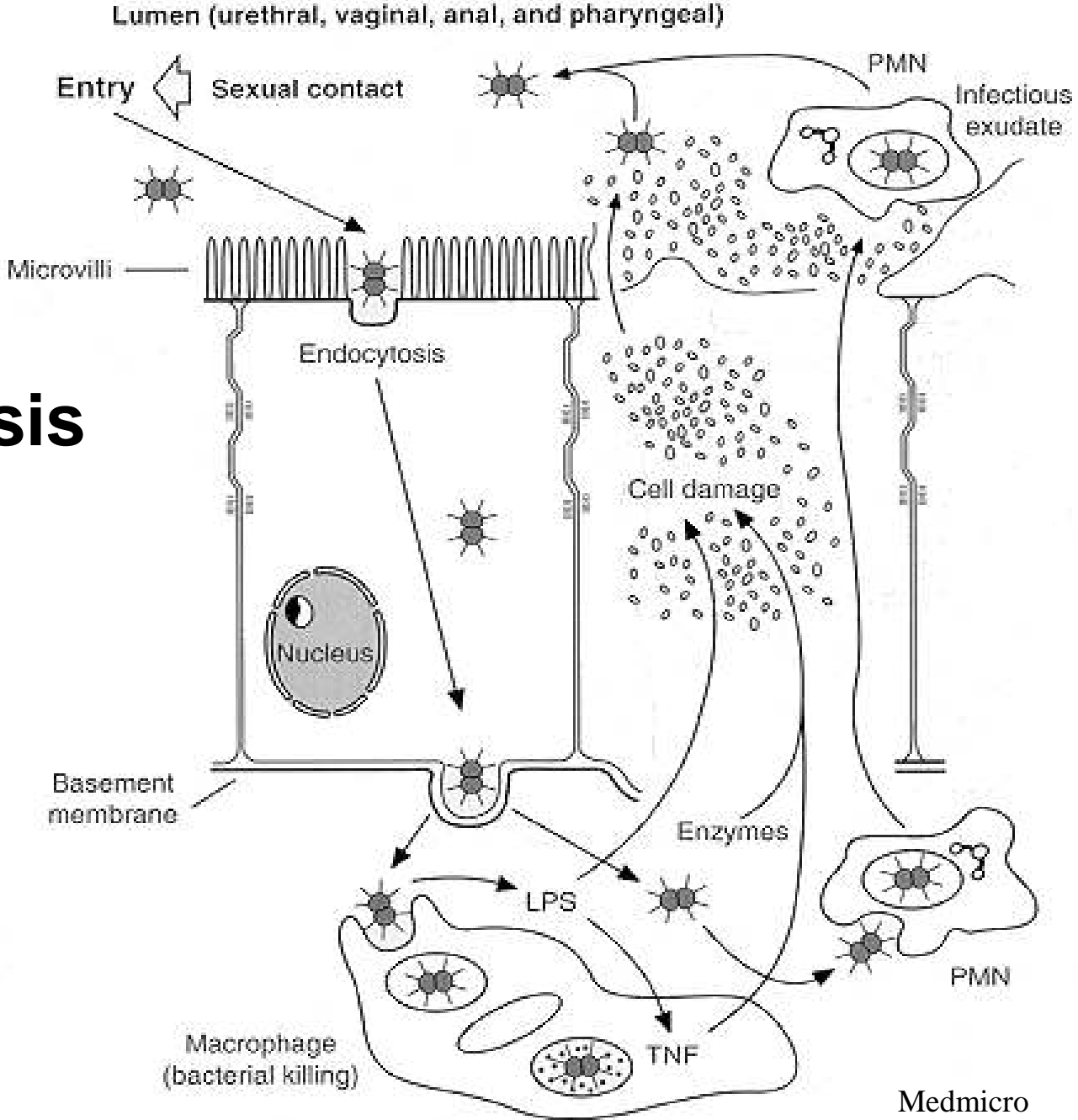
Gonorrhoea = Kankó = Tripper

Ophthalmoblenorrhoea neonatorum

Generalisatio 1%

NINCS IMMUNITÁS!
(Antigen variációk!)

Pathogenesis



Gonorrhoea – akut Urethritis



www.boltonlgb.co.uk

www.stdservices.on.net

Gonorrhoea – akut Urethritis

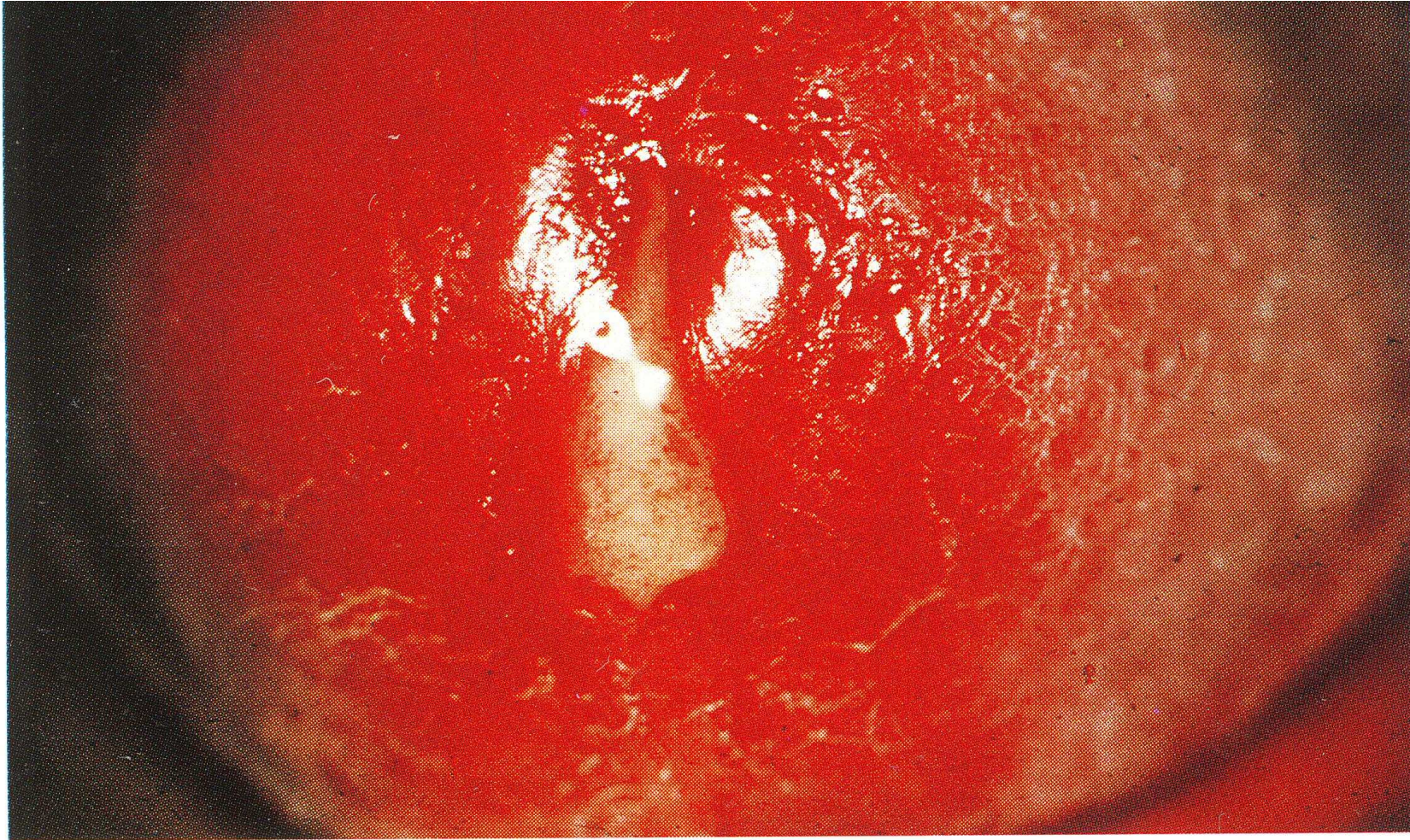
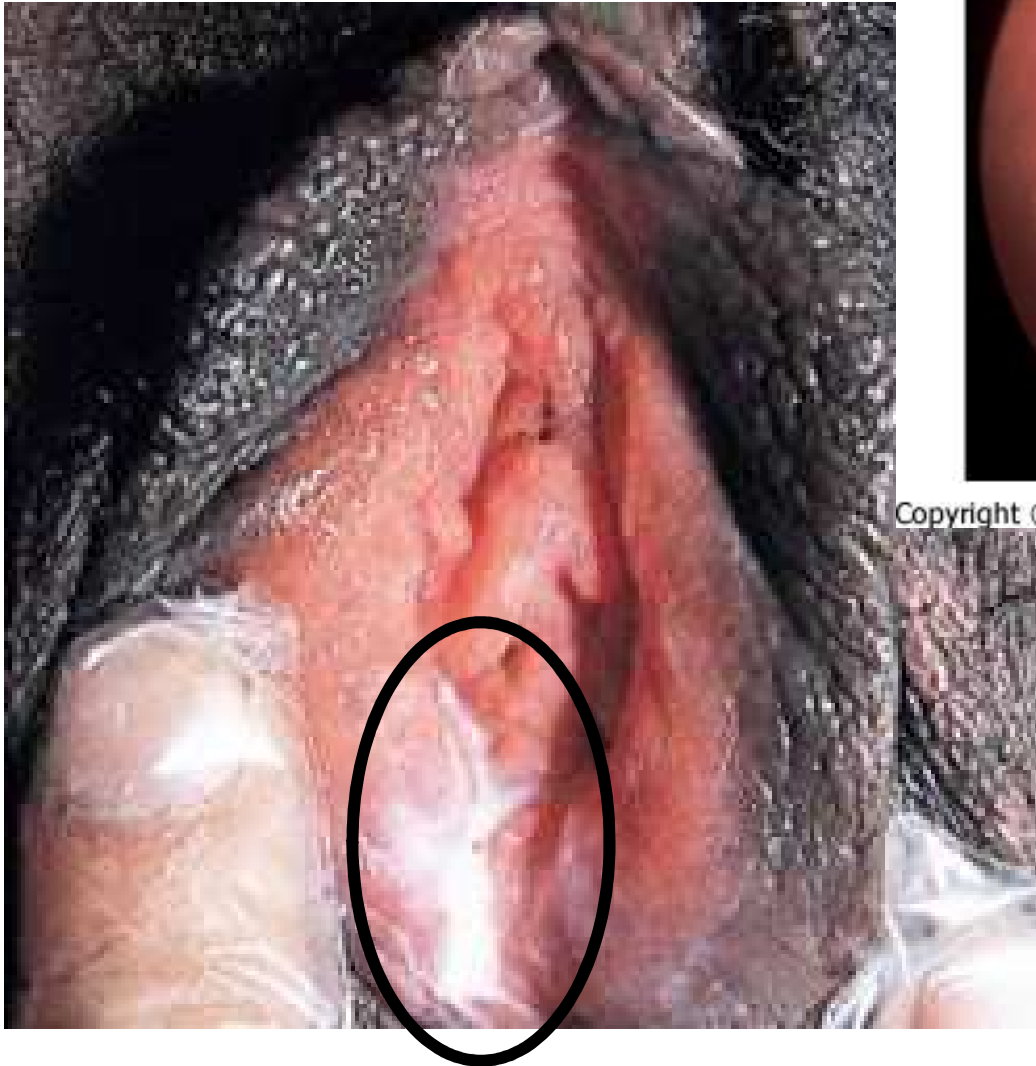


Fig. 78 Gonococcal urethritis. Typical purulent meatal discharge with inflammation of the glans. Symptomatic gonorrhoea in males is characterized by a spontaneous purulent discharge and dysuria. Courtesy of Dr J. Clay.

Gonorrhoea – akut Cervicitis



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Gonorrhoea – akut Cervicitis

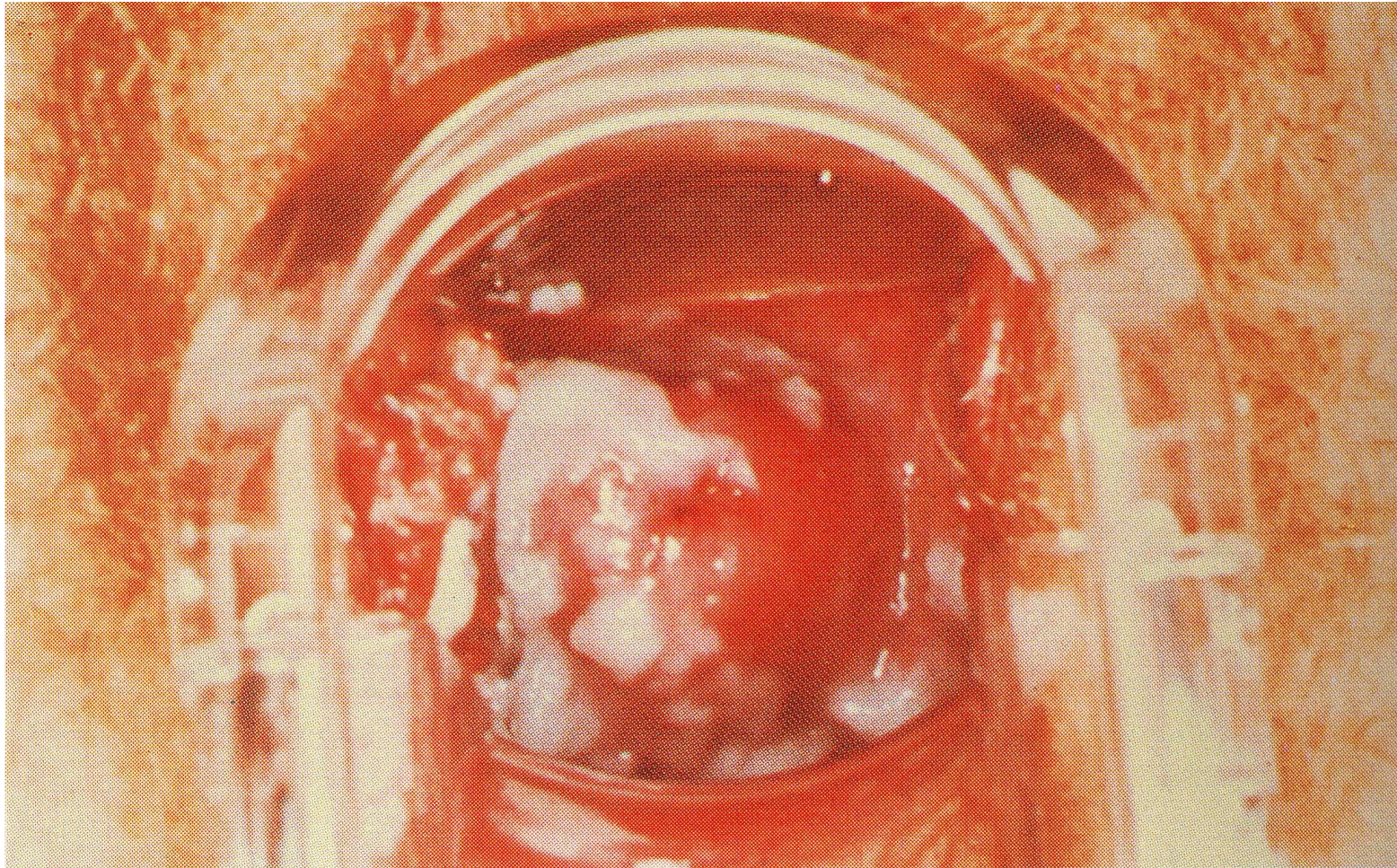


Fig. 79 Gonococcal endocervicitis. View through vaginal speculum showing reddened external os through which mucopurulent secretion is exuding. The most common manifestation of gonorrhoea in females is cervicitis, which is often asymptomatic. Courtesy of Dr S. E. Thompson.

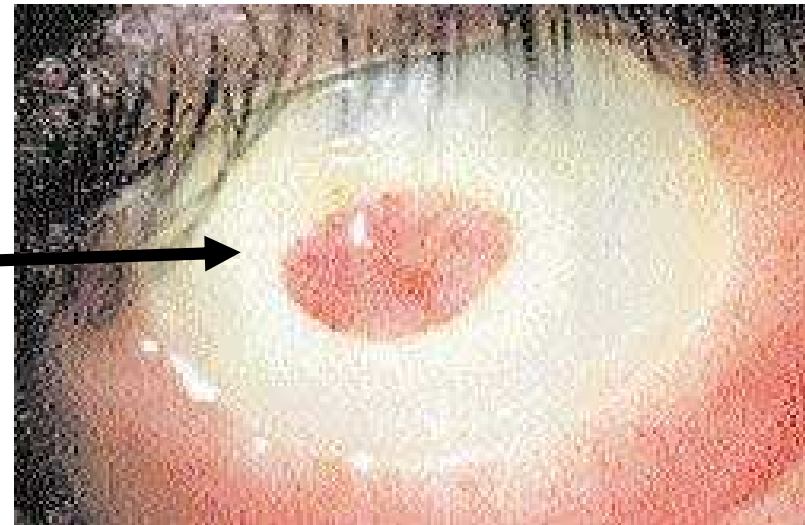
Gonorrhea – akut Conjunctivitis Blenorrhoea neonatorum



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www.mc3.edu

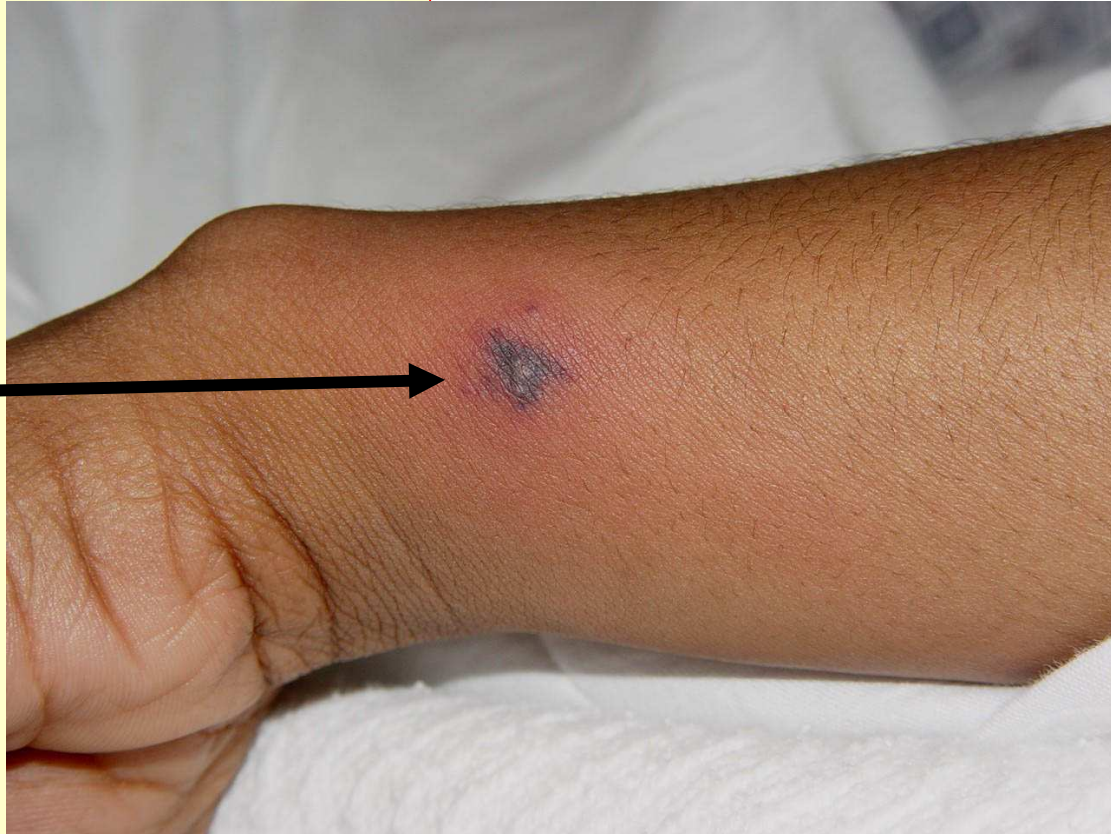
Corneal ulcers due to gonococcus are very destructive and have a tendency to perforate the cornea.



www.slackbooks.com

Gonorrhoea – Krónikus és disseminált forma

Endometritis,
Salpingitis,
Prostatitis
purulent Arthritis,
Vasculitis

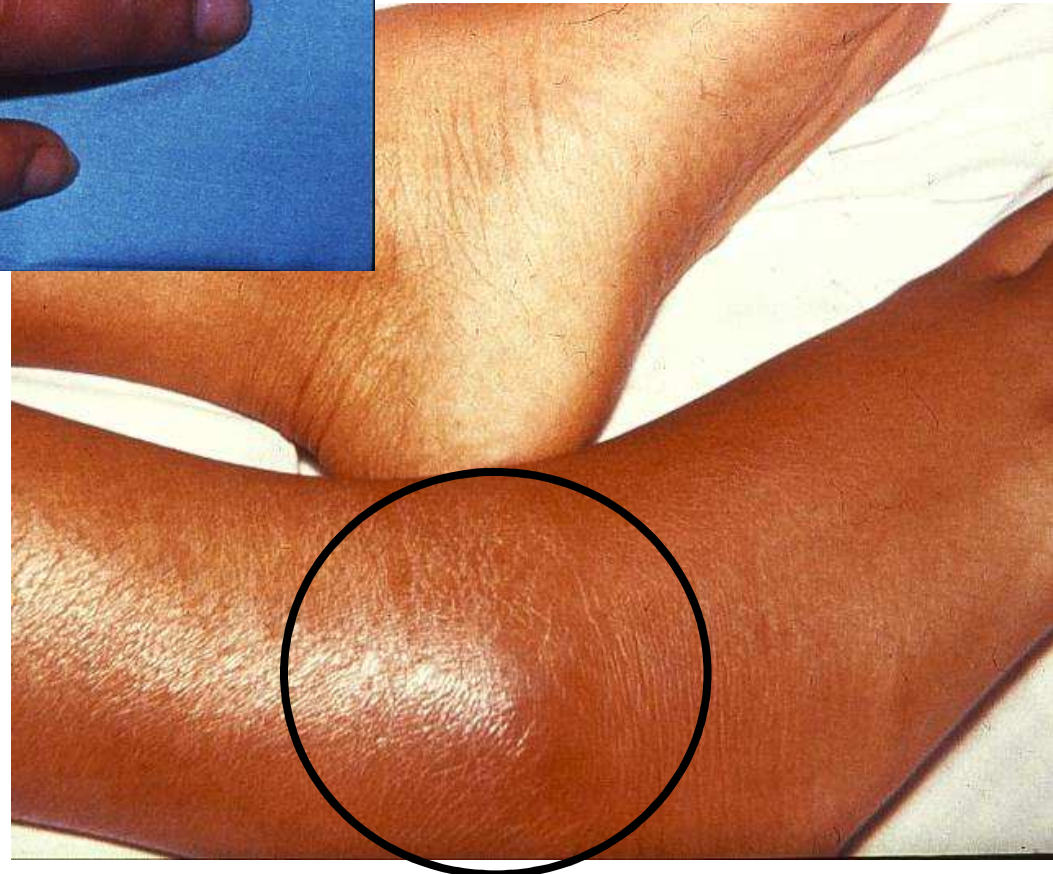


FONTOS!
anorectalis Go és Pharyngitis
(„alternatív Genitáliák”)



Fig. 8.33 Gonococcal arthritis. Dactylitis secondary to gonococcal bacteraemia. By courtesy of Dr. S.E. Thompson

Fig. 8.33 Gonococcal septic arthritis. Arthritis due to *N. gonorrhoeae* in a 24-year-old woman, showing marked erythema and swelling of the right ankle and leg. By courtesy of Dr. T.F. Sellers Jr.



Gonorrhoea – Diagnosis – csak akut esetben!

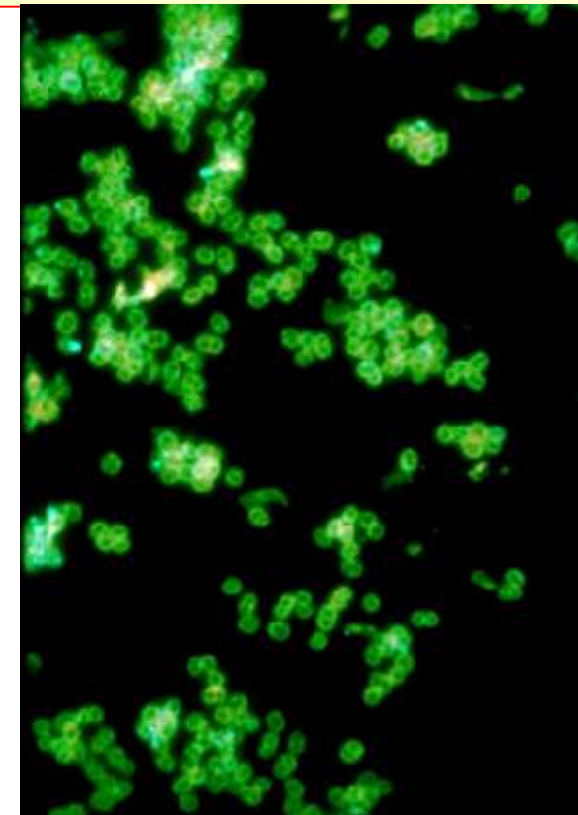
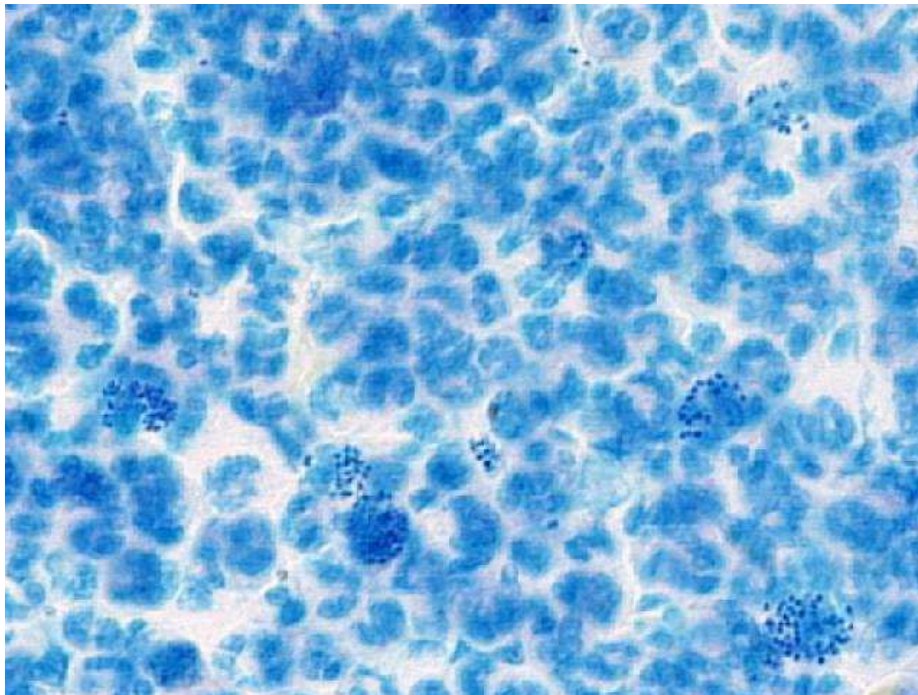
Mikroszkópos vizsgálat

Kórokozó kimutatása

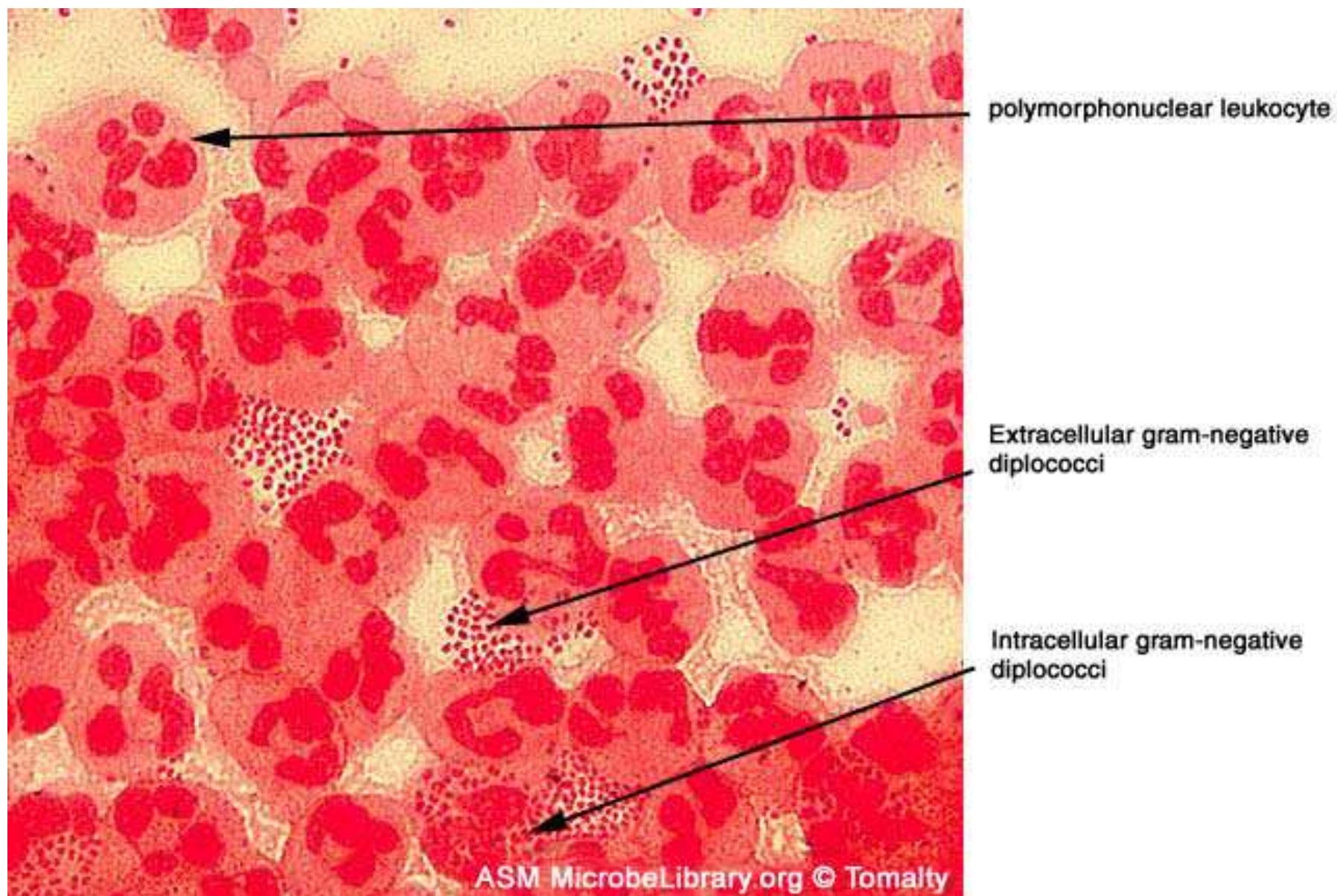
Gram festés

Metilénkék festés, Direkt Immunofluoreszcens (DIF)

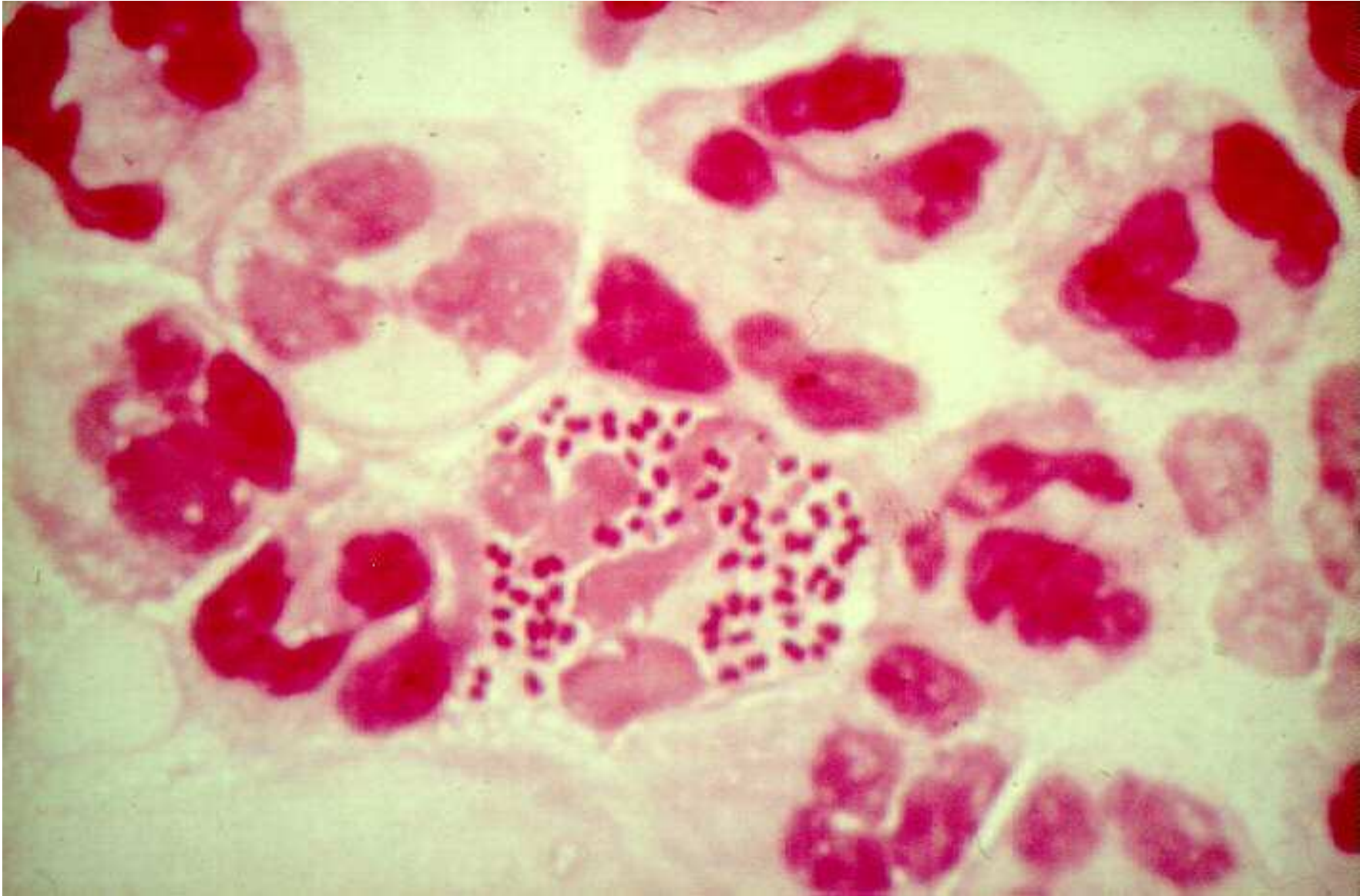
www2.mf.uni-lj.si,
www.uni-ulm.de,
pathmicro.med.sc.edu



GO – Gram festés – előzetes eredmény!



GO – Gram festés – előzetes eredmény!



Gonorrhoea – Diagnosis

Tenyésztés:

„bedside” Thayer-Martin táptalaj
és Csokoládéagar, 5% CO₂

Identifikálás: ox+, glu+, mal-

Antigén kimutatás:

Latex-agglutinatio

DNS kimutatás

Real-time PCR



Gonorrhoea

www.tiscali.co.uk

Therápia:

3. Generációs Cephalosporin (Ceftriaxone)
vagy Spectinomycin (Aminoglycoside)



Prophylaxis:

GO

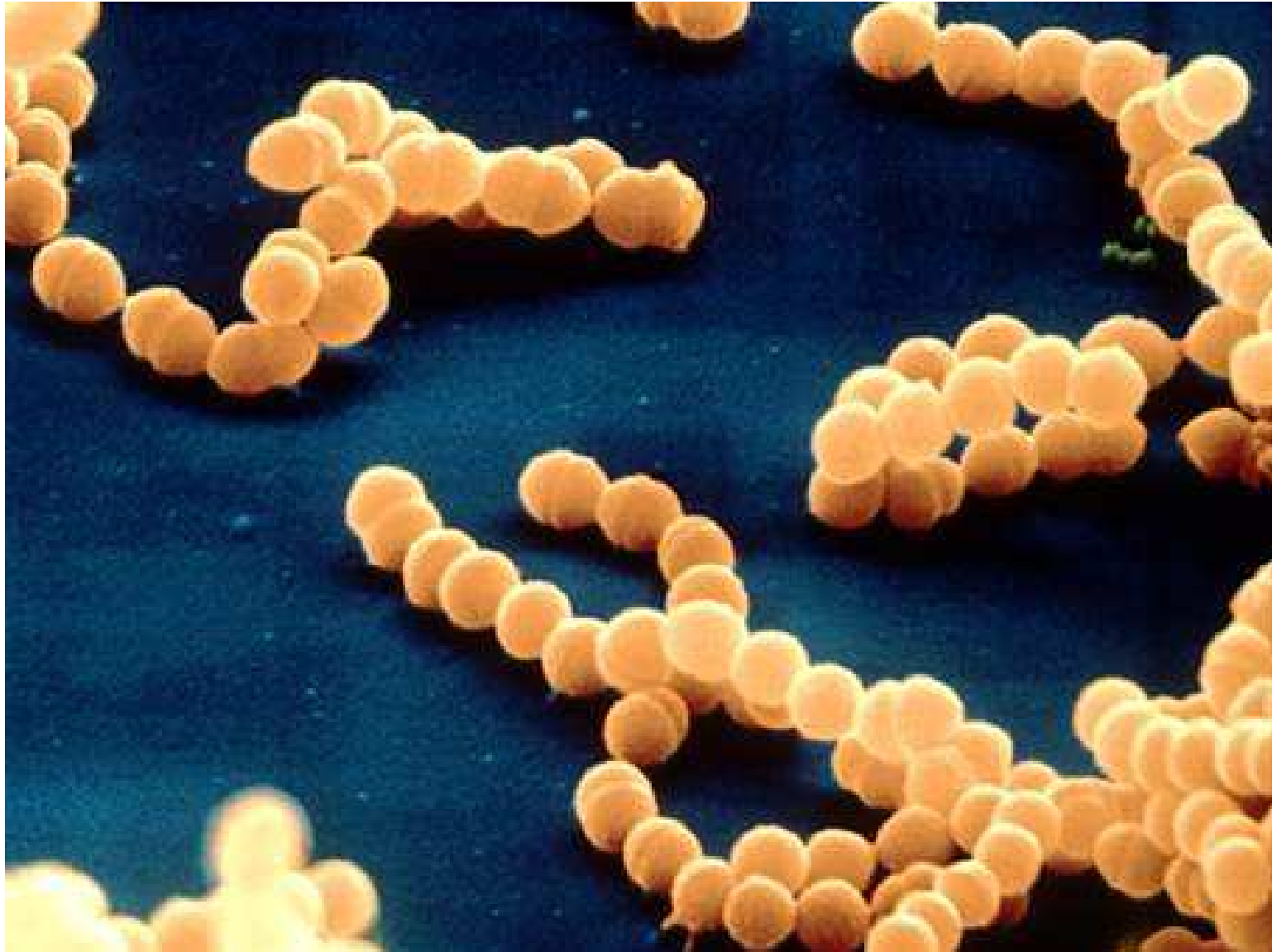
- Nem megkapni! (safe sex)
- Lehetséges fertőző források, kontaktok felderítése
- Korai Diagnosis és kezelés

Ophthalmia neonatorum:

Credé szemcsepp 1% ezüst-acetát (-nitrát)

Védőoltás NINCS! (Antigenvariációk!)

N. meningitidis = Meningococcus



scanning EM

N. meningitidis = Meningococcus

Antigének és Virulencia faktorok:

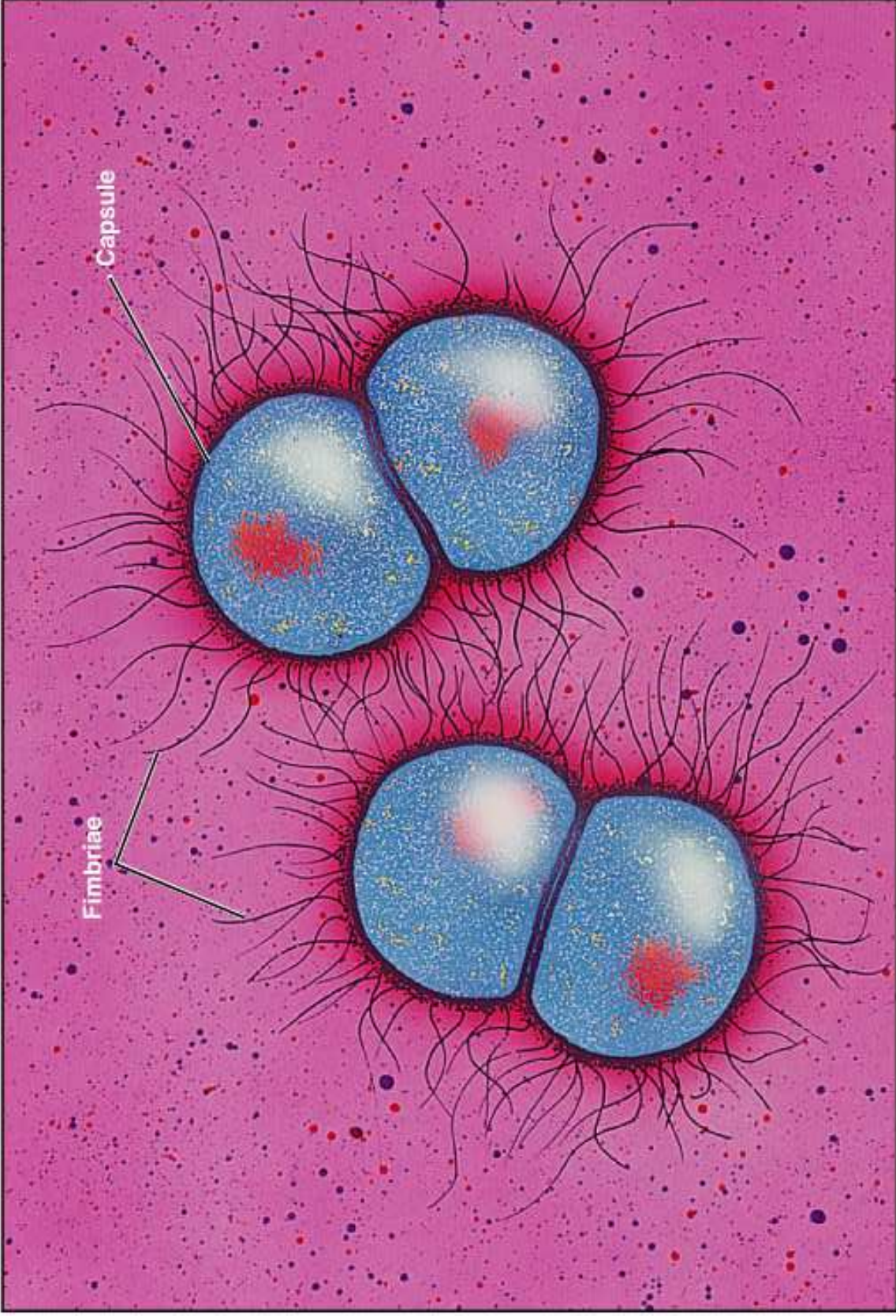
TOK – Polysaccharide – antifagocita hatású
12 Serotypus (A, B, C, W135, Y!)

Pili/Fimbriae

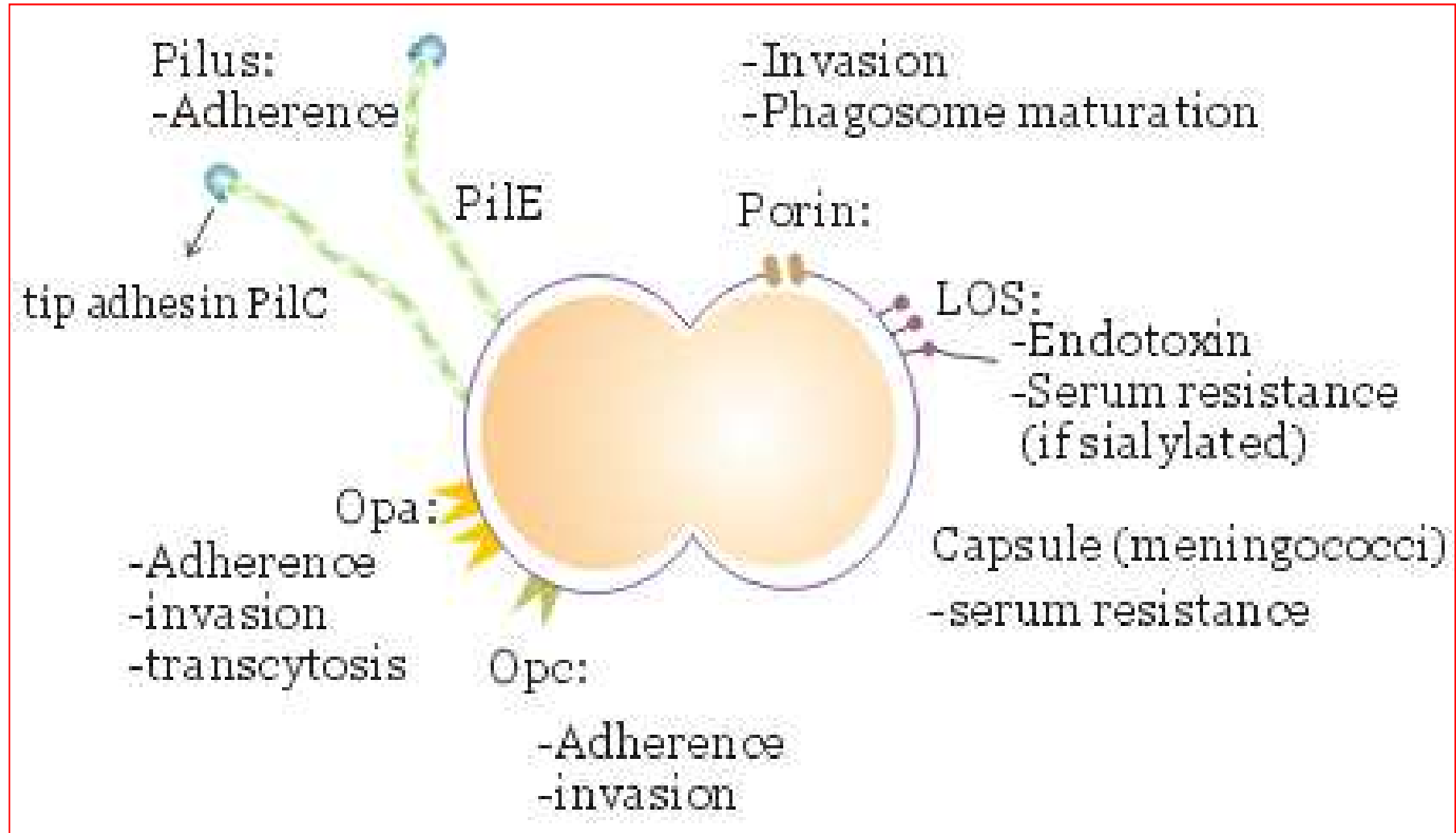
IgA-Protease!

Outer Membrane Protein-ek (OMP)

LOS (Mimikri, szializálva Serum-rezisztens!)



Meningococcus



N. meningitidis = Meningococcus

Fertőzés forrása

emberek – hordozók (betegek, egészségesek)

Átvitel, behatolás

- Direkt, cseppfertőzéssel
- Orrüreg, Torok

Kórképek

Pharyngitis

Meningitis cerebrospinalis epidemica

Sepsis = **Waterhouse-Friderichsen Syndroma**



Fig. 10.56 Acute meningococcaemia. Note the variable size of the lesions and their peripheral distribution. Some of the lesions are obviously purpuric, others macular or papular.



Fig. 10.60 Acute meningococcaemia. Petechia on bulbar conjunctiva.



Fig. 10.62 Acute meningococcaemia. Gangrene of the extremities following a near-fatal illness with hypotension.



Fig. 10.63 Acute meningococcaemia. Gangrene of both legs in a black man with acute meningococcal infection. Bilateral below knee amputations were later required.



The characteristic skin rash of meningococcal septicaemia, caused by *Neisseria meningitidis*. (Courtesy of Wellcome Trust Photographic Library)
srs.dl.ac.uk



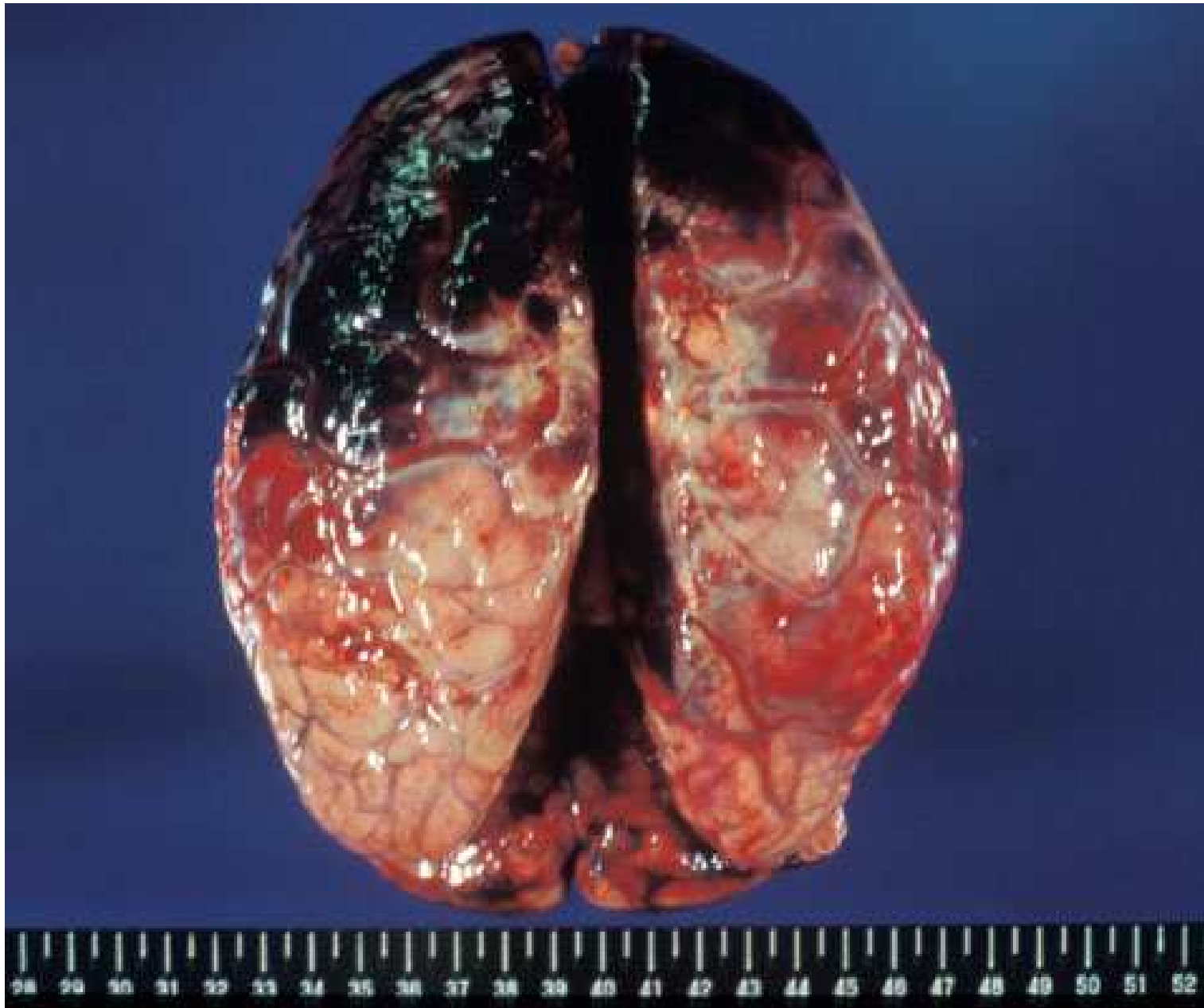
© Urban & Fischer 2003 – Roche Lexikon Medizin, 5. Aufl.

Waterhouse- Friderichsen Syndrome: schwere nekrotisierende Hautläsionen bei Meningokokkensepsis mit Verbrauchskoagulopathie (R. E. Rieger, Univ.-Kinderklinik Marburg).

www.gesundheit.de

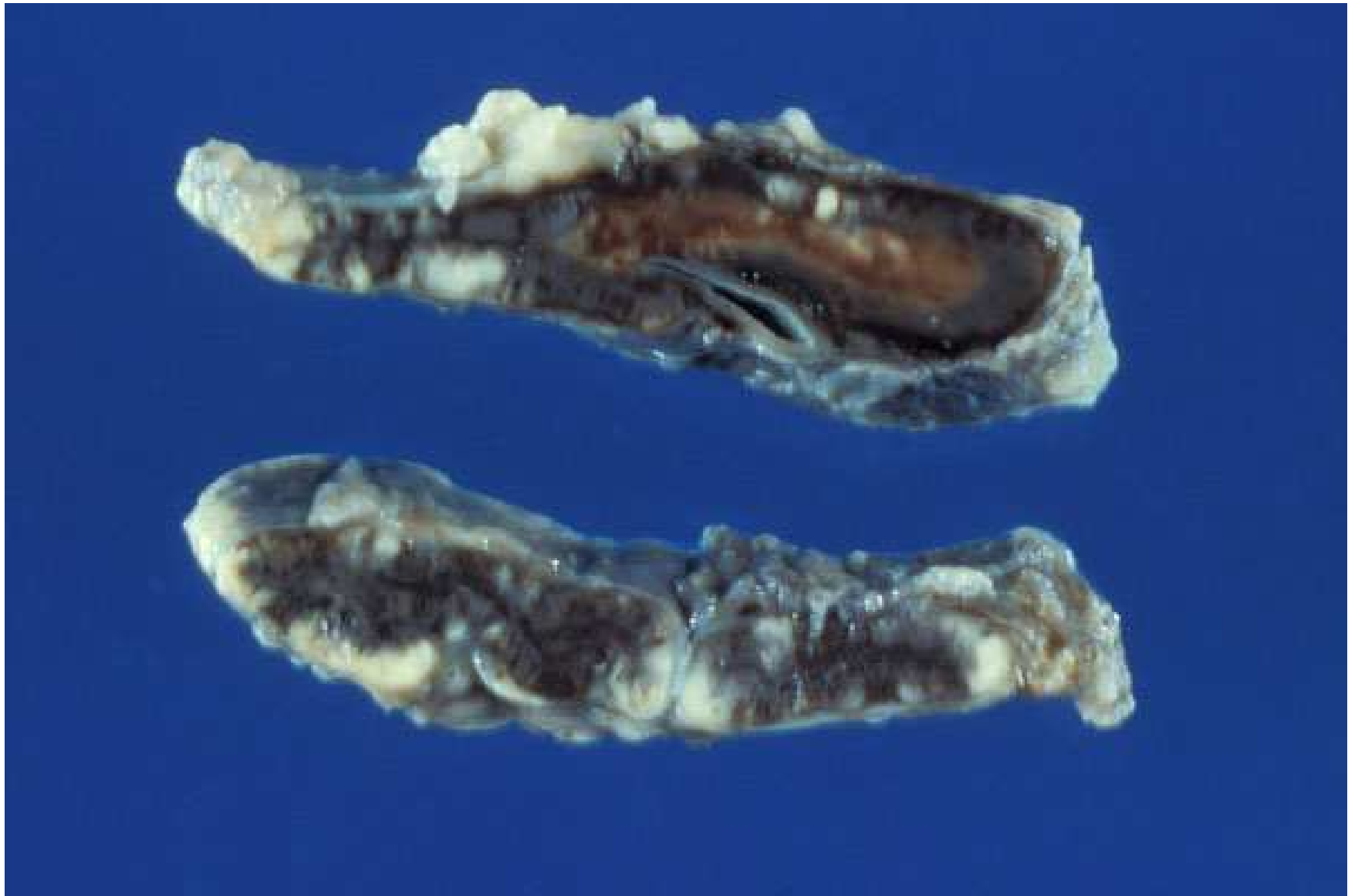


The patient with Waterhouse-Friderichsen syndrome has sepsis with DIC and marked purpura.



pathy.fujita-hu.ac.jp

Purulent meningitis with hemorrhage in the frontal lobe (gross findings).



Acute hemorrhage in bilateral adrenals caused acute adrenal insufficiency (Waterhouse-Friderichsen syndrome).

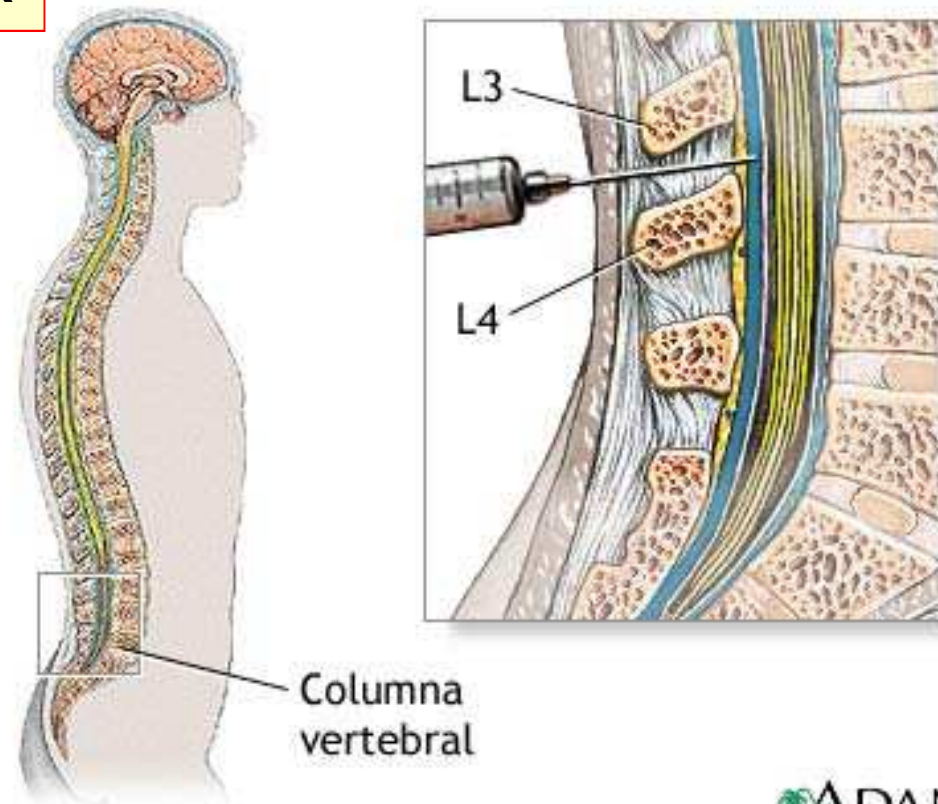
Meningitis Diagnosis

Vizsgálati anyagok:

Liquor! - Lumbalpunkcio

Vér

Hordozóktól: Torokváladék



Meningitis Diagnosis

Kórokozó kimutatás

Mikroszkópos Vizsgálat

(Liquor, Haemokultura)

Tenyésztés

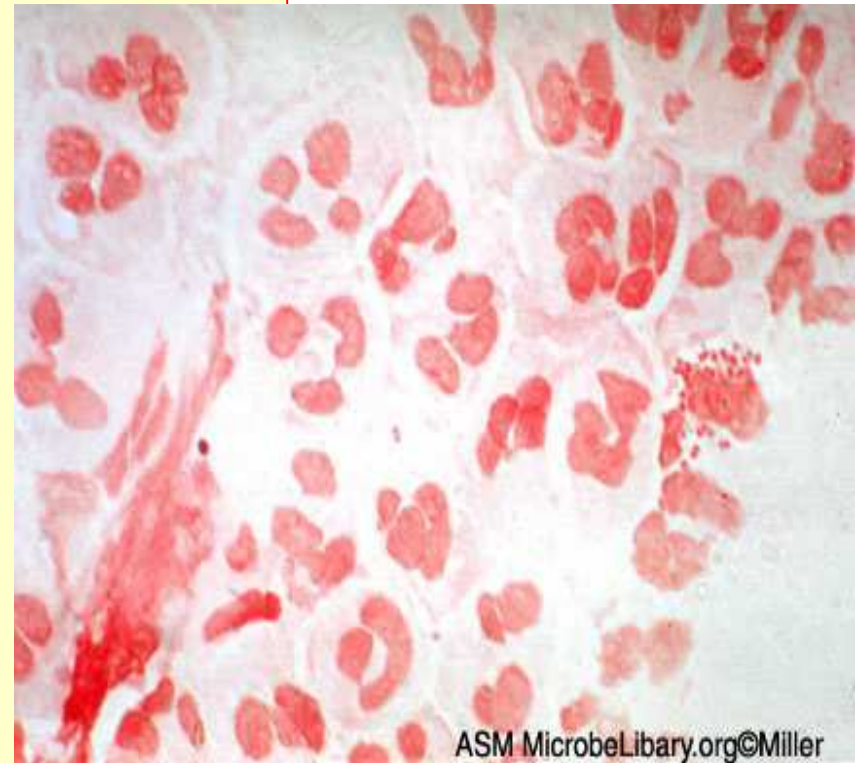
Liquor, Vér, Torok

Direkt Ag Kimutatás

(Liquor) – Latex-agglutinatio

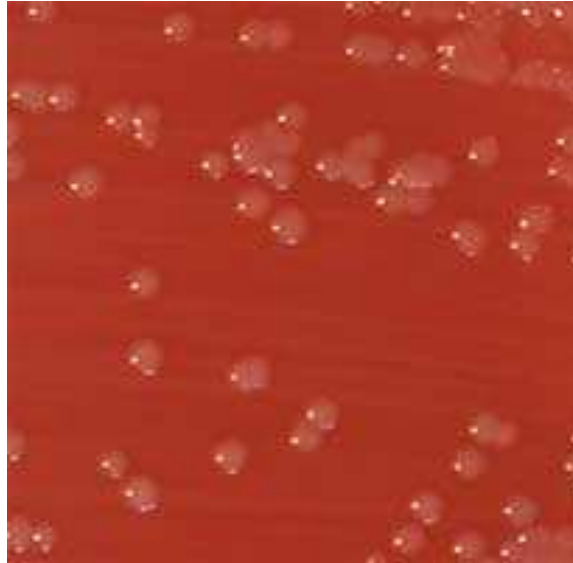
Direkt DNS kimutatás

Real-time PCR

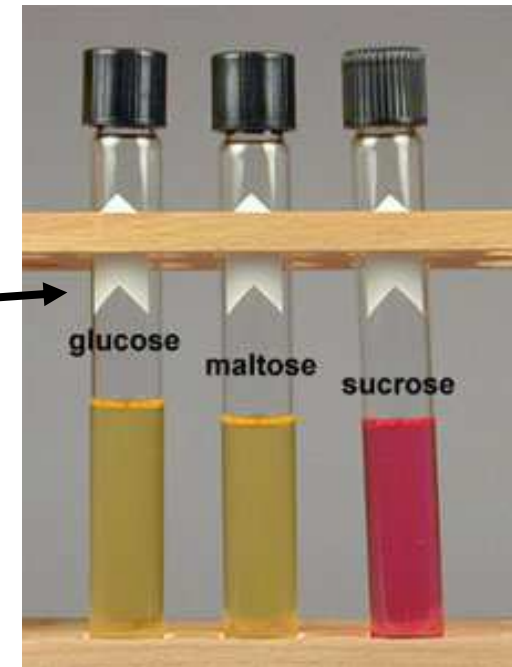


Diagnosis *N. meningitidis*

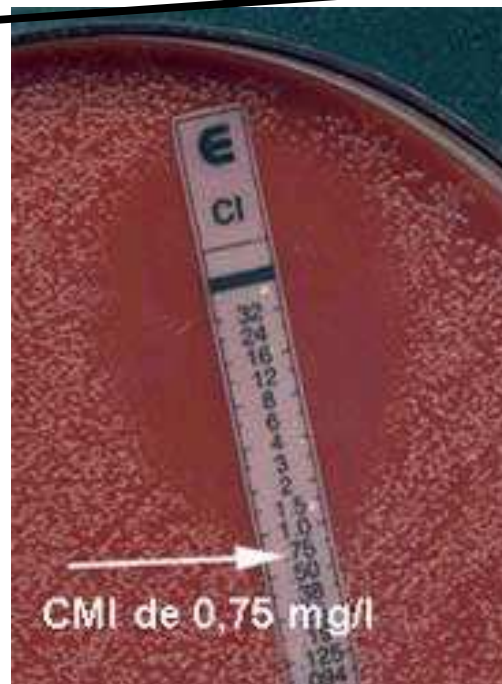
Tenyésztés:
Véresagar,
Csokoládéagar



Identifikálás:
glu+, mal+



MIC (E-test)



Meningococcus meningitis

Therapia:

Penicillinek és/vagy
Cephalosporin (III. Gen.)
Nincs Beta-lactamase termelés

Prophylaxis:

Aktív Immunizálás

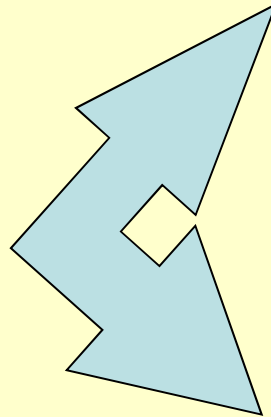
Védőoltás:

- Rizikócsoportok
- Utazás!

(Meningitis övezet!)

Chemoprophylaxis:

Ciprofloxacin,
Rifampicin (Kontaktok)





Meningitis övezet

Neisseria meningitidis - B

Európa!

NINCS Védőoltás!

Rifampicin



**Neisseria, Haemophilus,
Bordetella**

2. Haemophilus

Kicsi, Gram negatív pálcák/coccobacillusok

Genus

Haemophilus

Faj

H. influenzae P

H. parainfluenzae

H. aegyptius P

H. ducreyi P

Bordetella

B. pertussis P

B. parapertussis

P: Pathogen

Haemophilus influenzae

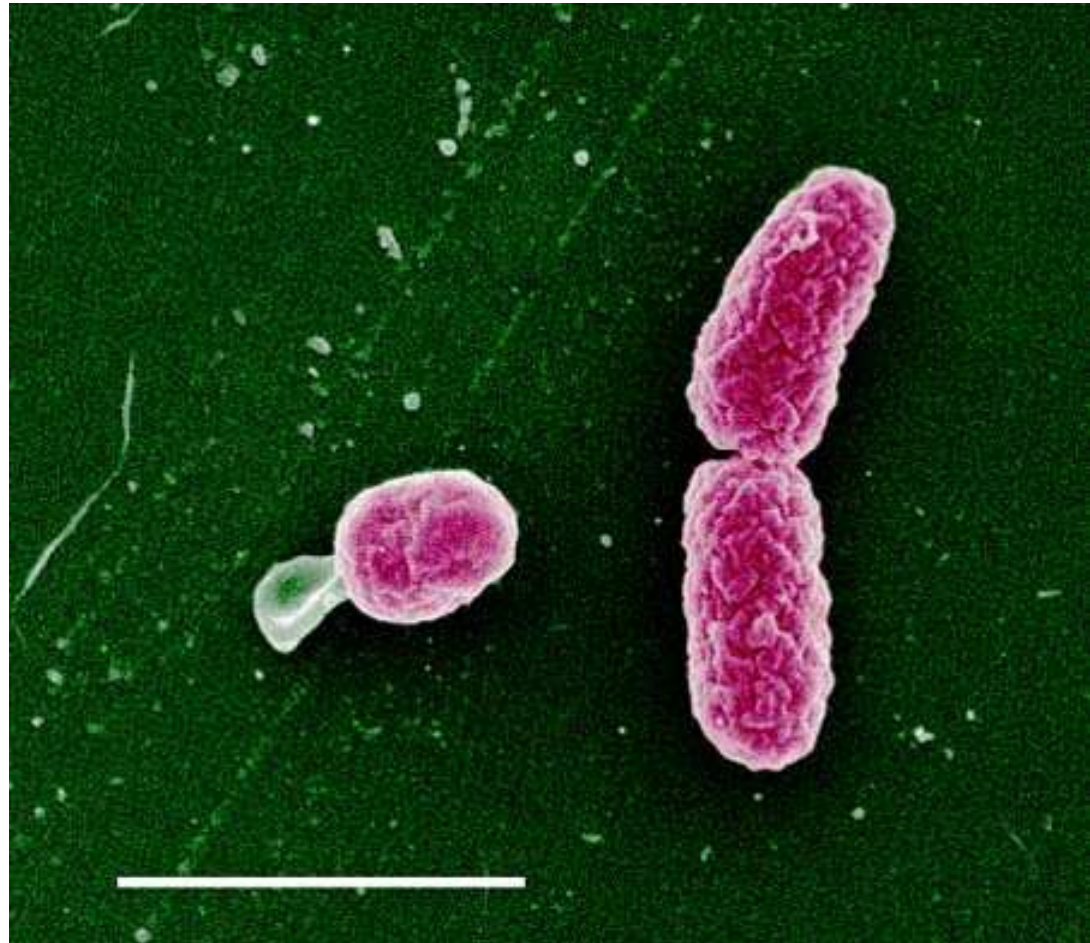
Morphologia:

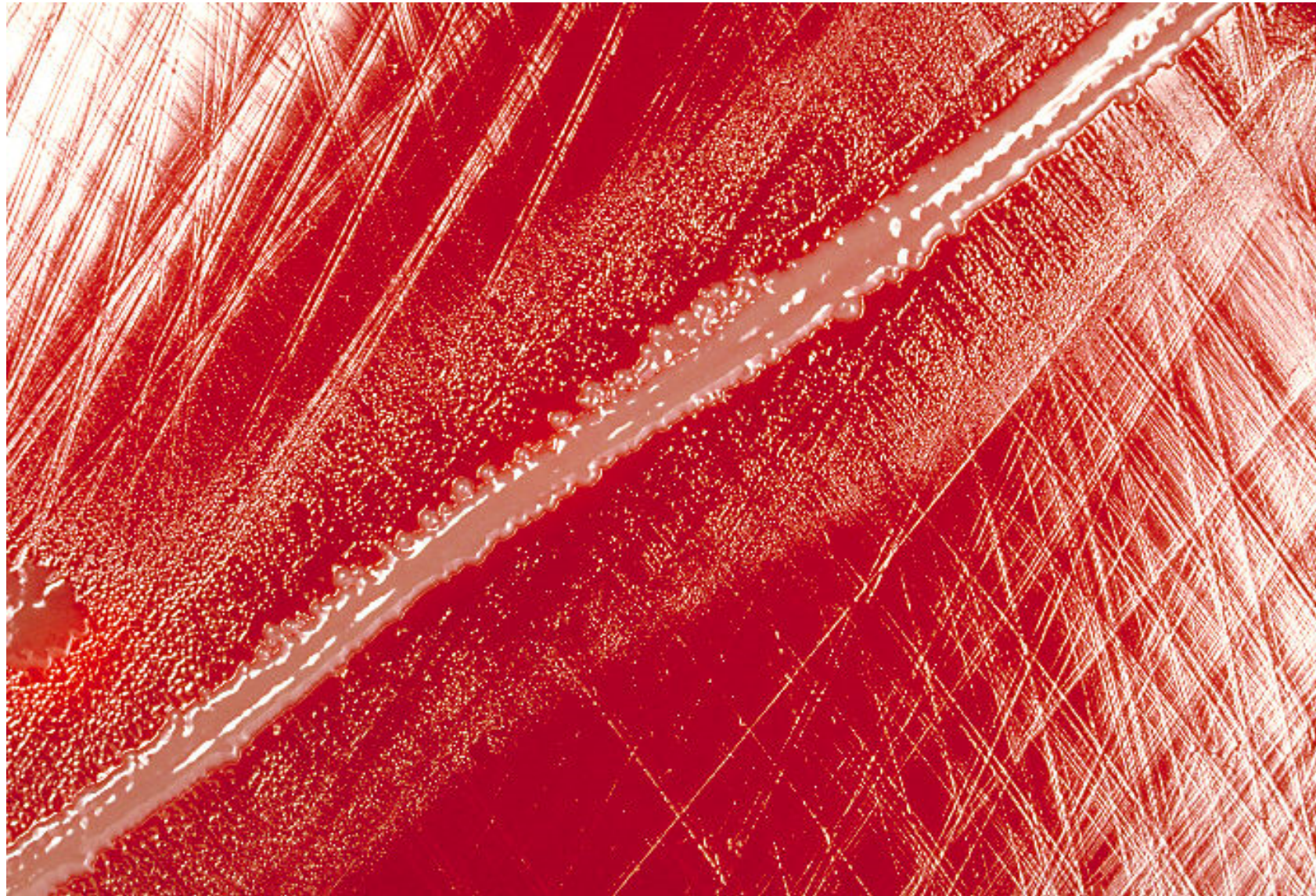
Gram - Coccobacillus,
ca. 1 μm

Tenyésztés:

Növekedési faktorok !

(Csokoládé agar,
X= Haem, V= NAD,
Szatellitizmus,
„Dajkajelenség”)





phil.cdc.gov

Blood agar plate culture showing *Haemophilus influenzae* satelliting around *Staphylococcus aureus*.

Haemophilus influenzae

Antigének és Virulenciafaktorok:

TOK – Polysaccharid

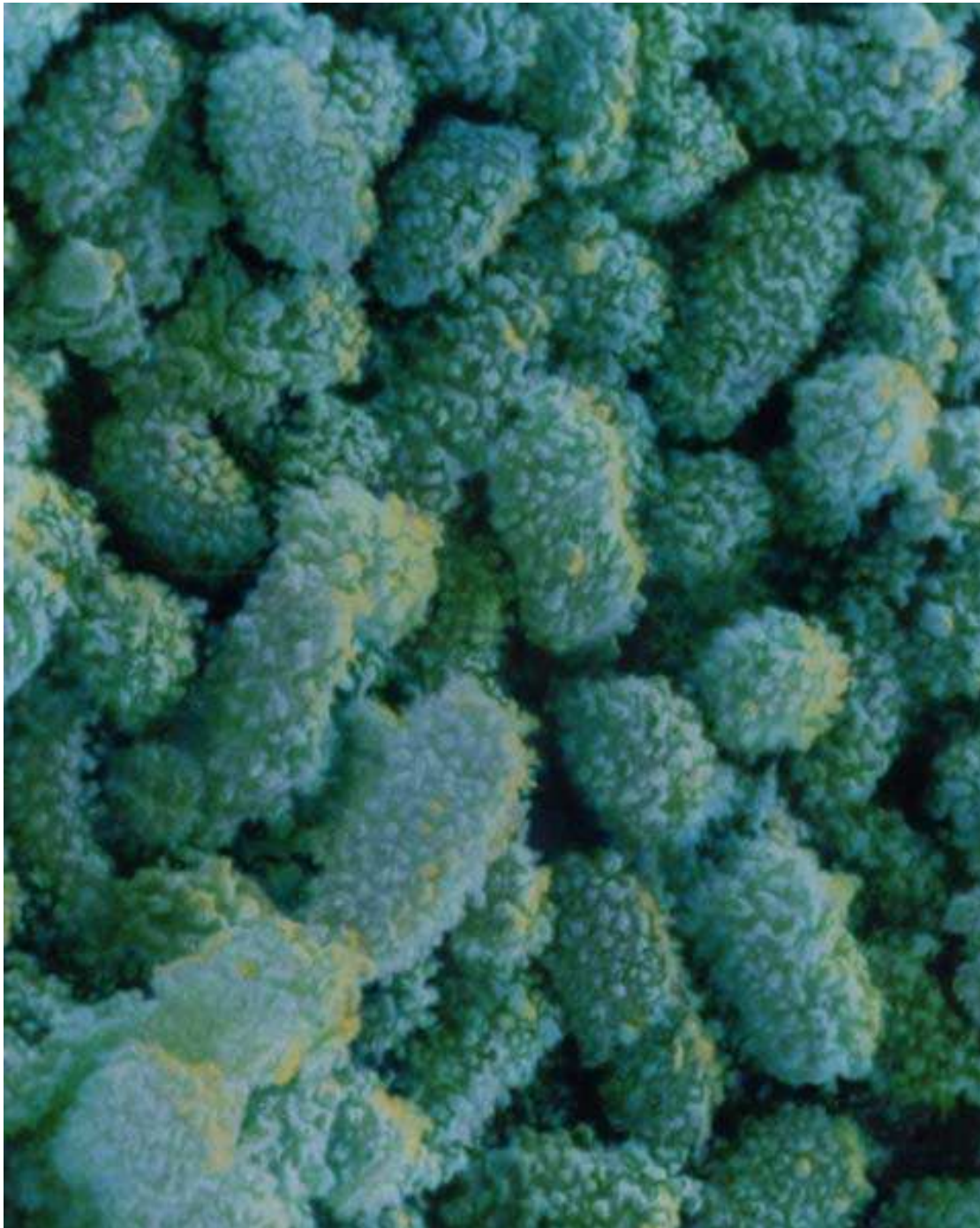
Typen: a, b, c, d, e, f (HiB!)

IgA-Protease!

Felszínen:

Outer Membrane Proteine (OMP)

LPS



*Haemophilus
influenzae Typ b*
(Hib)

www.soundmedicine.iu.edu

Haemophilus influenzae

Kórképek:

Meningitis, Sepsis

Cellulitis

Felső légutak:

Epiglottitis!, Nasopharyngitis, Sinusitis, Otitis media

Alsó légutak:

Bronchitis, Pneumonia

Haemophilus influenzae



Sepsis

An infant with severe vasculitis with disseminated intravascular coagulation (DIC) with gangrene of the hand secondary to *Haemophilus influenzae* type b septicemia - prior to the availability of the Hib vaccine.

-Image provided by: Visual Red Book on CD-ROM-

-(2000 Red Book: 25th Edition, Report of the Committee on Infectious Diseases)

www.ecbt.org

Haemophilus influenzae



Periorbitalis cellulitis.

Haemophilus influenzae

Kórképek:

Meningitis, Sepsis

Cellulitis

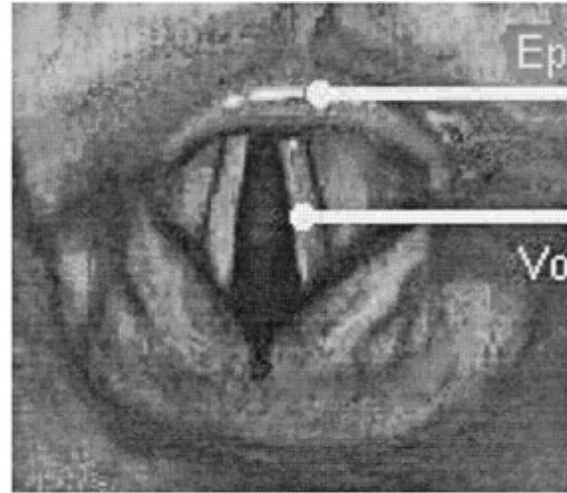
Felső légutak:

Epiglottitis!, Nasopharyngitis, Sinusitis, **Otitis media**

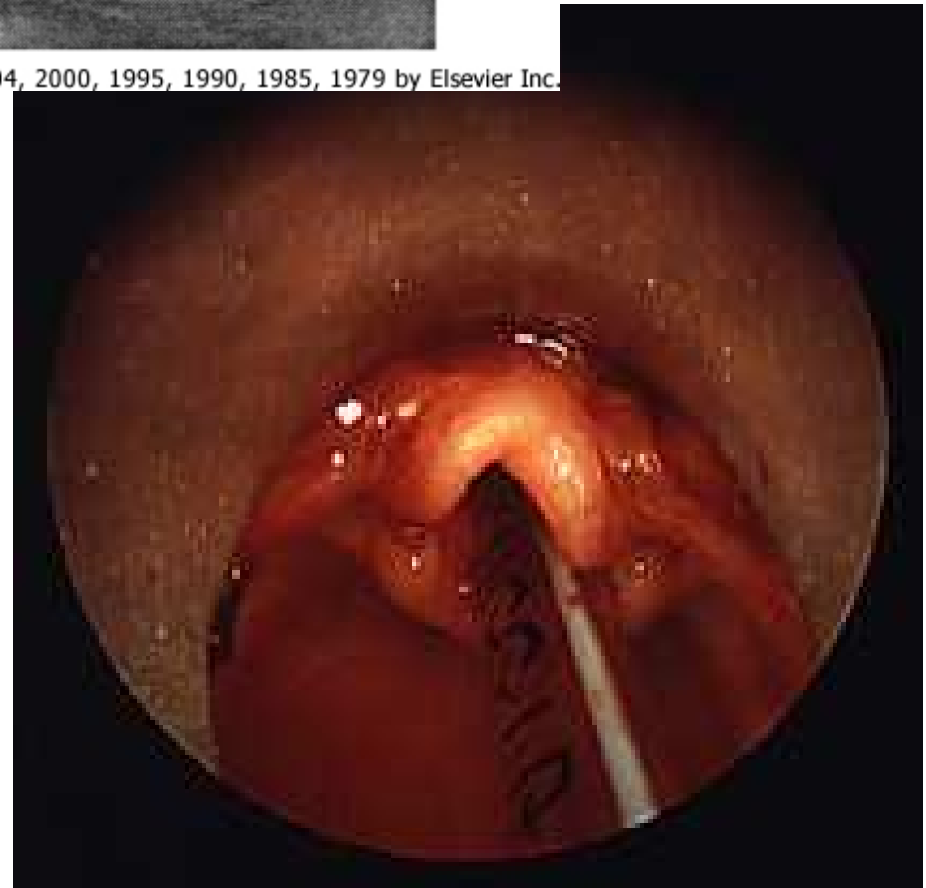
Alsó légutak:

Bronchitis, Pneumonia

HIB-epiglottitis



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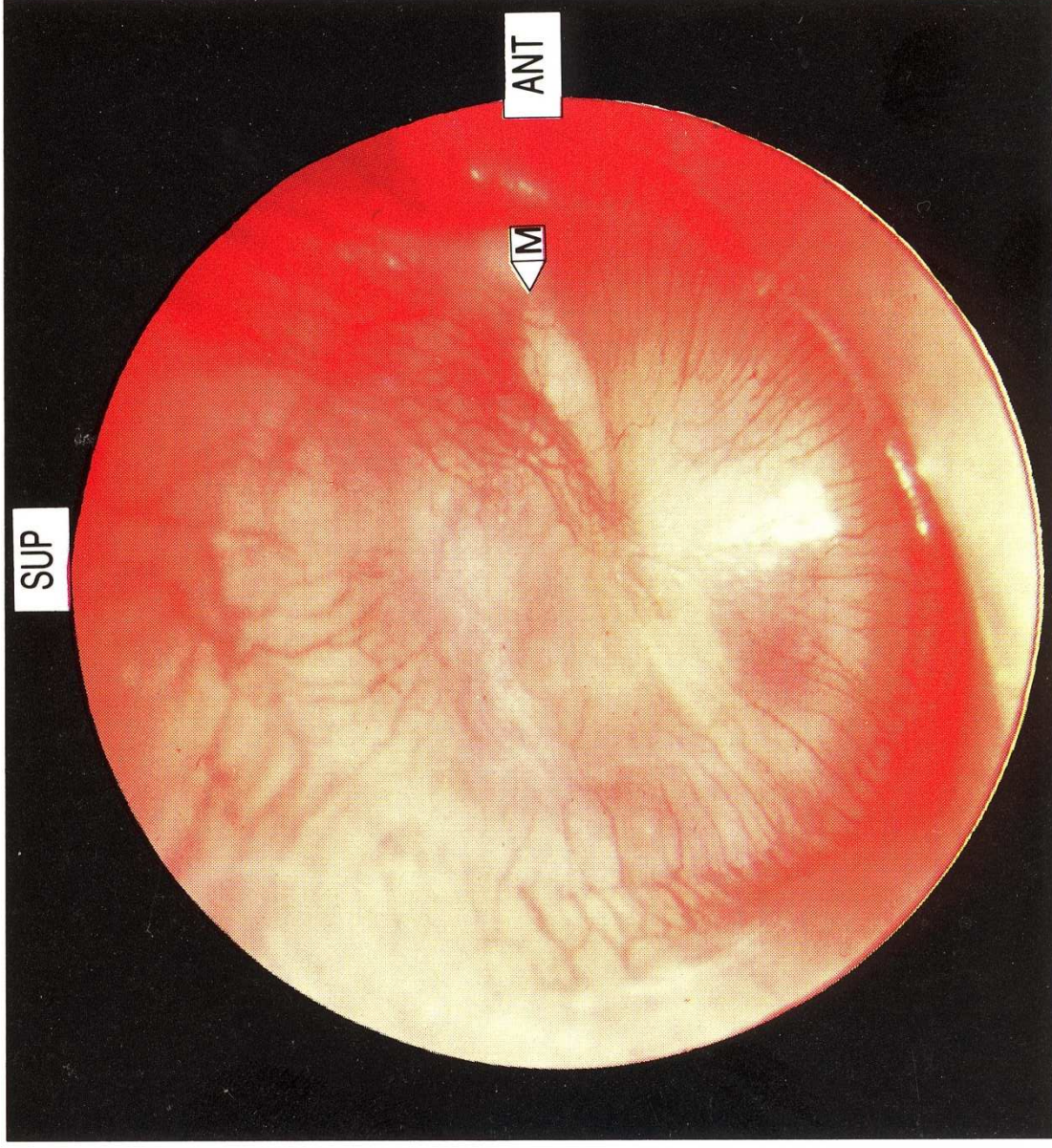


Fig. 10 Acute otitis media. Early stage showing mild injection of the drum, especially in the region of the malleus (M). The most common bacterial causes are *Streptococcus pneumoniae* and *Haemophilus influenzae*, with a smaller proportion of cases caused by *Streptococcus pyogenes* or *Branhamella catarrhalis*. Courtesy of Dr M. Chaput de Saintonge.

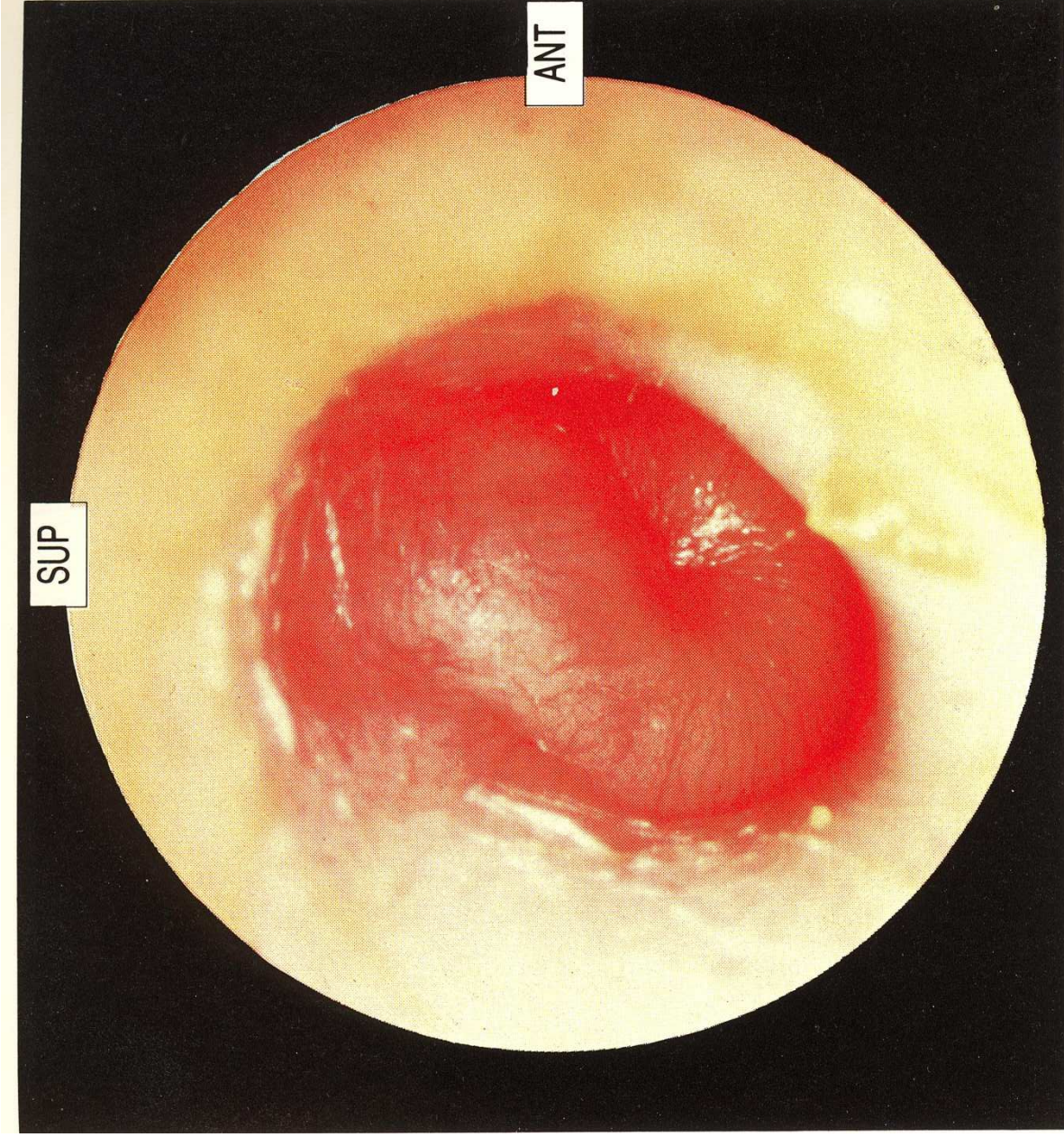


Fig. 11 Acute otitis media. Advanced stage showing bulging of the drum on both sides of the malleus, which is obscured. These features are seen just before the drum perforates. By courtesy of Dr M. Chaput de Saintonge.

Haemophilus influenzae

Diagnosis:

Vizsgálati anyagok

- LIQUOR! (CSF)
- Minták a fertőzés helyéről (orr, torok, köpet stb.)

Kórokozó kimutatás:

Mikroszkópos vizsgálat, Tenyésztés,

Tok Ag kimutatás (Latex-agglutinatio)

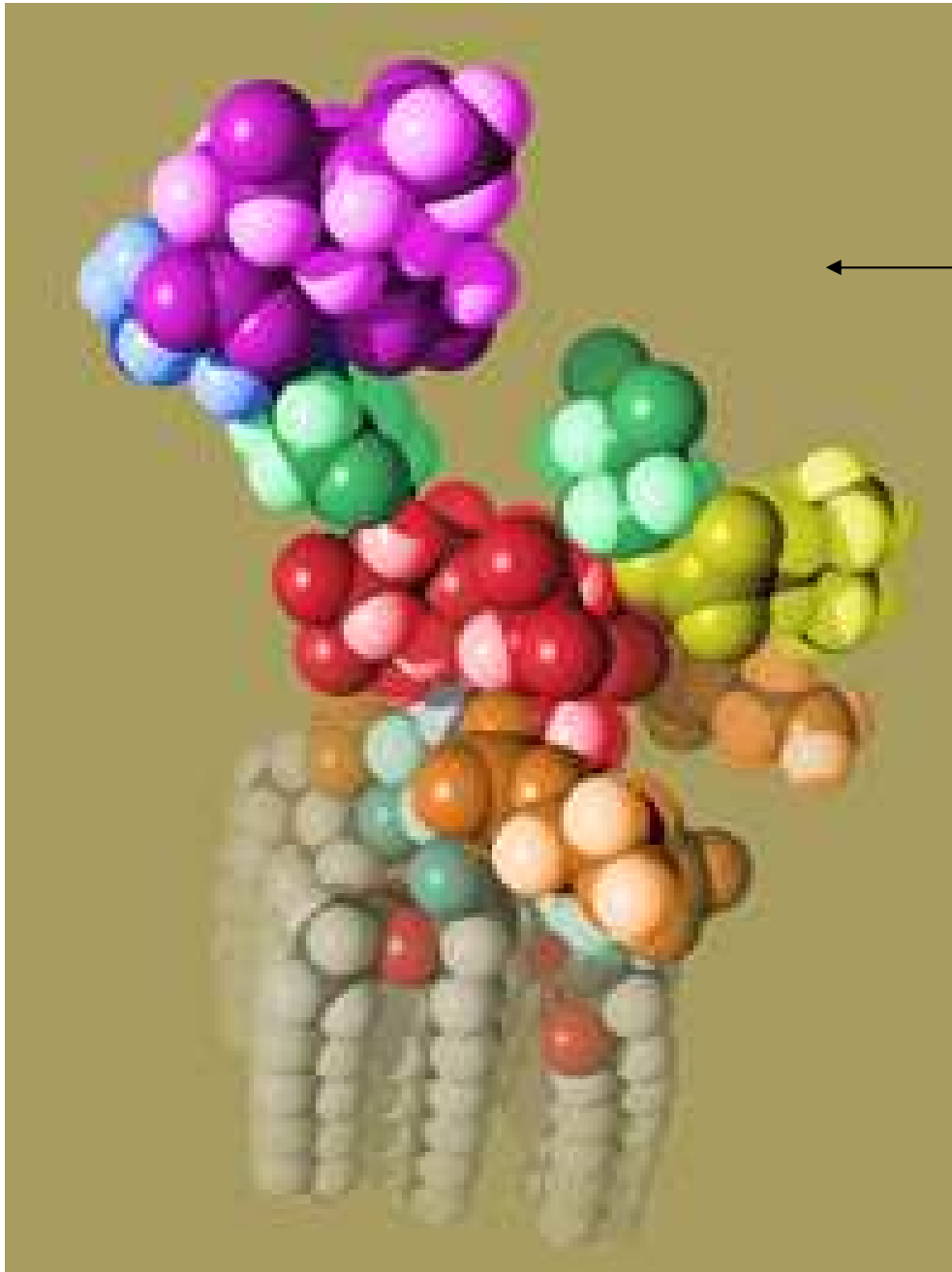
DNS kimutatás vérből: real-time PCR

Therapia:

1. Ampicillin + III. gen. Cephalosporin
2. Ampicillin + Aminoglycoside

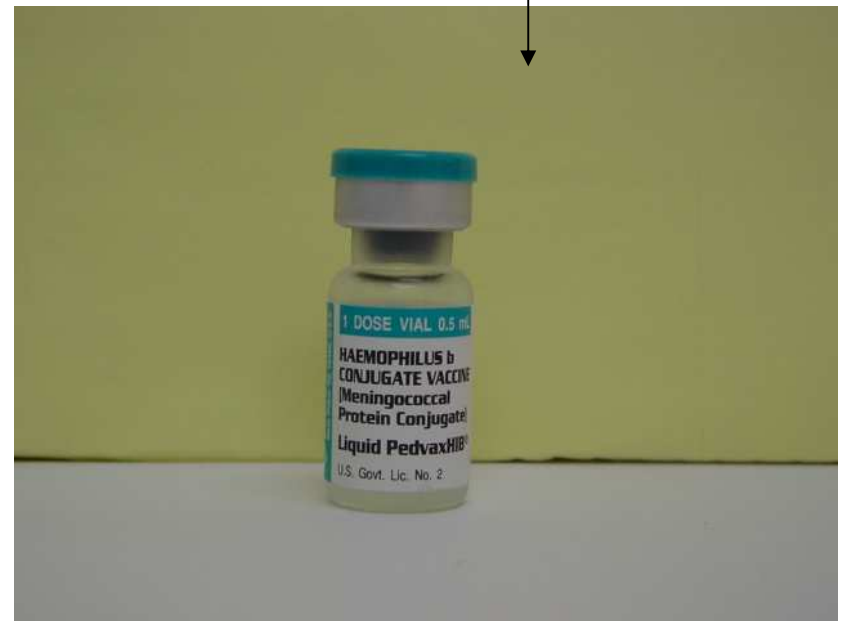
Prophylaxis:

Aktív Immunizálás - **HiB Konjugált-Védőoltás**
(Polysaccharid + Protein)



← Lipopolysaccharid
Extrakt - Vakcina

ibs-isb.nrc-cnrc.gc.ca



www.kmhk.kmu.edu.tw

Haemophilus ducreyi

Kórkép:

Ulcus molle = Chancroid = lágy Schanker/fekély

Haemophilus aegyptius

Kórkép: Brazíliai purpurás láz

Haemophilus parainfluenzae

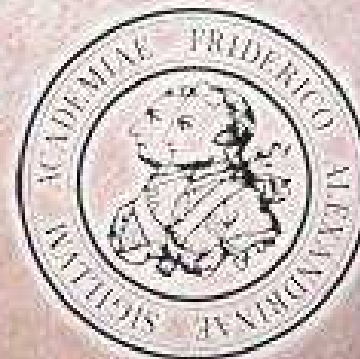
Pharyngitis, Endocarditis, Conjunctivitis

Ulcus molle



<http://dermis.net>

Ulcus molle



<http://dermis.net>





Chancroid in female

**Neisseria, Haemophilus,
Bordetella**

3. Bordetella

Kicsi, Gram negatív pálcák/coccobacillusok

Genus

Haemophilus

Faj

H. influenzae

H. parainfluenzae

H. aegyptius

H. ducreyi

Bordetella

B. pertussis

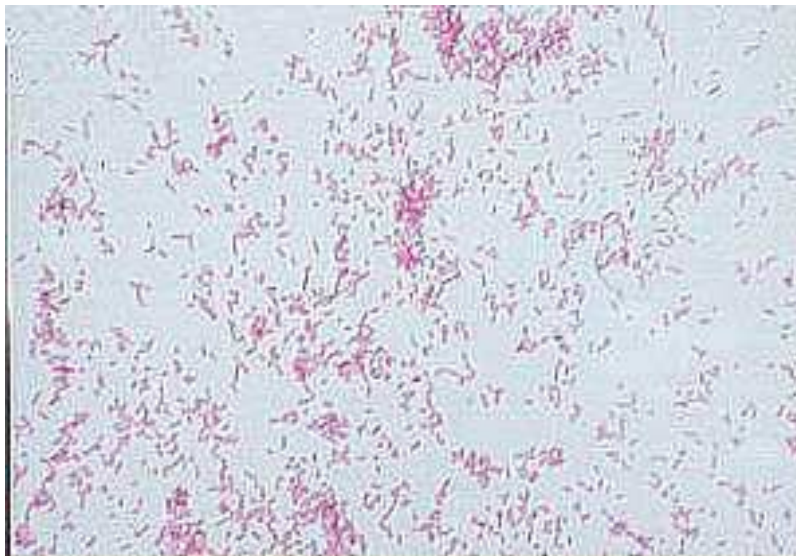
B. parapertussis

P: Pathogen

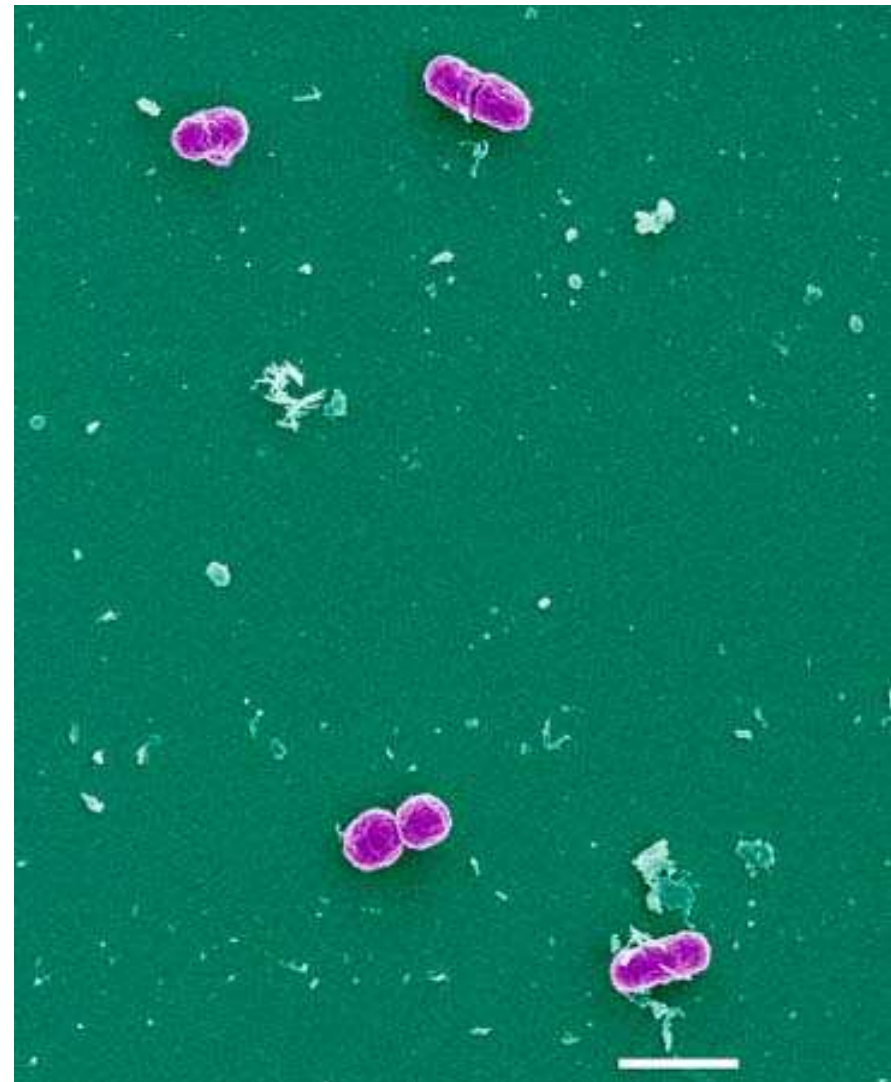
Bordetella pertussis

Morphologia:

Gram negatív
Coccobacillus,
ca. 1 μm



Gram stain of *B. pertussis*

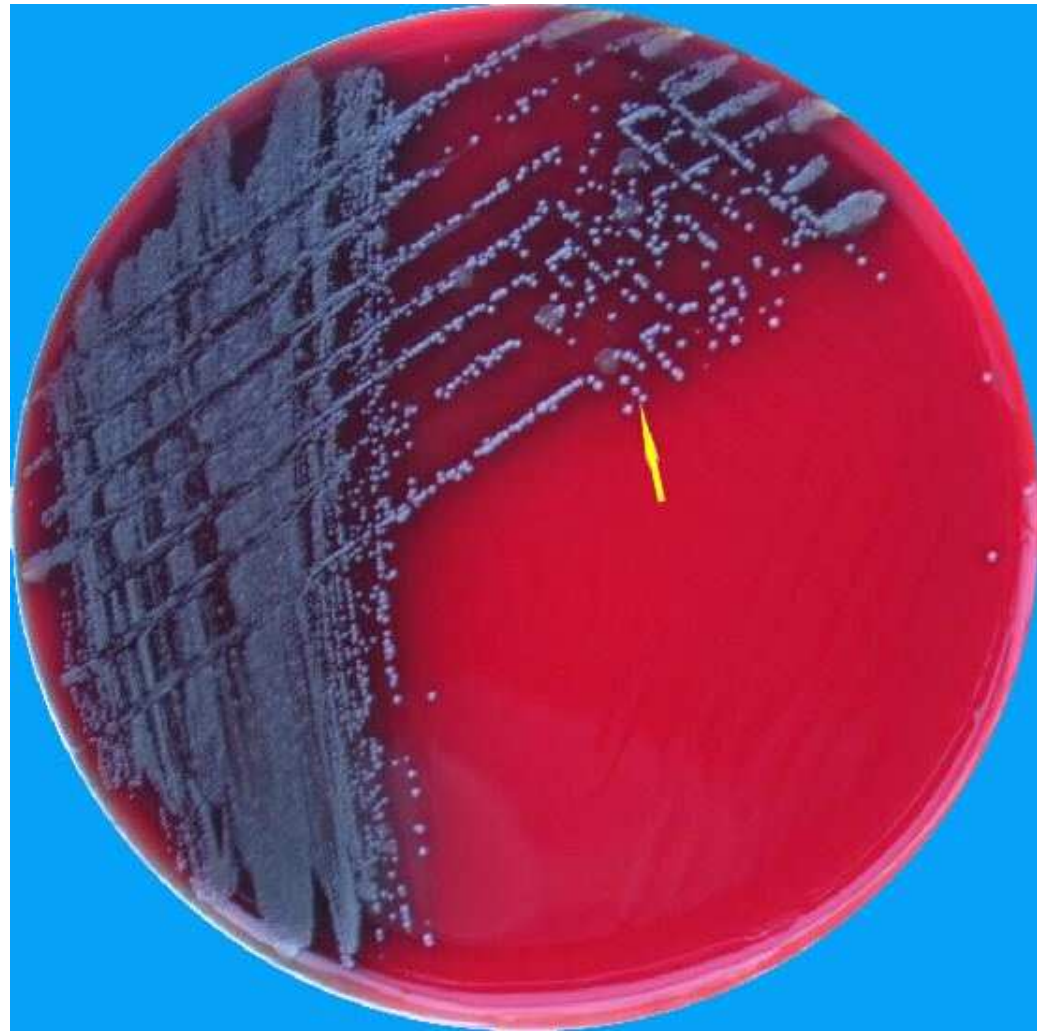


Bordetella pertussis

Tenyésztés:

Speciális

Bordet – Gengou



Bordetella pertussis

Antigének és Virulenciafaktorok:

Tok

**Fimbriák, filamentózus Haemagglutinin
Outer Membrane Proteine (OMP)**

LPS

Pertactin

Extracelluláris Toxinok:

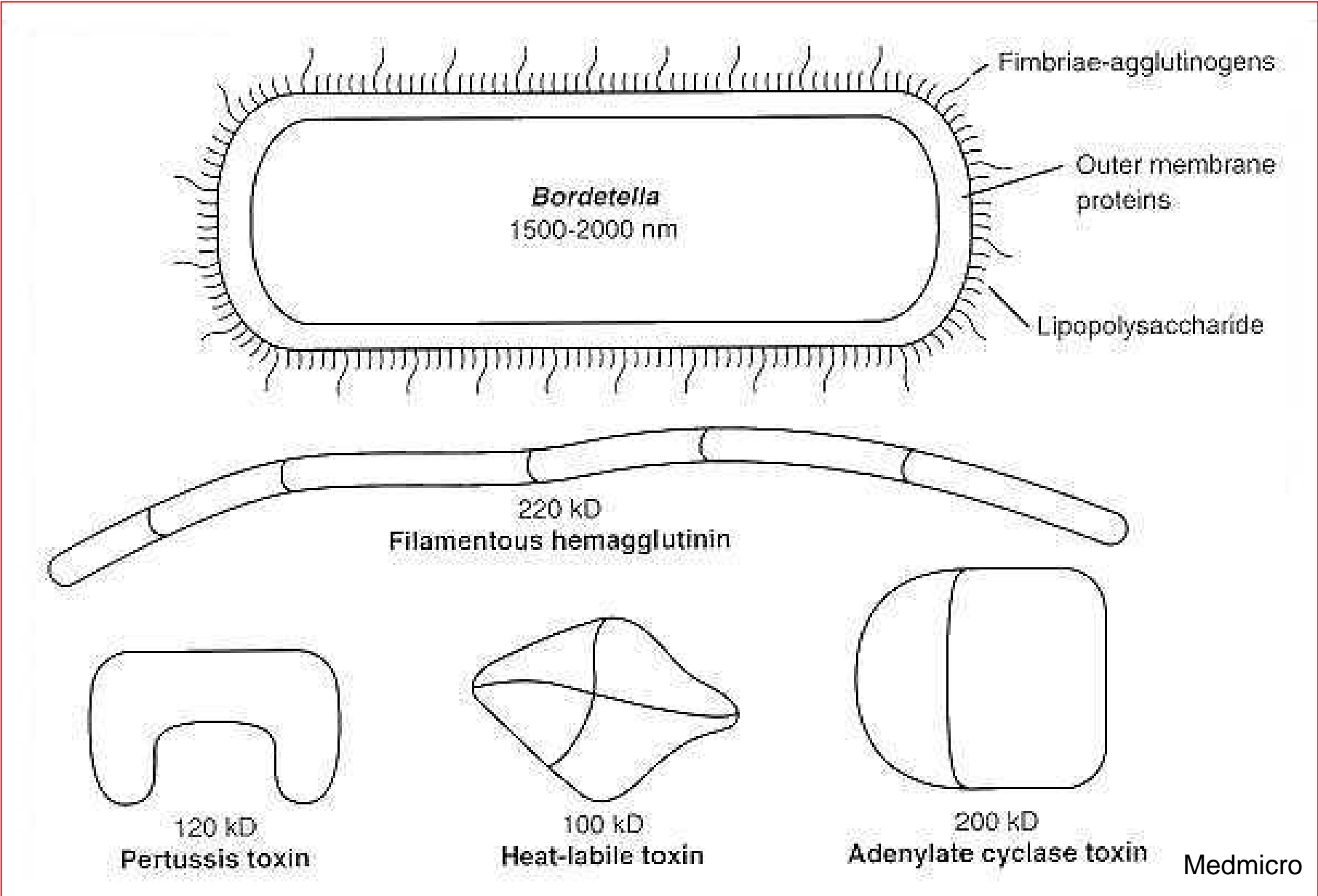
Pertussis Toxin (AB toxin)

Adenylatcyclase Toxin

Trachealis cytotoxin

Dermatonecrotikus Toxin

FIGURE 31-2 Virulence factors of *B pertussis*.



Bordetella pertussis

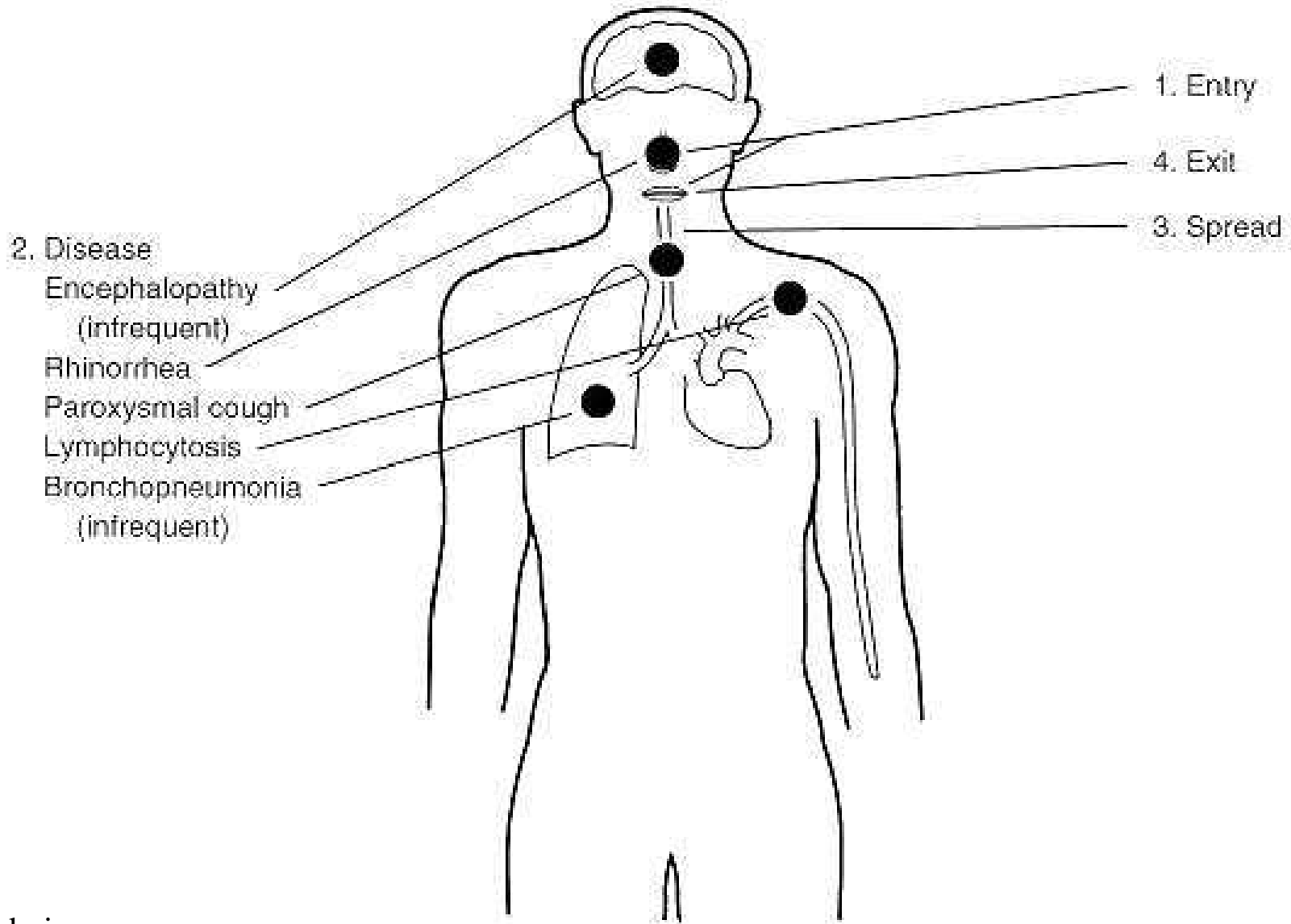
Pathogenesis, Fertőzés:

Fertőzés forrása: Betegek – prodromalis és katarrhalis Stadiumban

Behatolási kapu: Légzőtraktus

Átvitel: Cseppfertőzés → ÉRZÉKENY!
55°C; 30'

FIGURE 31-1 Pathogenesis of whooping cough.



Pathogenesis of *Bordetella pertussis*

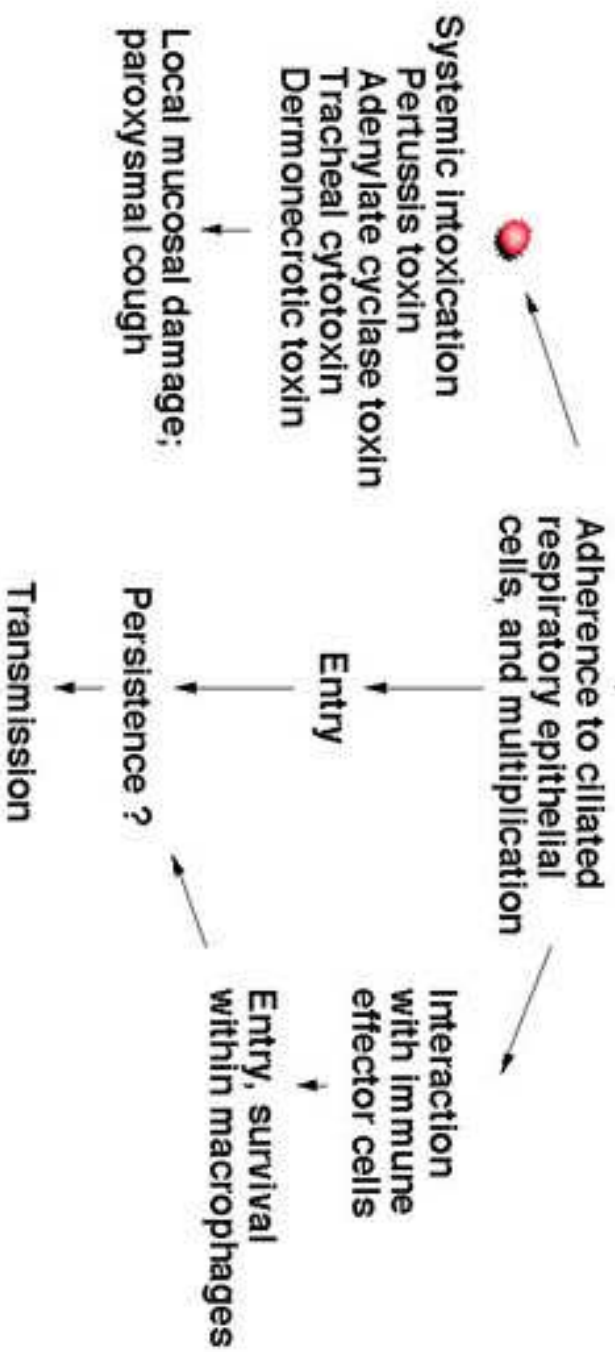
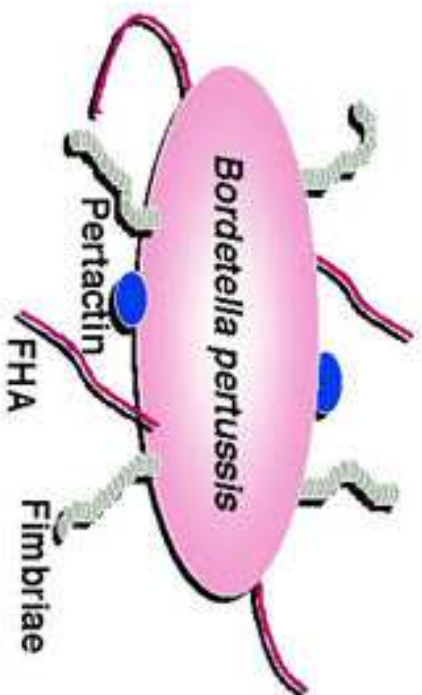
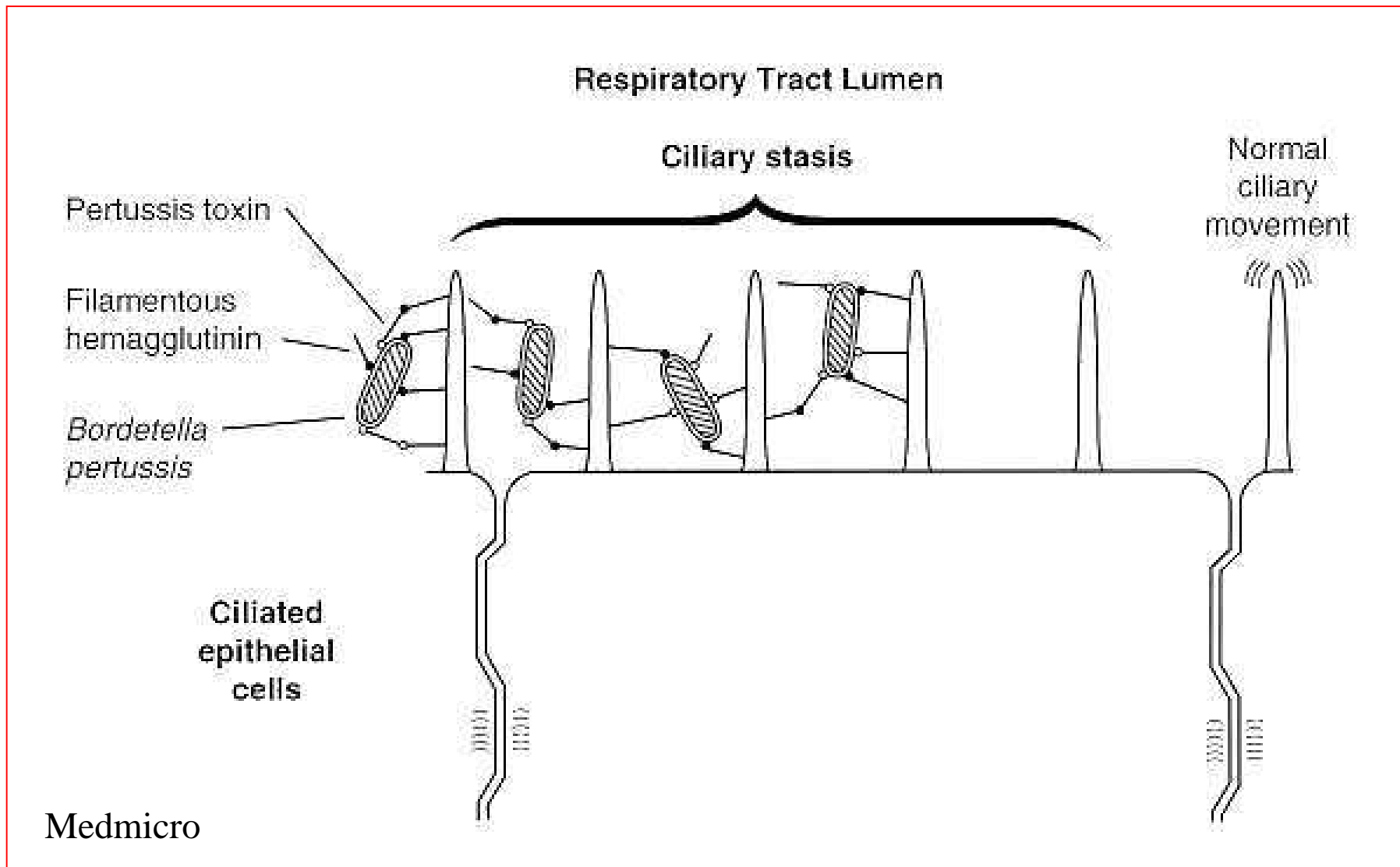


FIGURE 31-4 Synergy between pertussis toxin and the filamentous hemagglutinin in binding to ciliated respiratory epithelial cells.



Bordetella pertussis

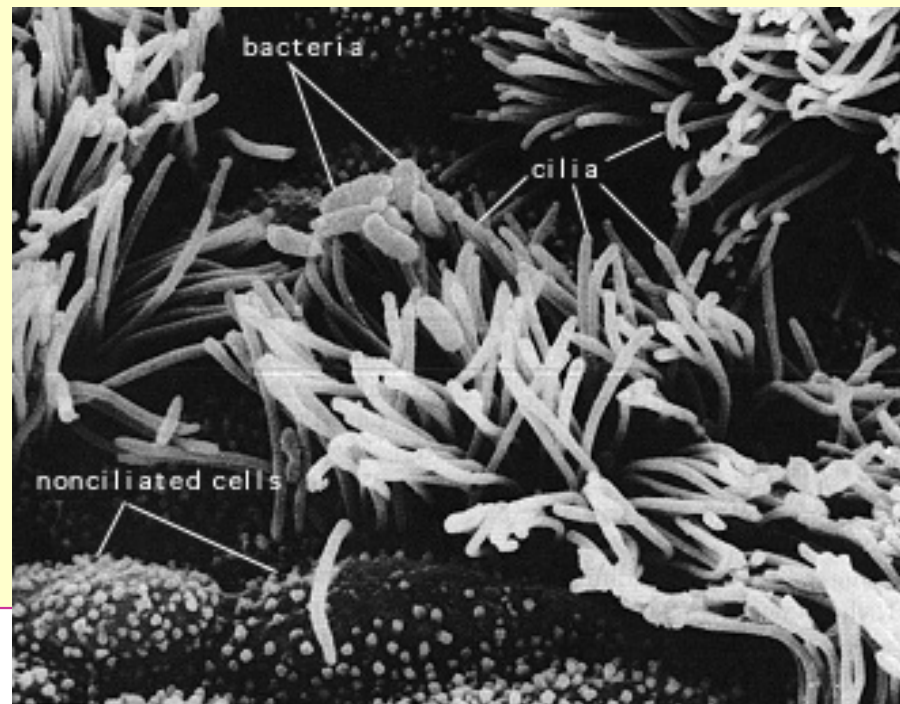
Kórkép:

Szamárköhögés / Pertussis

(Peribronchialis gyulladás, Intersticiális Pneumonia)

4-Phasis:

Prodroma,
Katarrhalis,
Paroxysmalis,
Rekonvalescens



Colonization of tracheal epithelial cells by *B. pertussis*

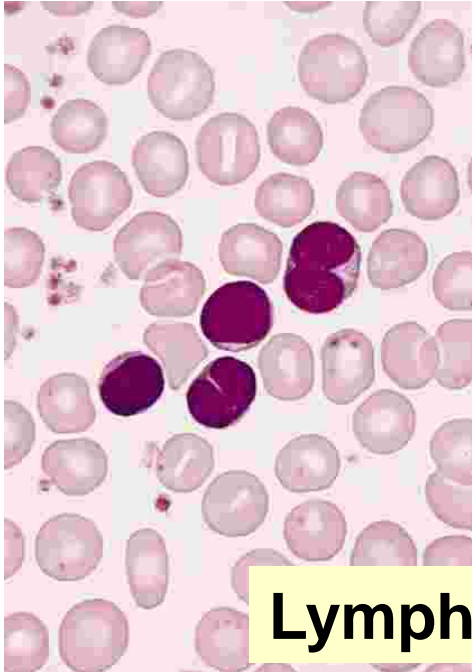
web.umr.edu/~microbio



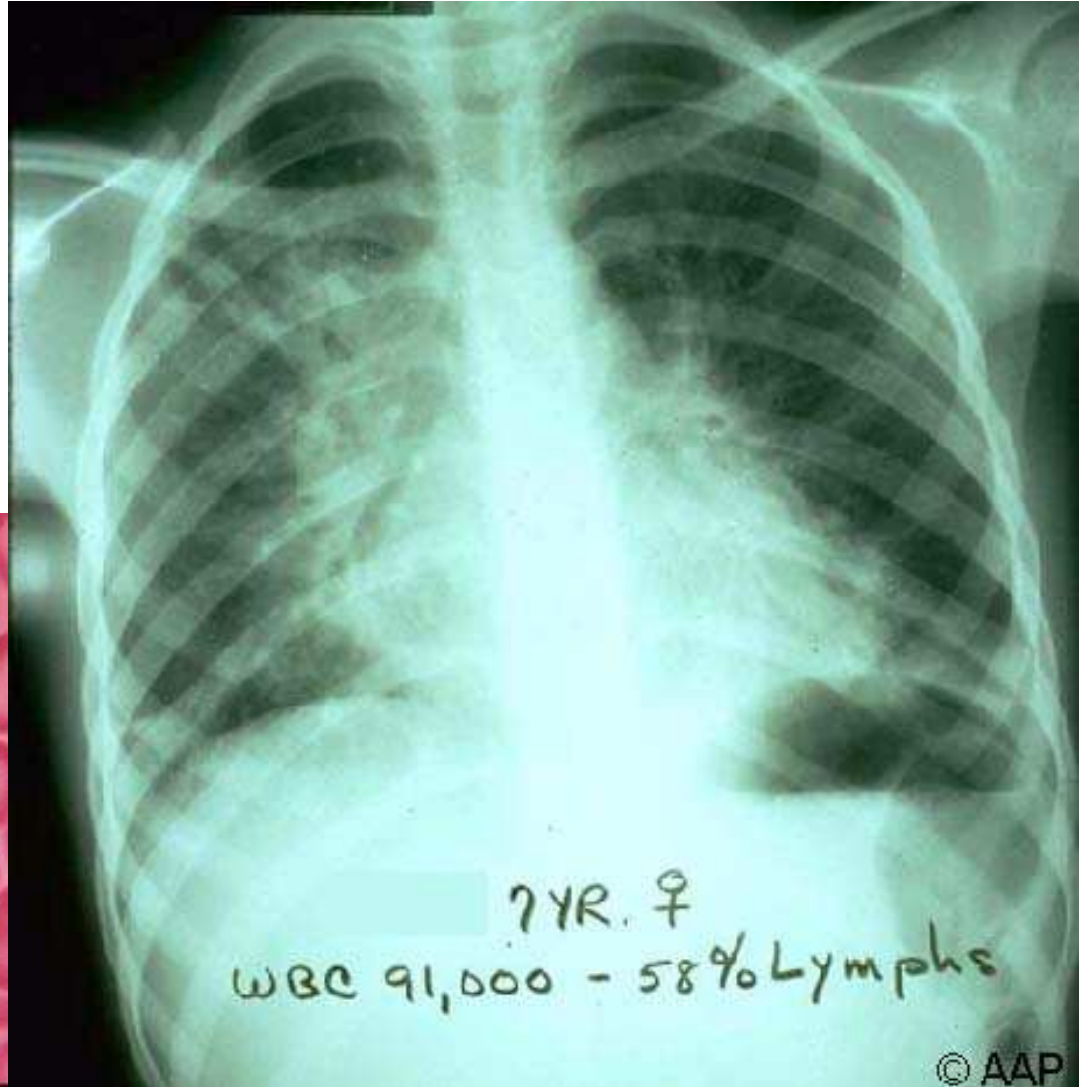
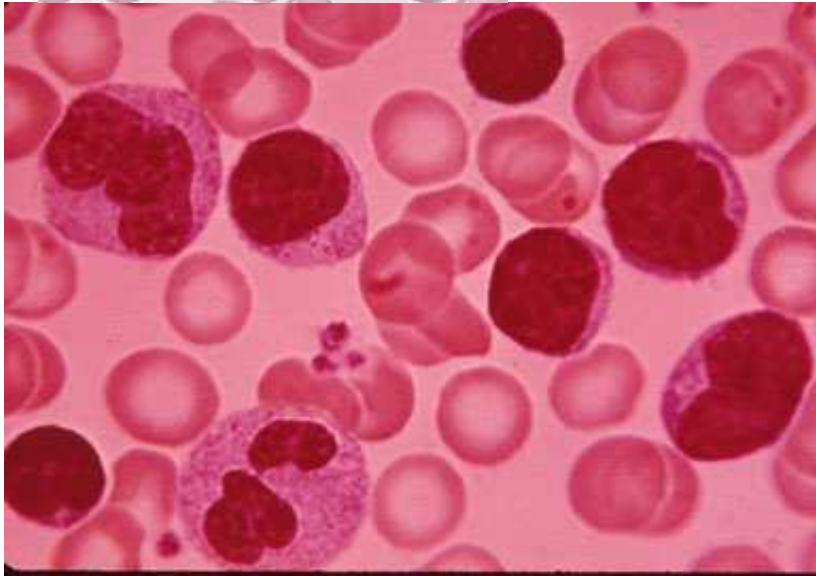
Pertussis – paroxysmalis Phasis



Pertussis - Diagnosis



Lymphocytosis



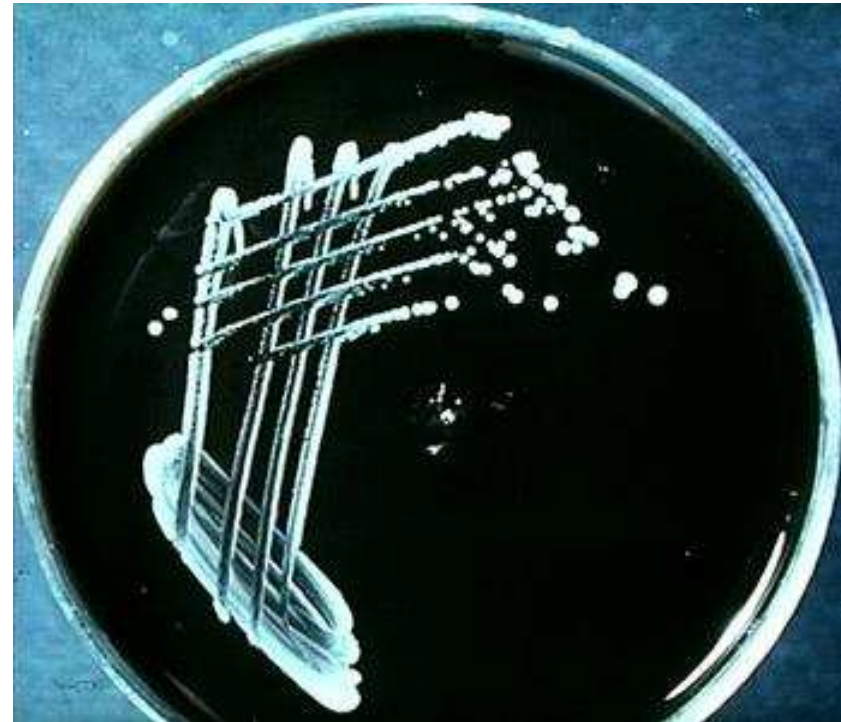
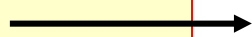
Bordetella pertussis

Diagnosis

Tenyésztés:

Bordet – Gengou
Direkt ráköhögni!

Charcoal Medium



Szerologia:

IgM, IgA, IgG kimutatás

PCR

Bordetella pertussis

Therapia:

Makrolid

Prophylaxis:

Aktív Immunizálás – acelluláris oltóanyag **DaPT**,

benne:

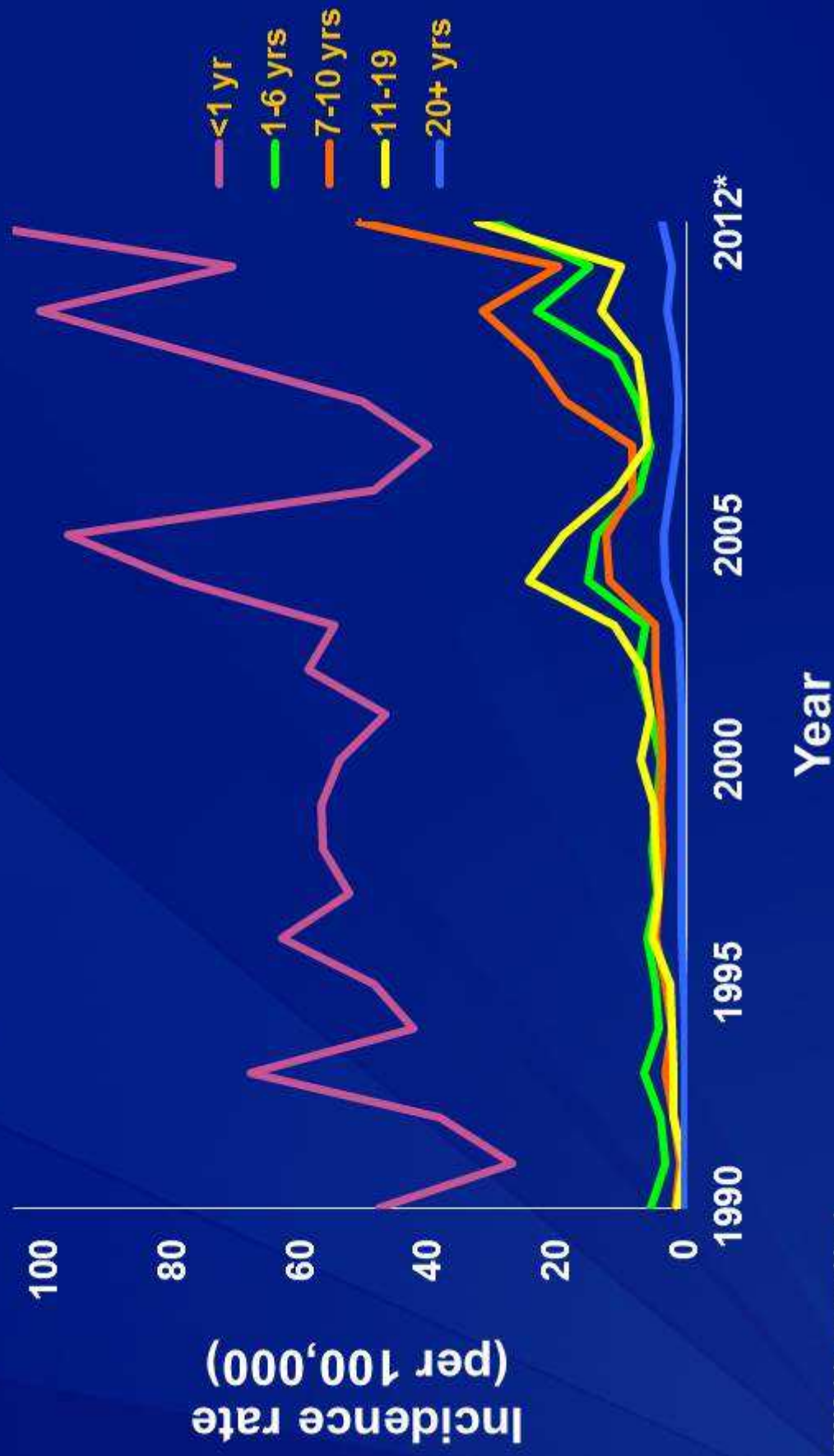
Toxoid

FH/Pilus

Pertactin

DiPerTe – elölt *B. pertussis* baktérium

Reported pertussis incidence by age group: 1990-2012*



*2012 data are provisional.

SOURCE: CDC, National Notifiable Diseases Surveillance System and Supplemental Pertussis Surveillance System

Pertussis in the USA – 2012

(CDC)

< 1 year	4516
1-6 years	7312
7-10 years	8349
11-19	12484
20+ years	8890
Unknown	329
Total	41880

GRAM NEGATIV PÁLCÁK

AEROB

Bordetella

Brucella

Francisella

Pseudomonas

Acinetobacter

Legionella

FAKULTATIV ANAEROB

Haemophilus

Pasteurella

Familia:

Enterobacteriaceae

Vibrionaceae

Cardiobacterium

Eikenella

Kingella

Actinobacillus

ANAEROB

Bacteroides

Prevotella

Porphyromonas

Fusobacterium

MIKROAEROPHIL

Campylobacter

Helicobacter

Brucellae

Morphologia:

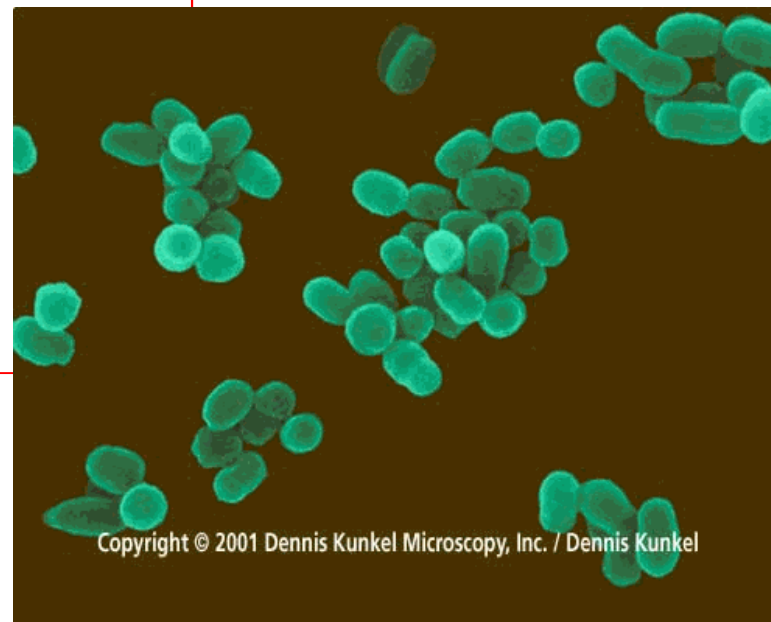
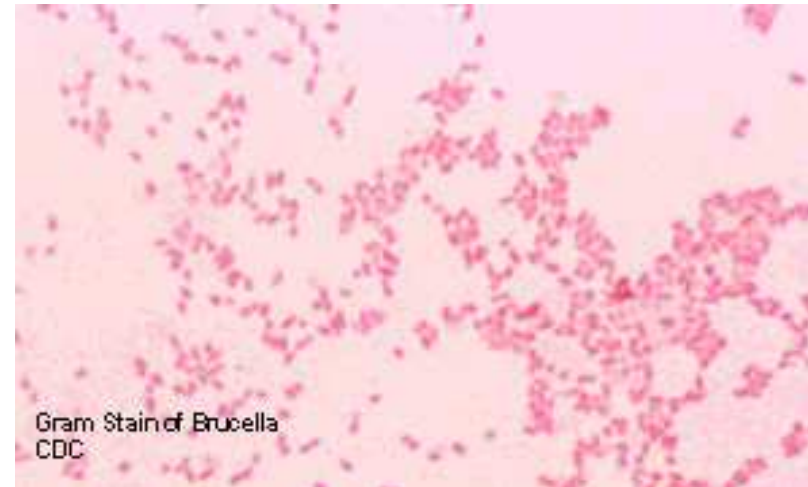
Gram negativ Coccobacillus

Tenyésztés:

Brucella agar - dúsítás
(Serum, Glycerine)

CO₂

21 nap





staff.vbi.vt.edu/pathport/pathinfo_images/Bru...

Description: *Brucella* spp. **Colony Characteristics:** - A. Fastidious, usually not visible at 24h. - B. Grows slowly on most standard laboratory media (e.g. sheep blood, chocolate and trypticase soy agars). Pinpoint, smooth, entire translucent, non-hemolytic at 48h

Brucellae

Pathogenesis, Infectio, Kórképek

B. melitensis		kecske	máltai láz
B. abortus		szarvasmarha	Morbus Bang
B. suis	sertés		sertés Brucellosis

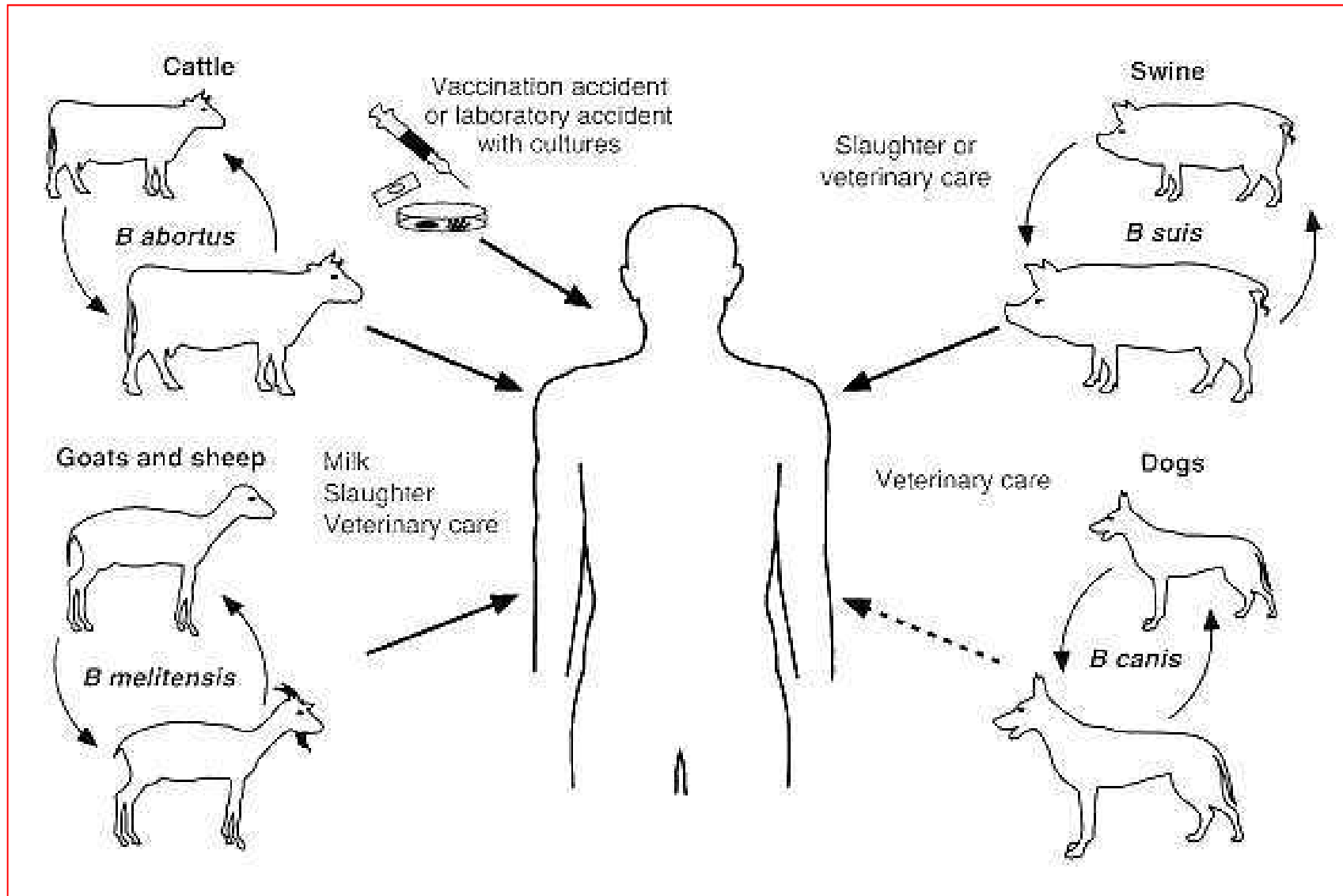
Anthropozoonosis

MIND Brucellosis

„Febris undulans” RES!
(hullámzó = unduláló láz)

- **forrás** beteg állatok (hús, tej)
- **átvitel** direkt Kontaktus vagy kontaminálódott élelmiszer
- **behatolás** bőrsérülés vagy conjunctiva vagy bélnyálkahártya

Brucella – fertőzés forrása



Brucella – behatolásí kapuk

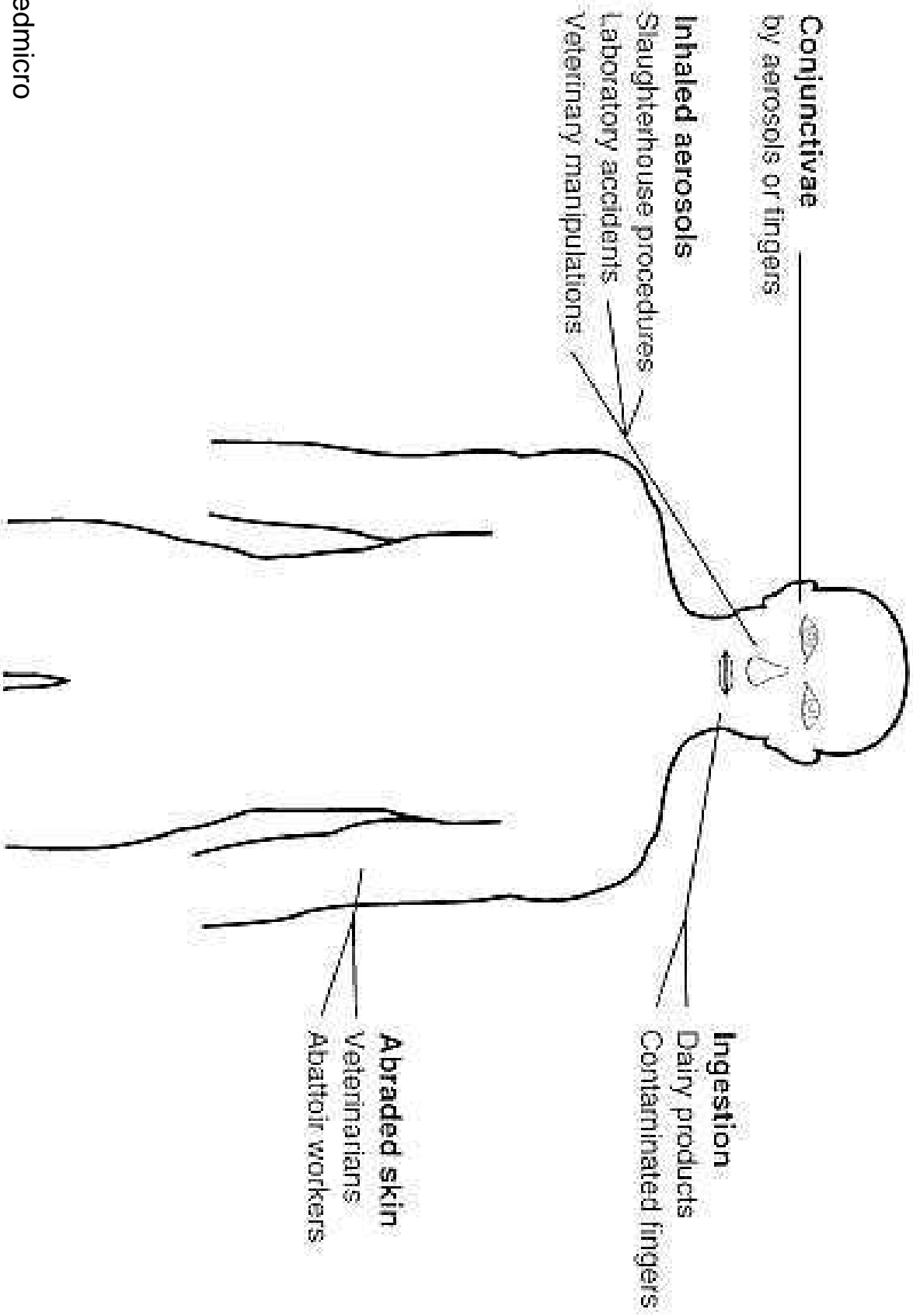


Figure 28-1 Portals of entry for Brucella species.

Brucella – szétterjedés

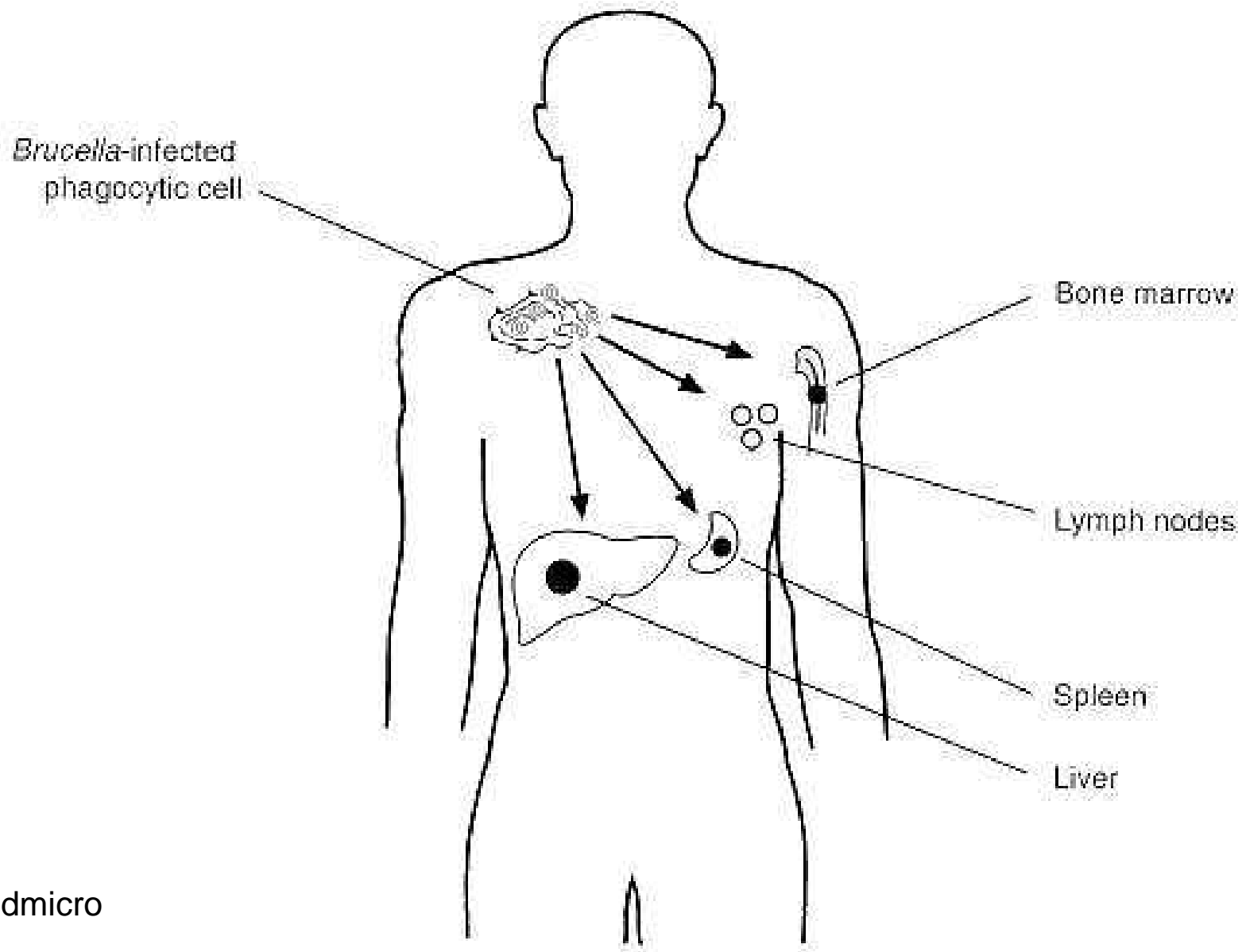




Figure. Acute unilateral scrotal swelling in a 27-year-old man with brucellosis.

www.medscape.com/.../art-iim441224.fig.jpg



Fig.13.36 Brucellosis. Arthritis of the left knee. This was accompanied by fever, malaise, generalized myalgia and depression.

Fig. 13.37 Orchitis – B. abortus

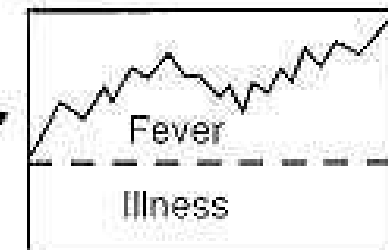
Brucellosis - diagnosis

History and Physical Exam

Clinical

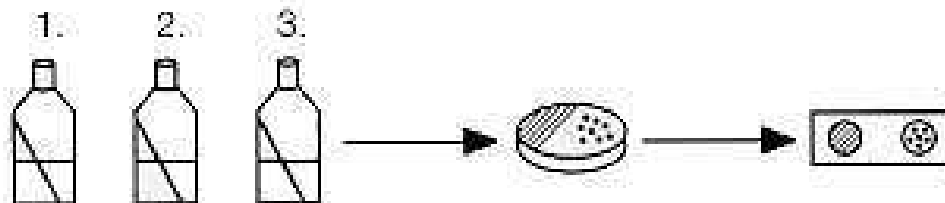
- Occupation
- Raw milk
- Fresh cheese
- Travel
- Symptoms
- Signs

Course of disease

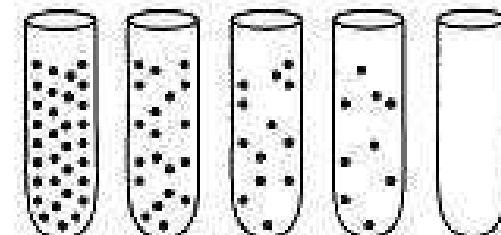


Laboratory

Blood cultures



Quantitative serology



Bruce11osis

Diagnosis

Tenyésztés: min. 5 nap

Szerologia

Ellenanyag kimutatás

Cső-agglutinatio (Wright)

IgM Chromatographia

ELISA

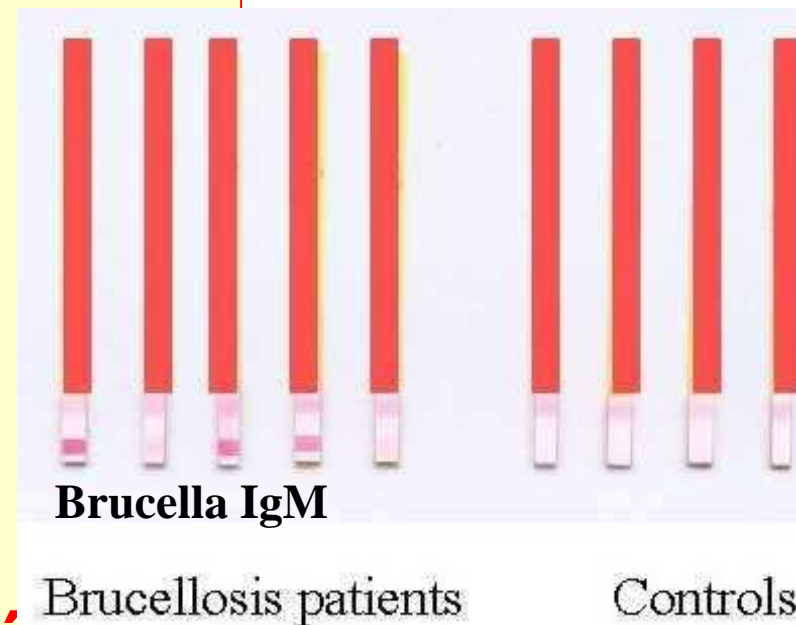
DNS direkt kimutatás: PCR

Therapia:

Doxycyclin, Rifampicin, Streptomycin

WHO – Bioterrorizmus céljára

felhasználható



www.kit.nl

Francisella tularensis

Morphologia:

Gram negatív pálcák

Hidegtűrő!

Tenyészteni tilos!

Csak speciális laboratóriumokban

WHO – Bioterrorizmus céljára

Felhasználható

Pathogenesis, Infectio

- forrás: Beteg állatok

- átvitel: direkt kontaktus

belégzés, per os, ektoparasiták

EMBERRŐL EMBERRE NEM TERJED!



Francisella tularensis

Kórképek:

TULAREMIA

nyirokcsomókban, apró granulomák
+ fekélyek
+ necrosis

Primer Komplex

cutano-, oculo-, tonsilloglandularis, (látszik!)
thoracalis, abdominalis - (nem látszik!) formák

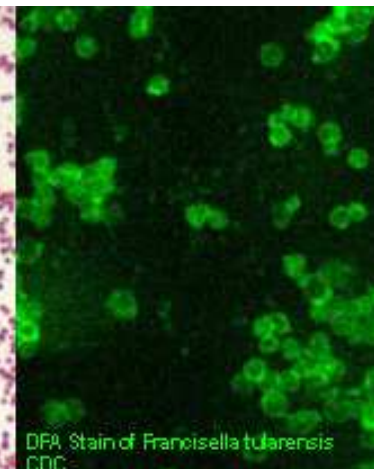
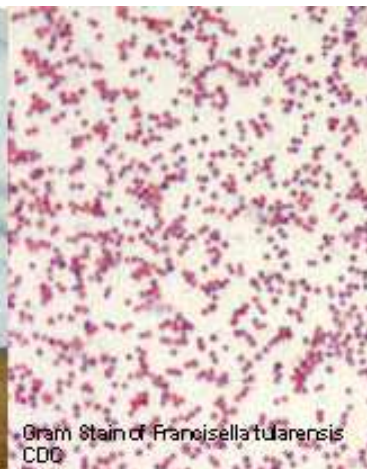
Generalisatio – Granuloma képződés!

Diagnosis: Szerologia

DNS kimutatás: PCR

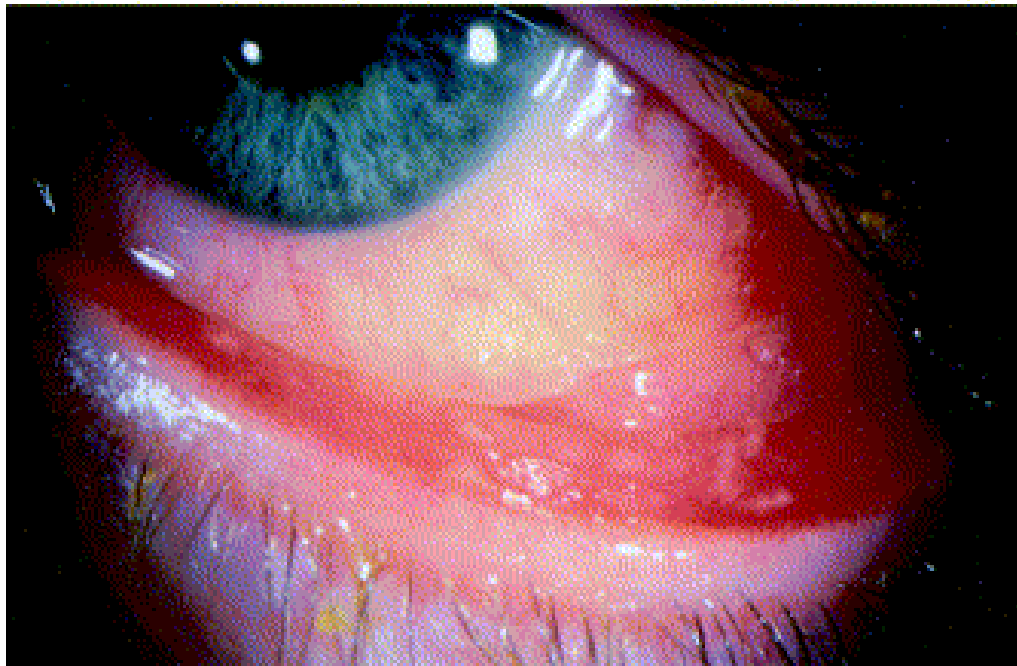
Therapia:

Streptomycin, Doxycyclin,
Ciprofloxacin





A reported case of exposure of a patient to a wild rabbit, which subsequently died, suggested that tularemia was the likely etiology

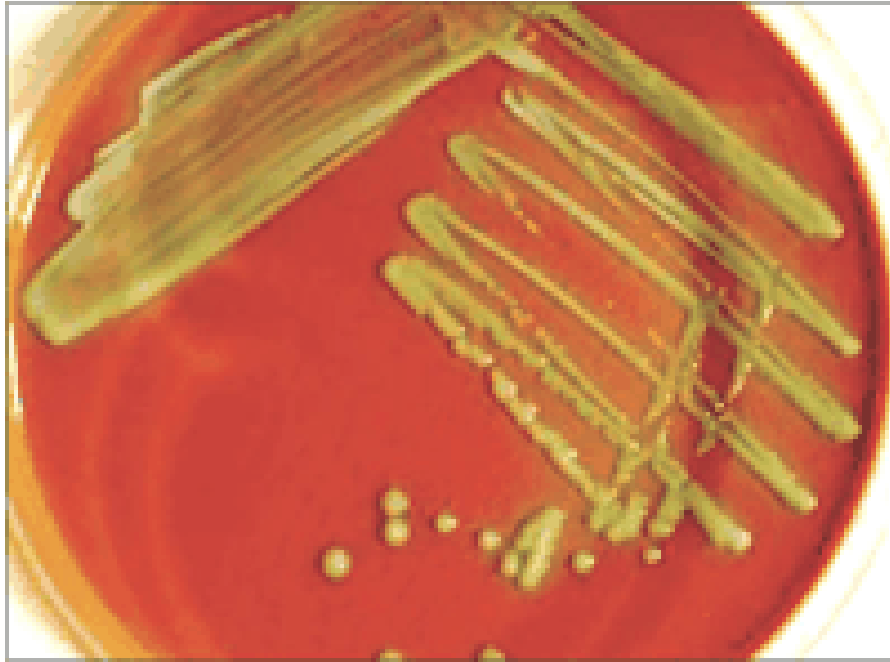


staff.vbi.vt.edu/.../Ftularensis



staff.vbi.vt.edu/.../Ftularensis

Description: Cervical Lymphadenitis in a Patient With **Pharyngeal Tularemia**; Patient has marked swelling and fluctuant suppuration of several anterior cervical nodes. Infection was acquired by ingestion of contaminated food or water. Source: World Health Organization



Description: These *Francisella tularensis* colonies show characteristic opalescence on cysteine heart agar with sheep blood (cultured at 37 C for 72 hours). Note: On cysteine heart agar, *F. tularensis* colonies are characteristically opalescent and do not discolor the medium

Description: Chest Radiograph of a Patient With Pulmonary Tularemia

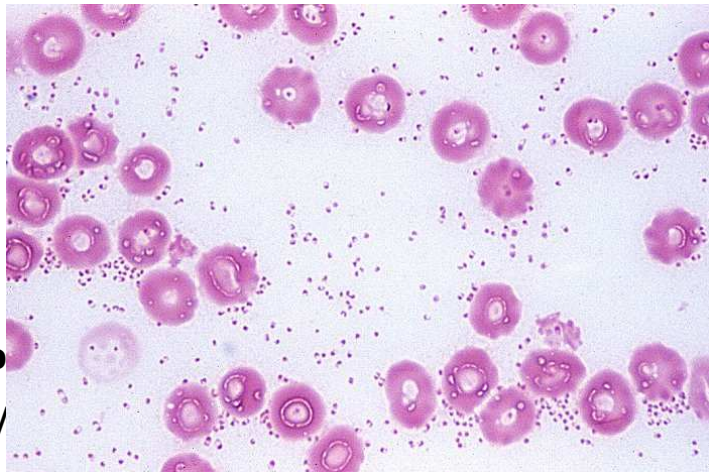


Pasteurella multocida

medecinepharmacie.univ-fcomte.fr

Morphologia:

Gram negatív, kicsi pálcák



P
M

immunkárosodott: Sepsis!

Therapia: sebészi, Penicillinek

Tenyésztés:

Véres- és csokoládé agar



Pasteurella multocida

Fig. 10.55 Animal bite.
Infected wound of finger
following bite of domestic
cat. *P. multocida* was
isolated from the wound.



© AAP



***Pasteurella
multocida***
cellulitis
secondary to
multiple cat
bites about the
face of a one-
year-old child

?



Yersinia pestis

genus: Enterobacteriaceae!

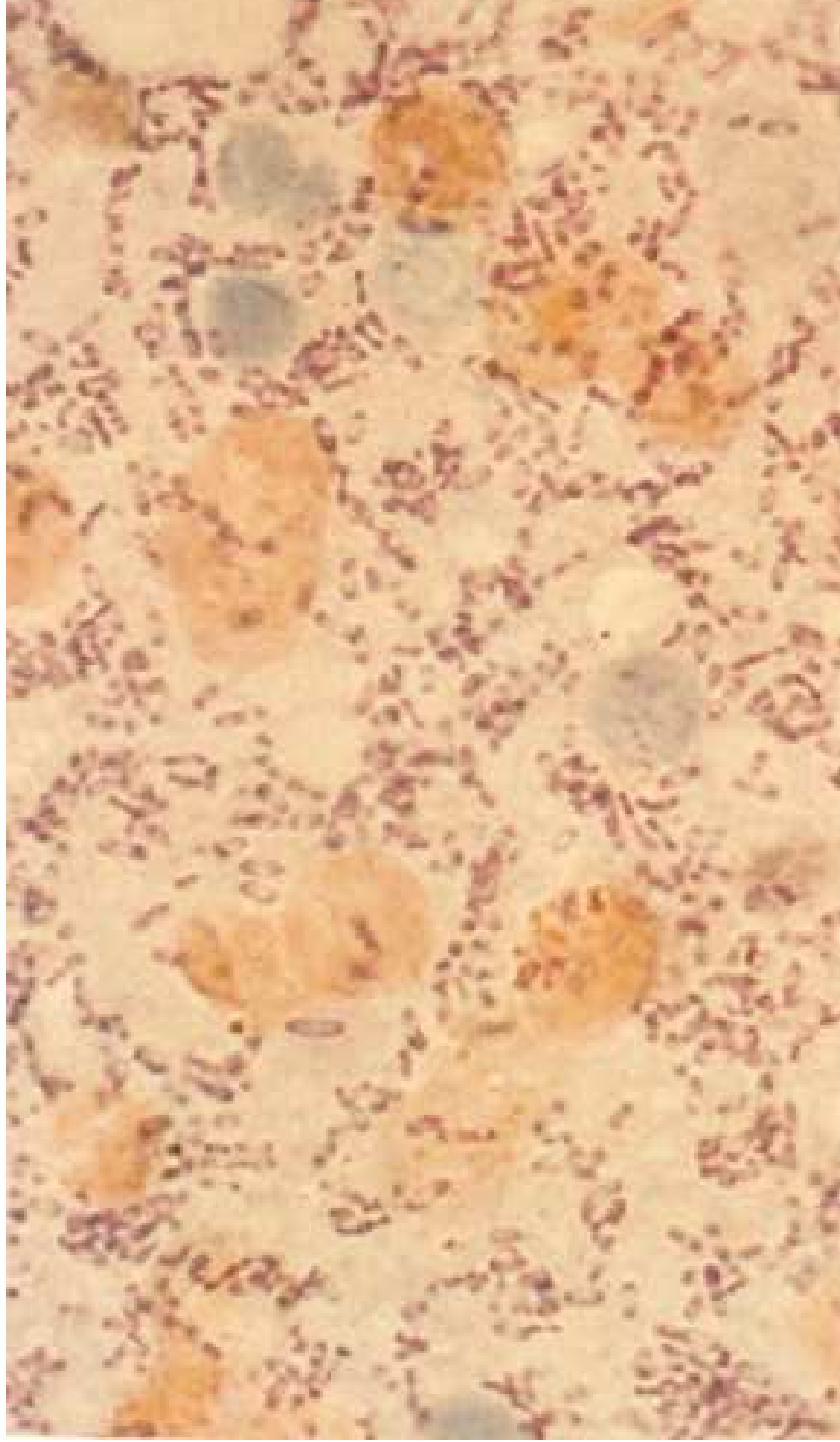
Morphologia: Gram negativ pálcák – bipolaris festődés



www.lonlygunmen.de

Giemsa festés

www.mja.com.au



Yersinia pestis in Leber

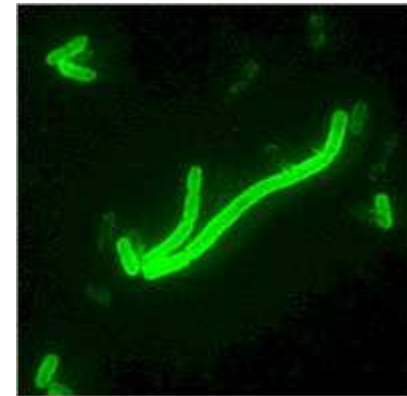
Yersinia pestis

TENYÉSZTÉS: TILOS!

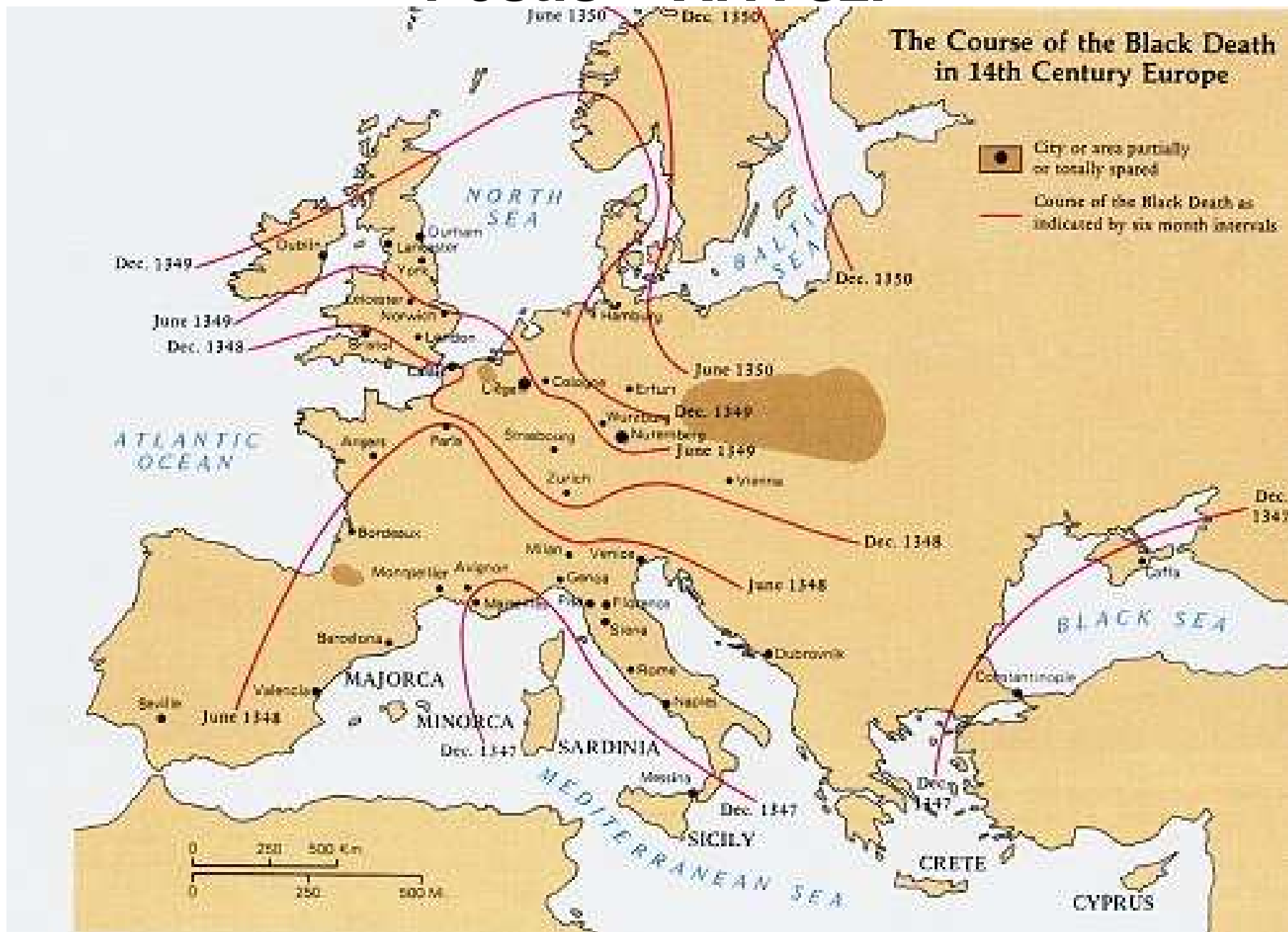
Csak speciális laboratóriumokban

WHO – Bioterroroizmus céljára

használható



Pestis - XIV. sz.



Yersinia pestis

VIRULENCIA FAKTOROK

TOK – Protein!

V Antigen (Protein) Antiphagocyter

W Antigen = Endotoxin

Extracellularis

- Plasminogen – Aktivator – Protein (Pla)
széttérjedés, fibrinolysis

-Toxin (egér)

Yersinia pestis

Pathogenesis, Infectio:

forrás:

Patkány (és más rágcsálók) → Patkányirtás!!!

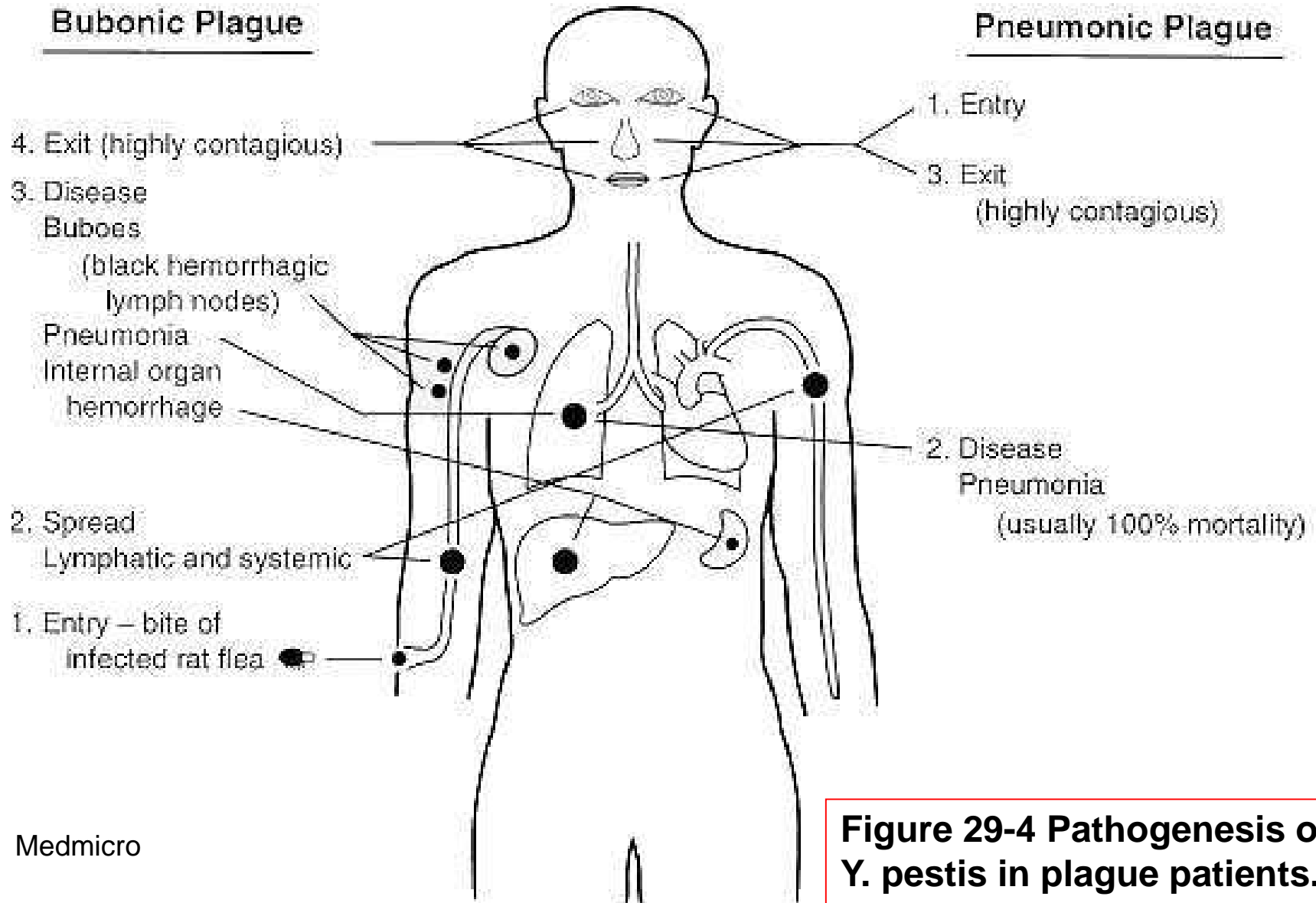
átvitel:

direkt kontaktus,
Patkánybolha csípése

behatolás: bőr



Yersinia pestis



Medmicro

Figure 29-4 Pathogenesis of *Y. pestis* in plague patients.

Yersinia pestis

Kórképek:

1) Bubó pestis

(nyirokcsomó
magnagyobbodás)



2) Szeptikus forma → **haemorrhagiás gyulladás**

3) **Tüdőpestis** = Pneumonia (haemorrhagiás) ←
direkt aerogen átvitel, emberről emberre
(cseppfertőzés → primer tüdőpestis)!



Bubopestis

Fig. 13.55 Plague. Enlarged tender inguinal lymphnodes in a Vietnamese child with bubonic plague.

Fig. 13.56 Advanced stage of inguinal lymphadenitis in bubonoc plague. The nodes have undergone suppuration and the lesion has drained spontaneously.

By courtesy of Dr. J.R. Cantey

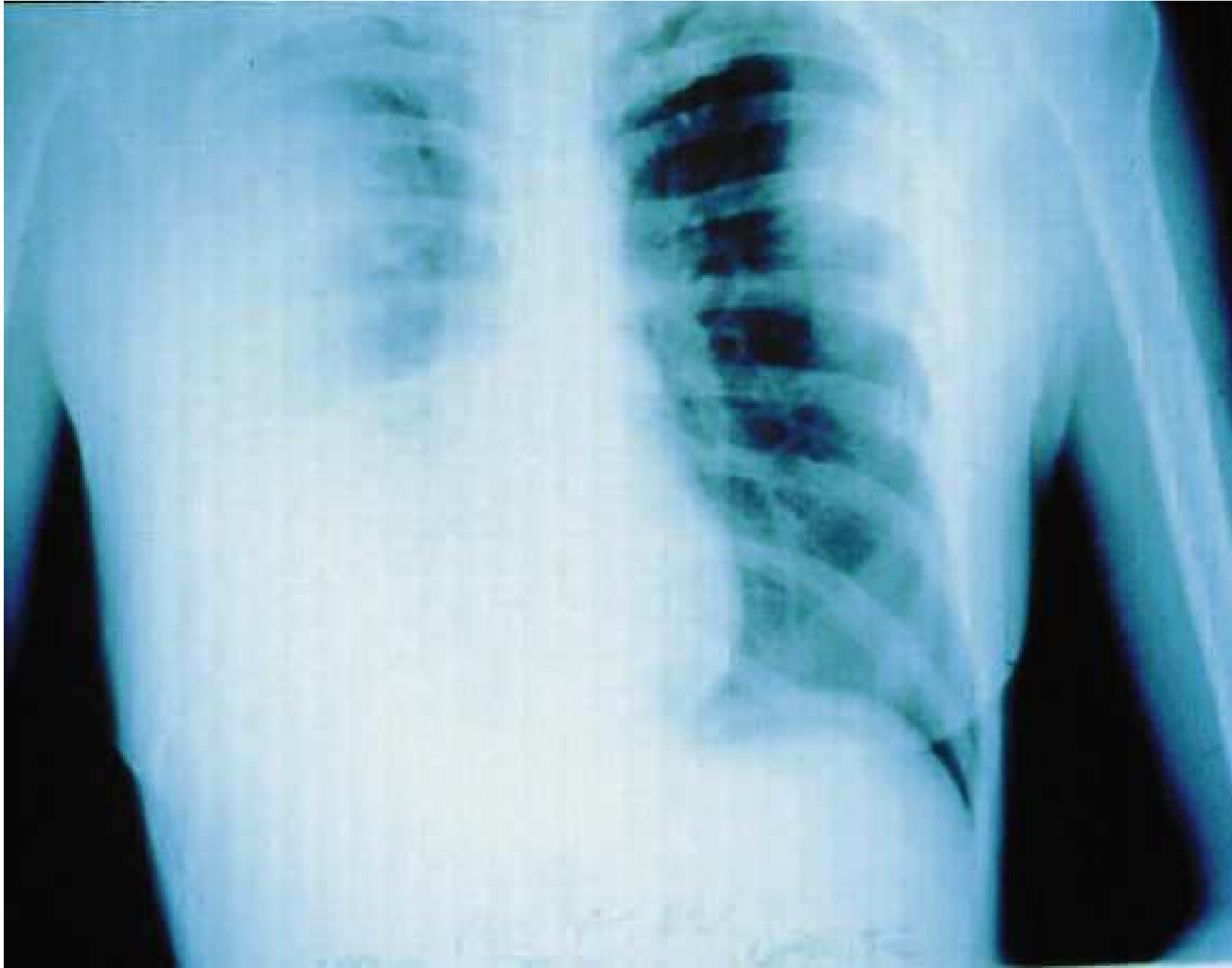


Necrosis of finger tips of septicemic plague.



Sepsis

Cutaneous Hemorrhages in Plague. Source www.cdc.gov



Tüdőpestis

Yersinia pestis

Diagnosis

Klinikai

Direkt kimutatás - Mikroszkópos

Szerologia – cső-agglutinatio, IF

PCR

Therapia:

Doxycyclin, Streptomycin



Biológiai fegyverek – bioterrorizmus

Biológiai fegyverek: Organismusok, Toxinok, Vírusok

Cél:

- megbetegítése és/vagy elpusztítása egyéneknek, közösségeknek (populáció)
- gazdasági károkozás

Biológiai hadviselés (katonai konfliktus)

Bioterrorizmus (ideológiai motiváció)

Biológiai bűncselekmény (személyes célok, indíttatások)

Biológiai fegyverek – bioterrorizmus

Kategóriák: A, B, C

legveszélyesebb: A

B. anthracis, C. botulinum, F. tularensis, Y. pestis

Egyszerű tenyésztési

Egyszerű terjesztési: cseppfertőzés, légutak

Magas halálozás

Therápia?

Hirtelen kezdet

Nagy számú áldozat



Korfu, 2006

VÉGE