

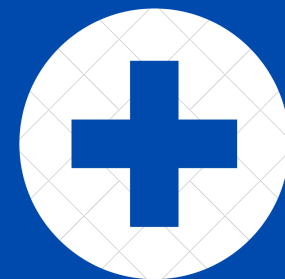
PASSION ACADEMIC TEAM *YU - MEDICINE*

Sheet# 6 - MICROBIOLOGY

Lec. Date :

Lec. Title : MYCOPLASMA

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**If you come by any mistake , please
kindly report it to
shaghafbatch@gmail.com**

RESPIRATORY SYSTEM

MYCOPLASMA

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محاضرة فيها حكي كثير
بس سهله الله بعينكم

MYCOPLASMA



- Smallest free-living micro organisms.
- Eaton (1944) first isolated the causative agent of the disease in hamsters and cotton rates.
- Also known as Eaton agent.

قبل ما يحكوا عنها
بكتيريا هيكل كان اسمها

* Unusual , smallest self replicating organism , was classified as virus because it's very small size .

* Until now , it's confused if it cause a primary infection (caused by viruses then damage/ inhibit the locomotion of cilia) OR secondary infection (caused by bacteria)

* Mycoplasma can do the same (inhibit the locomotion of cilia) as viruses . So , it's similar to viruses in size and pathogenecity .

: اذاً في اختلاط بينها وبين الفايروس لكنها بكتيريا لأنو

can replicate by BINARY FUSION .

فاللي خلاها تكون بكتيريا مش فايروس هو هاذ السبب

MYCOPLASMA



- Myco : fungus like branching filaments
- Plasma : plasticity
- highly pleomorphic
- Lack cell wall.

MYCOPLASMA : it's elastic because it doesn't have " cell wall "

* this cell wall less bacteria is Pleomorphic .
(third , coccus , bacillus , cup shape ..)

* the outer layer (cell membrane) : more thick than the cell membrane of other bacteria حتى يعوّض عدم وجود cell wall .

Morphology and Physiology



- Small genome size (*M. pneumoniae* is ~800 Kbp)
 - Require complex media for growth
- Facultative anaerobes
 - Except *M. pneumoniae* - strict aerobe

In respiratory tract , the most common pathogen is "mycoplasma pneumoniae "
It's genome size = 800 Kbp , but there are other types of mycoplasma much less than 800 kbp such as (mycoplasma genitalium = 476 kbp) -> half .

كثرت حكي هون صح ؟ آسفه

- No cell wall means these are resistant to penicillins, cephalosporins and vancomycin, etc.
- Grow slowly by binary fission
- Doubling time can be as long as 16 hours, extended incubation needed

This indicate that: mycoplasma's microbial content is very low, but even thought it's pathogenecity is remarkable .

No cell wall , slower grower : 3 weeks to grow in culture .

ما بنقدر نطلع تقرير أنو نمو negative إلا بعد اسبوعين أو ثلاث :
-البكتيريا

because of the generation time which is nearly equal to T.B generation time (18-20 hrs) .

Mycoplasma generation time : 16 hrs . Any other normal bacterial generation time : 20 mins (by average)
such as : E-coli , entrobacteriaceae ... others are on average

Morphology and Physiology

- Require complex media for growth, including sterols
- Major antigenic determinants are glycolipids and proteins, some cross reaction with human tissues.

في نظرية بتحكي انو الأمراض الي بتسببها هاي البكتيريا أو بتشارك فيها غير محدد ,
يربطوها بال **cancer** أو **infectious and organic diseases** أو الحساسية

حتى انهم اتهموها بأنها السبب وراء الي حدث بالتسعينات **Gulf war syndrome**
وهي حالة صابت الجنود الأمريكان الي شاركوا بحرب الخليج / اعراض مرضيه بالجهاز
التنفسي والدماغ فكان معظم الجنود عندهم هالبكتيريا فربطوا الأعراض فيها
فهي زي الشبح عندها القدرة تختفي عن الرادار وهو جهاز المناعة
This bacteria is stealth and remarkable pathogen .

This bacteria love sterols ..
نسبة الدهون الي بتستهلكها عالية لذلك منضيف الستيروولز على الميديا لما بدنا نعملها **culture**

Mycoplasmas of Humans



- Parasitic
- 1. Established pathogens: *M. pneumoniae*
- 2. Presumed pathogens: *M. hominis*, *U. urealyticum*
- 3. Non pathogenic: *M. orale*, *M. buccale*, *M. genitalium*, *M. fermentans*

The number of confirmed pathogens from Myco is limited but in scientific references say that *Streptococcus pneumoniae* is the main pathogen >> معلومه مش مهمه ومش عارفين شو جوها <<

* Opportunistic organisms : *M. hominis* , *U. urealyticum* -> they cause sexually transmitted diseases .

* *fermentans* & *genitalium* & *orale* : they said that they are non pathogen but that NOT TRUE , because *fermentans* are isolated from arthritis from synovial fluid . Also , *genitalium* can cause genital tract infection .

So , we have 17 confirmed pathogens of mycoplasmas .



- Two types of diseases:

1. Atypical Pneumonia

2. Genital infections

TYPES :

- Atypical Pneumonia

هي موضوعنا

- Genital infections

** حتى ال pneumonia

اللي بتسببها بتكون غير تقليدية**

Pathogenicity



- Adherence
 - P1 pili (*M. pneumoniae*)
 - Movement of cilia ceases (ciliostasis)
 - Clearance mechanism stops resulting in cough

virulence factor of this bacteria :

عندها قدرة هائله على الالتصاق وهاذ جاي من مجموعة البروتين بتكون زي الصمغ مع الهوست تشيو

P1 : One of the examples of adhesiase (Protein) .

كل ما كان حجم البروتين اكبر كل ما كان ال antigenicity تبعه أعلى وكانت قدرته ع الالتصاق اكبر

High Daltons , High adhesive

*** movement of cilia ceases : another virulence factor**

اول ما يدخل الجهاز التنفسي بروح على base of cilia وبعطل حركتها

*** clearance mechanism stops (of mucos) in trachea - > bacterial growth - > pneumonia .**

Mycoplasmal pneumonia



- Also called Primary Atypical Pneumonia/ Walking pneumonia.

Atypical : مش تقليدي بشغلتين

الاولى : ممكن تصير بأي وقت من السنة (بالعادة بالشتاء بس هالحكي بالبكتيريا هاي مش موجود) ليه ؟

because distribution on months all most equal

الثانيه : المريض بضل يعاني من الأعراض المرضية 3-4 اشهر تقريباً

bad slow resolution

walking pneumonia : المريض بس يمشي بتزيد الاعراض ويبطل يسيطر عليها

spontaneous , dry and non productive pneumonia

pneumonia in others هاي الاشياء بتميزها عن ال

- Seen in all ages

- Incubation period: 1-3 wks

- Transmission: airborne droplets of nasopharyngeal secretions, close contacts

Mycoplasmal pneumonia



- Gradual onset with fever, malaise, chills, headache & sore throat.

Once it infects the trachea, it could reach ears : establishment for mycoplasmal infections in ear-drum, and that what we call Bullous myringitis: إذا ما تعالج ممكن المريض ينطرم
other complications : otitis, meningitis ...

- Severe cough with blood tinged sputum (worsens at night)
- Complications: bullous myringitis & otitis, meningitis, encephalitis, hemolytic anemia

مامي شتوروتوروتروو

M. pneumoniae

الي هون انحكي بسياق الحديث فوق



- Persistent, dry, non-productive cough
- Respiratory symptoms
 - Patchy bronchopneumonia
 - acute pharyngitis may be present
- Slow resolution
- Rarely fatal

ام الهوا VS ابو الليل

Epidemiology - M. pneumoniae

- Occurs worldwide

لما حكيينا عن influenza حكيينا انو كل 10 سنين (في هجمه) بينما
بالمايكوبلازما بال epidemics كل 4-8 سنوات خصوصاً الاطفال

- No seasonal variation

- Proportionally higher in summer and fall

- Epidemics occur every 4-8 year

- Spread by aerosol route (Confined populations).

- Disease of the young (5-20 years), although all ages are at risk

Laboratory Diagnosis



- **Specimens** – throat swabs, respiratory secretions.

- **Microscopy** –

1. Highly pleomorphic
2. Gram negative

This bacteria is very difficult to be diagnosis , very difficult to be cultured .

** Before PCR diagnostic kits for mycoplasma , diagnosis by guessing was so rare (misdiagnosis) , So the best ways to diagnose are :

1. PCR
2. Serology

** the best test : complement fixation test

Laboratory Diagnosis

- Mycoplasma (Culture)

For culture : complex media , all normal gradient + sterol + microbial inhibitors (so good fro contamination , we don't want any thing to appear else mycoplsama) .

1. Semi solid enriched medium containing 20% horse or human serum, yeast extract.
2. Penicillin & Thallium acetate are selective agents.
2. Incubate aerobically for 7 -12 days with 5–10% CO₂ at 35-37°C.

* these inhibitors (chemicals)

* antimicrobial : Penicillin (attention : don't have any effect on mycoplasma (cell walls) if was tetracyclin may kill it .

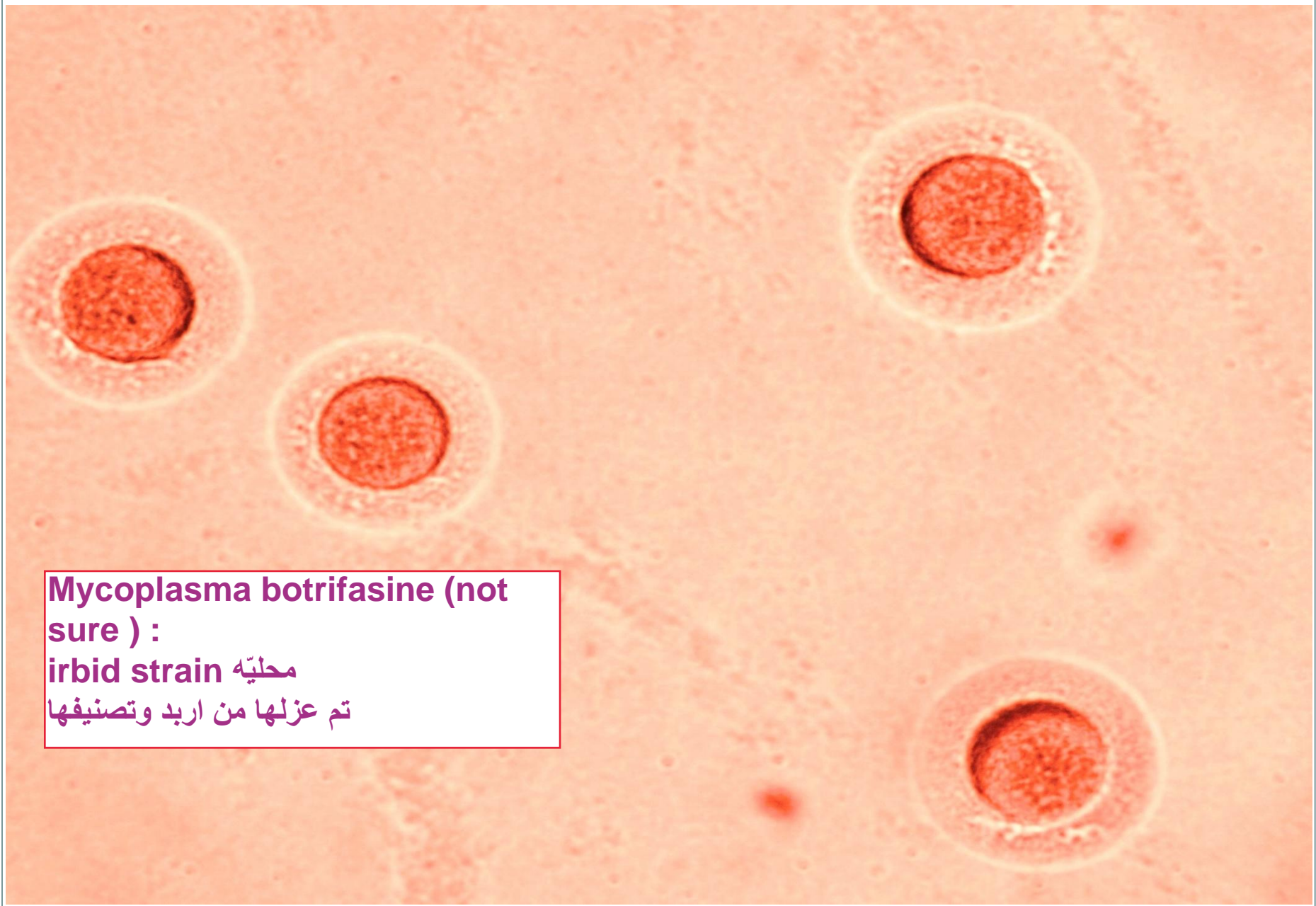
* very toxic material can kill every thing : thallium acetate (إذا اجاع النهايات العصبية يعطلها و بعمل paralysis)

Laboratory Diagnosis



3. Typical “fried egg” appearance of colonies
4. Colonies best seen with a hand lens after staining with Diene’s method.

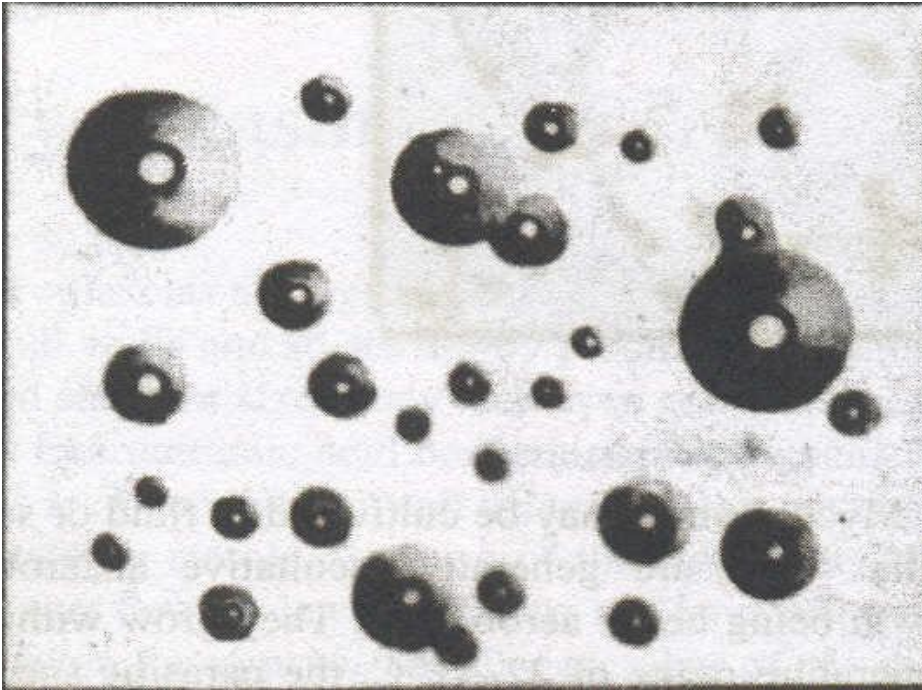
Morphology of the colonies :
fried egg appearance ما في بكتيريا
بتبين زيها



**Mycoplasma botrifasine (not
sure) :**

irbid strain محليّه

تم عزلها من اربد وتصنيفها



Fried egg colonies

Mycoplasma :
عاديّه اوروبيّه



Identification of Isolates



- Growth Inhibition Test
- Immunofluorescence
- Molecular diagnosis
 - PCR-based tests are being developed
 - These should have good sensitivity and be specific

Identification of Isolates



- Serological diagnosis
 1. Specific tests – CF, HAI
 2. Non specific serological tests – cold agglutination tests (Abs agglutinate human group O red cells at low temperature, 4°C).
1:32 titer or above is significant.

يلا ضل صفحة وخلص

Treatment and Prevention *M. pneumoniae*



- Treatment
 - Tetracycline in adults (doxycycline) or erythromycin (children)
 - ✦ Newer fluoroquinolones (in adults)
 - Resistant to cell wall synthesis inhibitors.

Treatment : we except cell wall inhibitors ..
Drug of choice : tetracyclin or Erythromycin ,
Azithromycin , clarithromycin

- Prevention
 - Avoid close contact
 - Isolation is not practical due to length of illness
 - No vaccine, although attempted