

COMMUNITY-ACQUIRED PNEUMONIA (CAP) IN ADULTS

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OVERVIEW

- Definition
- History
- Classification
- Epidemiology
- Aetiology
- Clinical features
- Investigation
- Management
- Prognostic factors
- Complications

DEFINITION

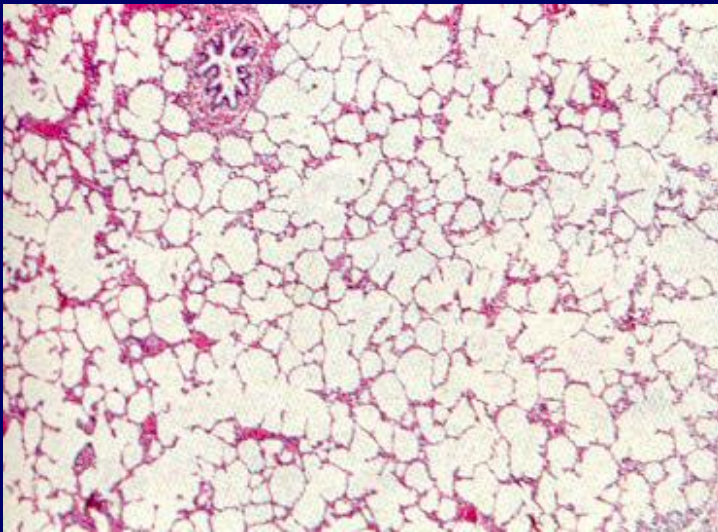
Infection in the alveolar spaces of the lung leading to accumulation of secretions and inflammatory cells

Clinical manifestations are due to

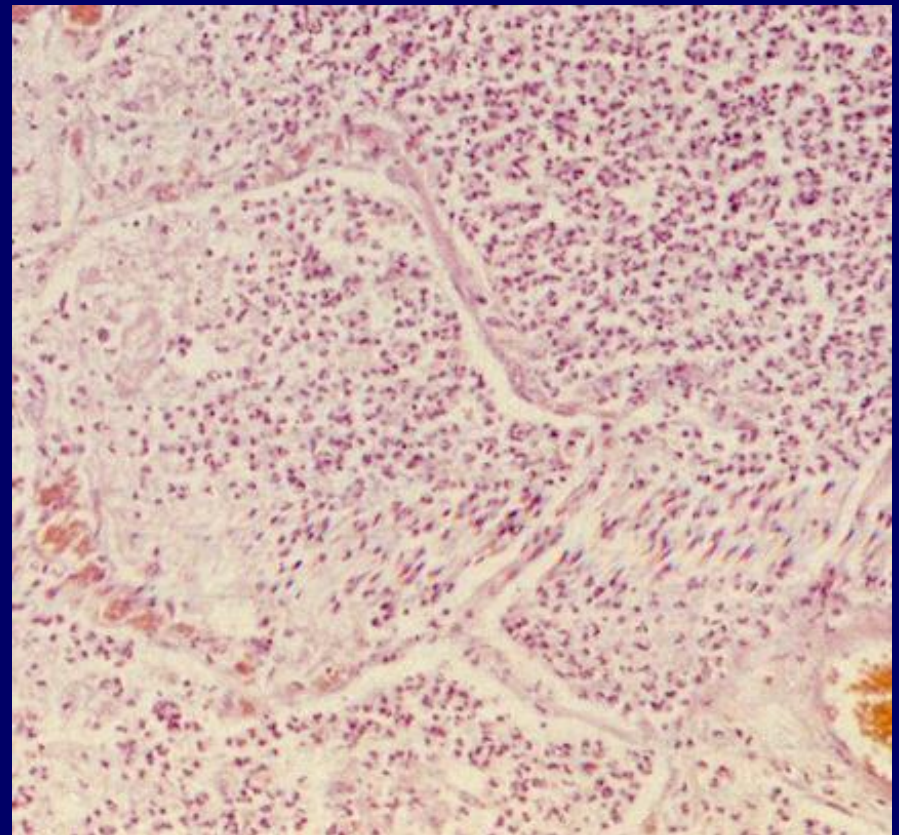
- Infecting organism
- Inflammatory response
- Disturbance of gas exchange

DEFINITION:

Microscopic features



Normal parenchyma



HISTORY 1/3

- 4th cent: Hippocrates first recorded the use of auscultation in pneumonia
- 1834: Laennec clinico-pathological correlation: 3 stages of consolidation
- 1880: Friedlander proposed a bacterial aetiology
- 1886: Fraenkel established the role of pneumococcus



HISTORY 2/3

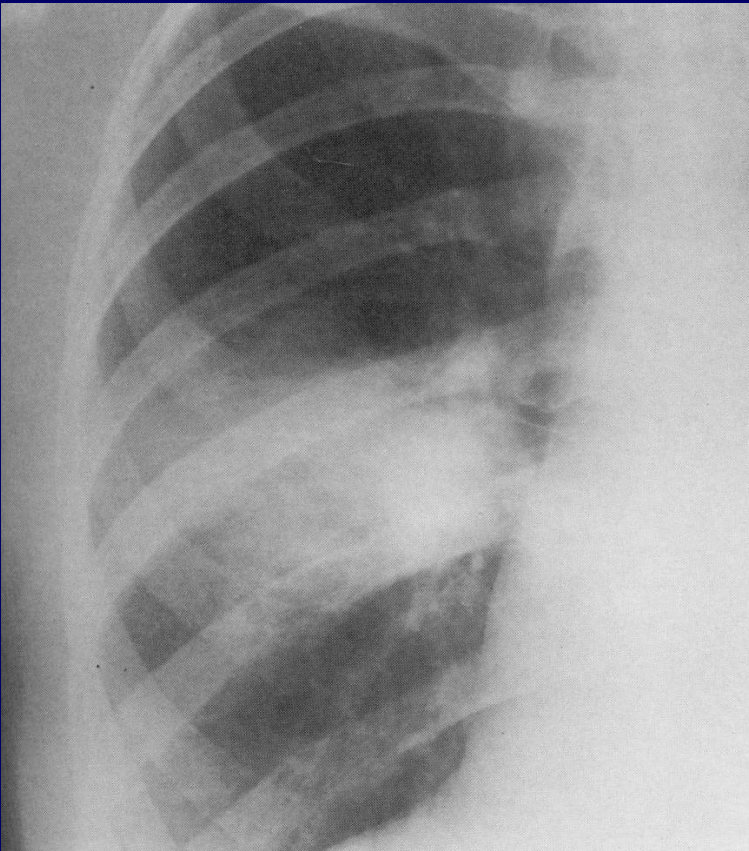
Osler in Principles and Practice of Medicine, 4th Ed (1901):

- *‘...a local disease, produced by the inhalation of diplococci, which induces by its toxins, constitutional disturbances of varying degrees...’*
- *‘the most widespread and fatal of all acute diseases, pneumonia, is now Captain of the Men of Death’*

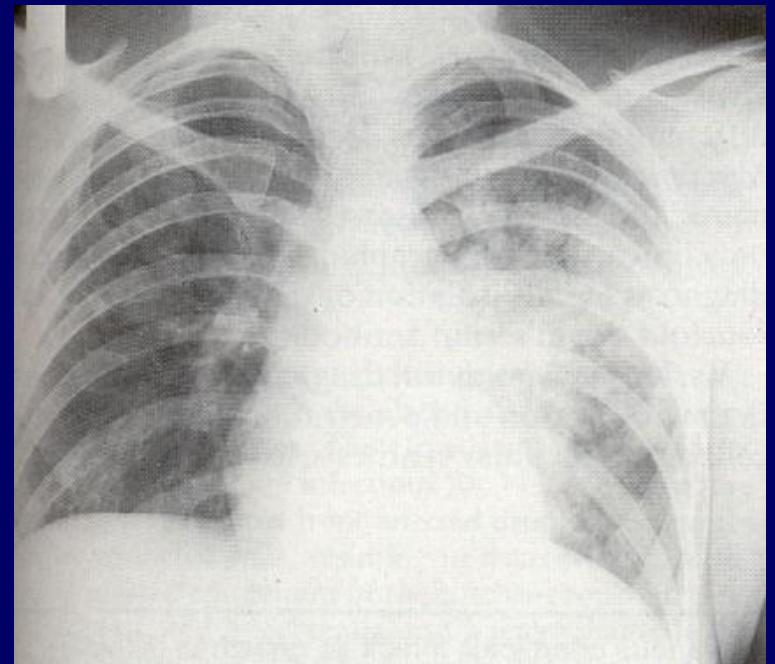
HISTORY 3/3

- Early 20th century only treatment anti-sera therapy
- Antibiotic era: sulphonamides (1938) & penicillins (1944) revolutionized therapy
- Atypical pneumonias recognised
- 1976 Legionnaires disease in Philadelphia
- AIDS-related pneumonia

CLASSIFICATION: Radiological



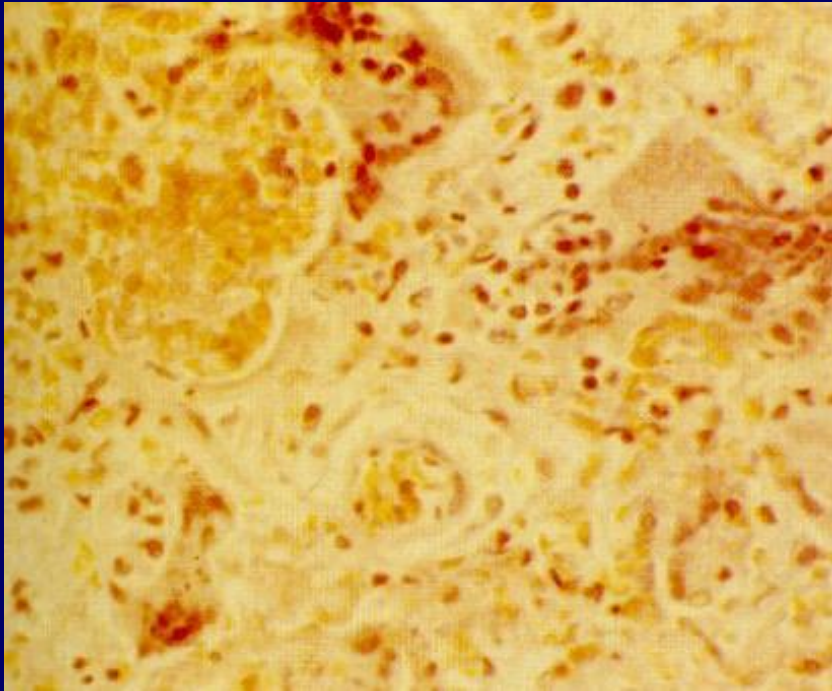
Lobar



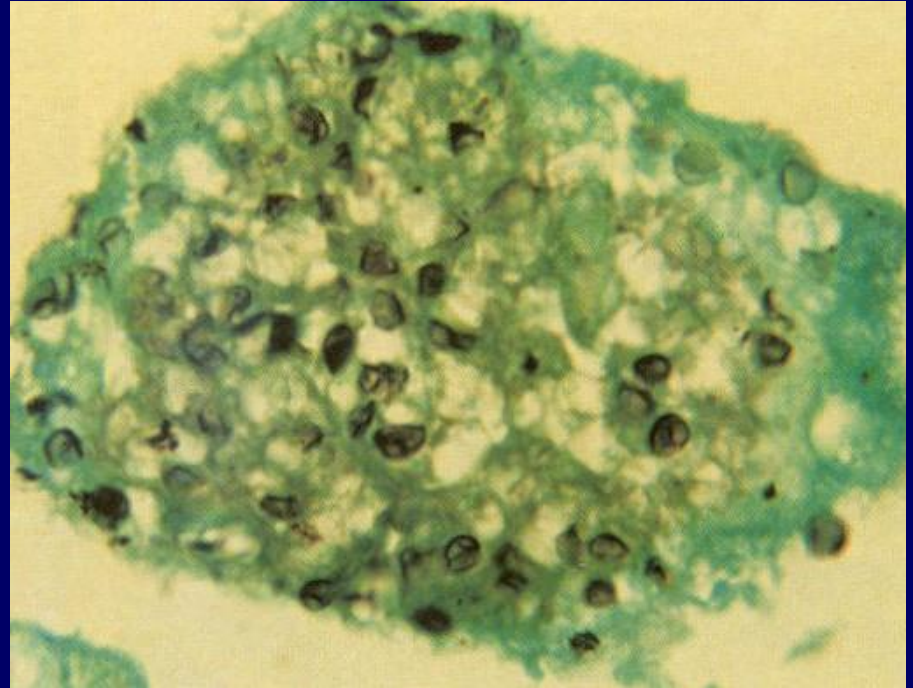
Bronchopneumonia

CLASSIFICATION:

Microbiological



Viral



Fungal

CLASSIFICATION:

Clinical

Pneumonia can be:

- COMMUNITY-ACQUIRED
- Hospital-acquired
- Aspiration
- Immuno-compromised host
- Recurrent

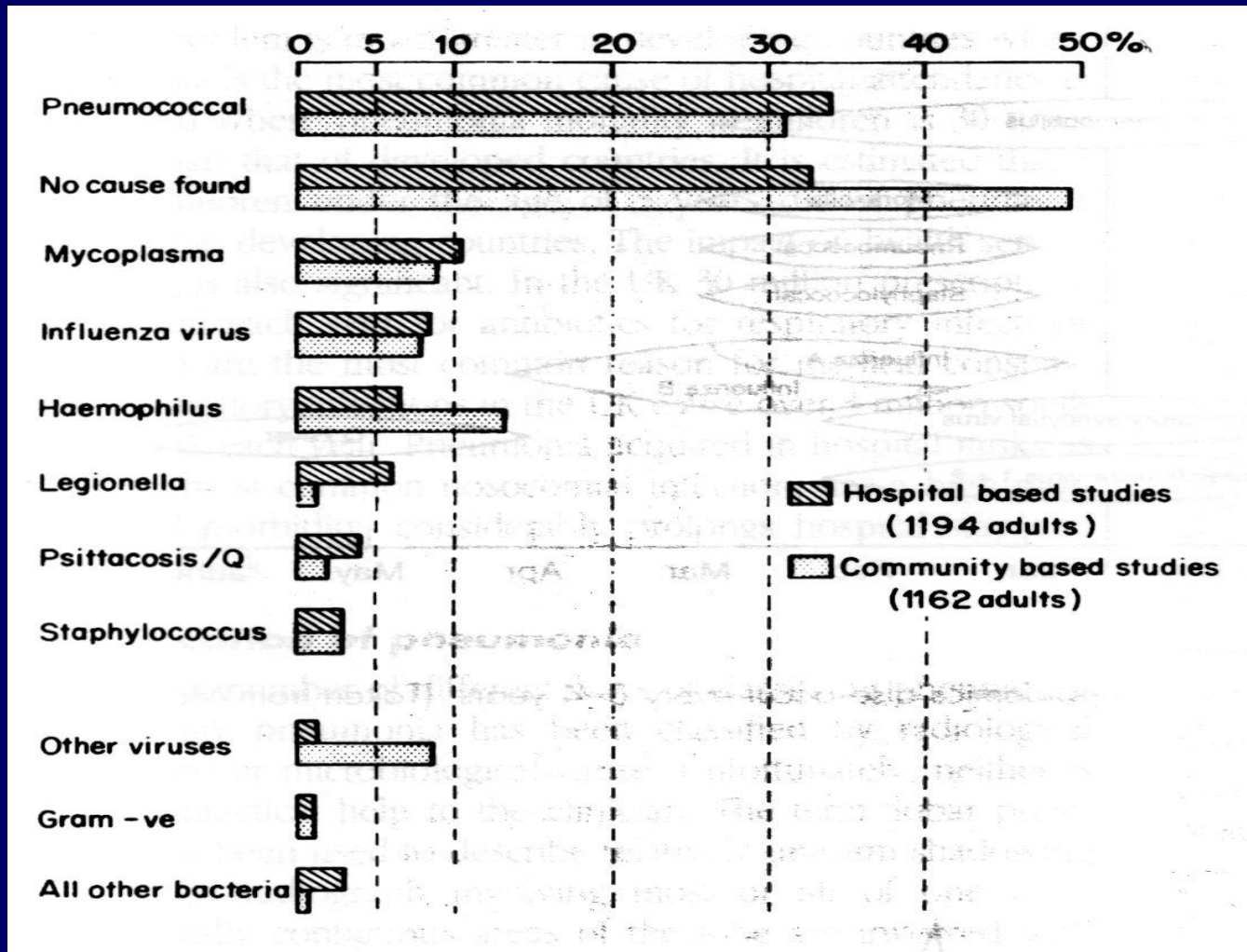
EPIDEMIOLOGY

Data from the UK:

Woodhead M. et al Lancet 1983; I:691

- Lower respiratory tract infection 40-80 /1000 adults/year
 - 1/25 is a pneumonia; 1/6 is admitted
i.e. 1/2000 adults/year is admitted from
the community with pneumonia
- 3x commoner < 5yrs or > 75 yrs

AETIOLOGY OF CAP



STREP. PNEUMONIAE



STREP. PNEUMONIAE

Commonest cause

- Also severest disease & most mortality, especially when associated with bacteraemia

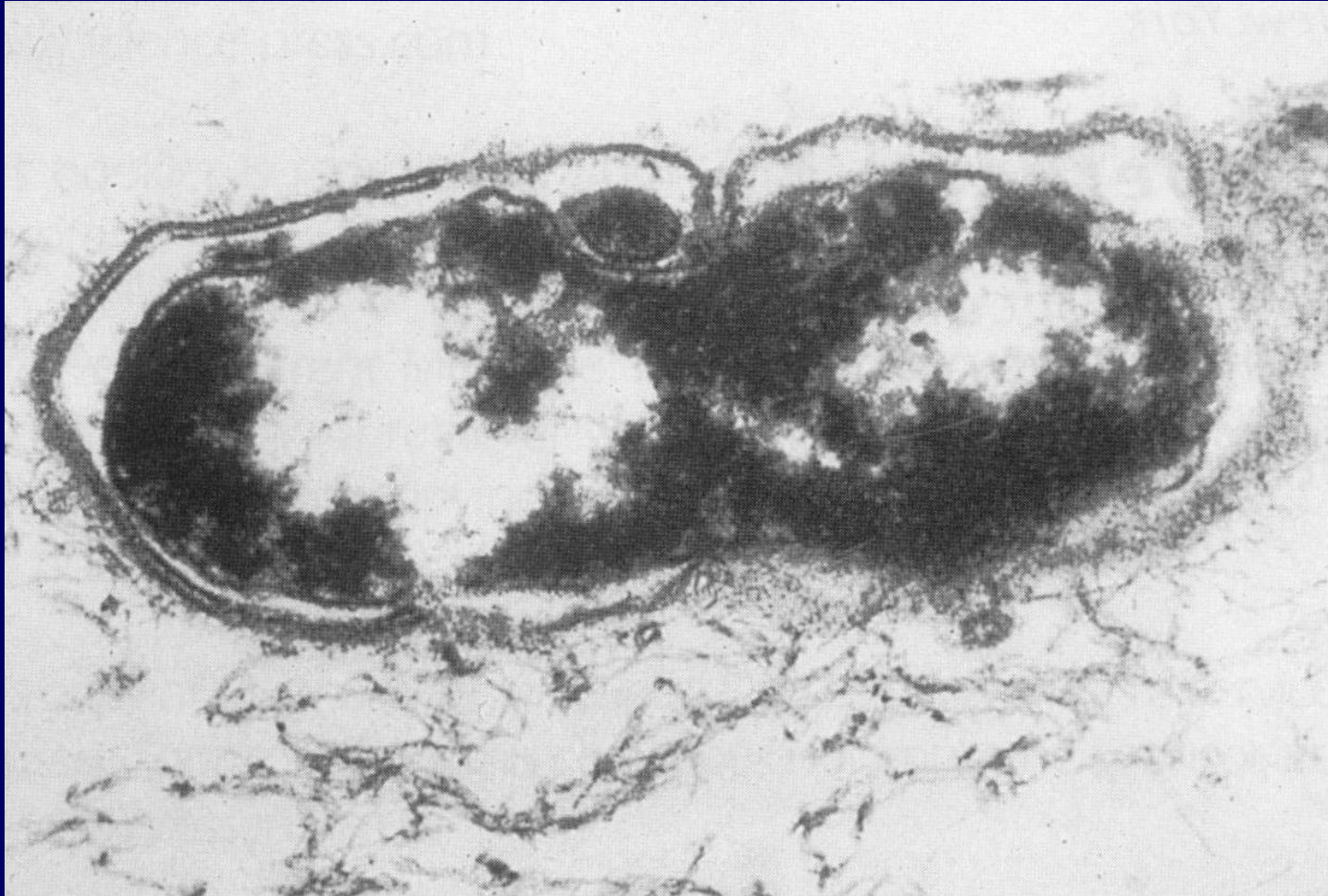
Penicillin is the drug of choice

- Resistance is becoming a problem worldwide: 1-5% of isolates in Northern Europe, 10% in N.America, up to 60% in East Europe & Far East Asia

HAEMOPHILUS INFLUENZAE

- Common pathogen in acute exacerbations of COPD
- Increasingly penicillin-resistant

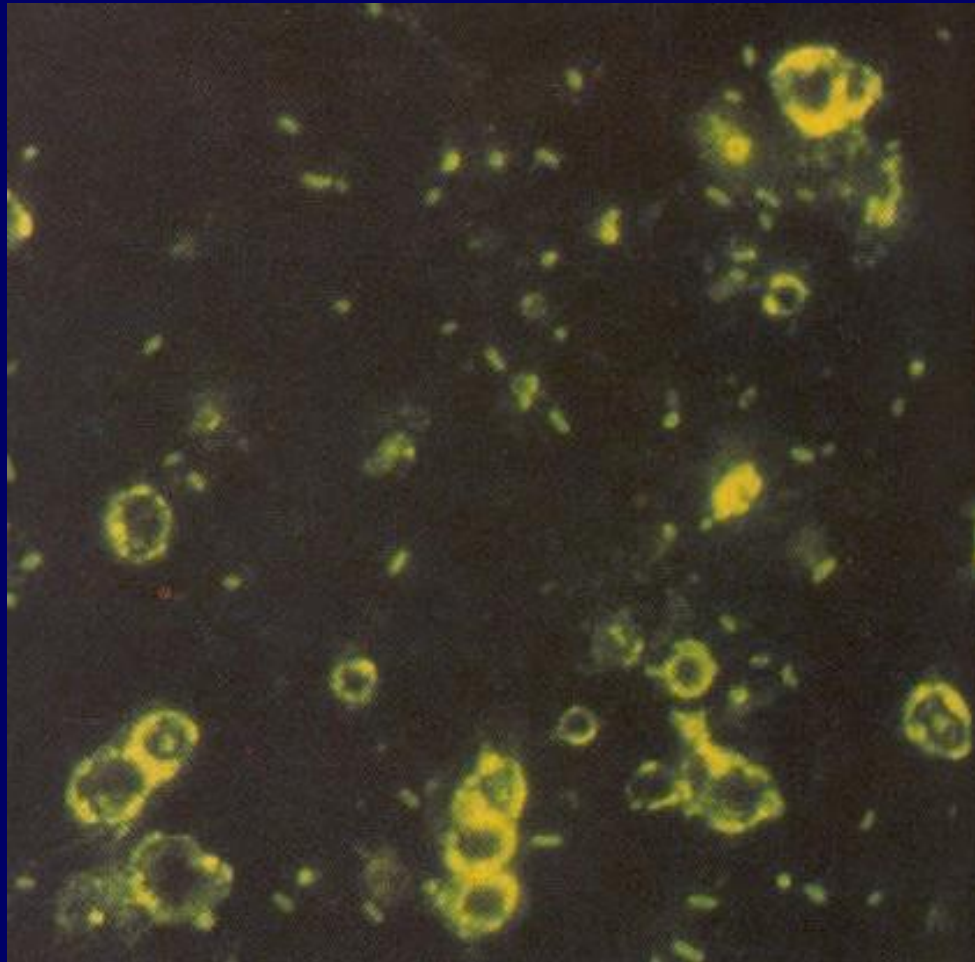
MYCOPLASMA PNEUMONIAE



MYCOPLASMA PNEUMONIAE

- Commonest atypical CAP
- Occurs in 4 yearly epidemics
- Normal WBC, bilateral shadowing but can cause a 'typical' lobar consolidation
- Treatment of choice is a macrolide

LEGIONELLA PNEUMOPHILA



LEGIONELLA PNEUMOPHILIA

- Environmental pathogen, most commonly in air-conditioning systems
- Usually a severe pneumonia
 - Multilobar, abnormal liver and renal function, neurological abnormalities
- High dose macrolides plus rifampicin or quinolone

CLINICAL FEATURES

History:

Sudden onset, fever (70%), cough (80%) with muco-purulent sputum (60%) & pleuritic chest pain (30%)

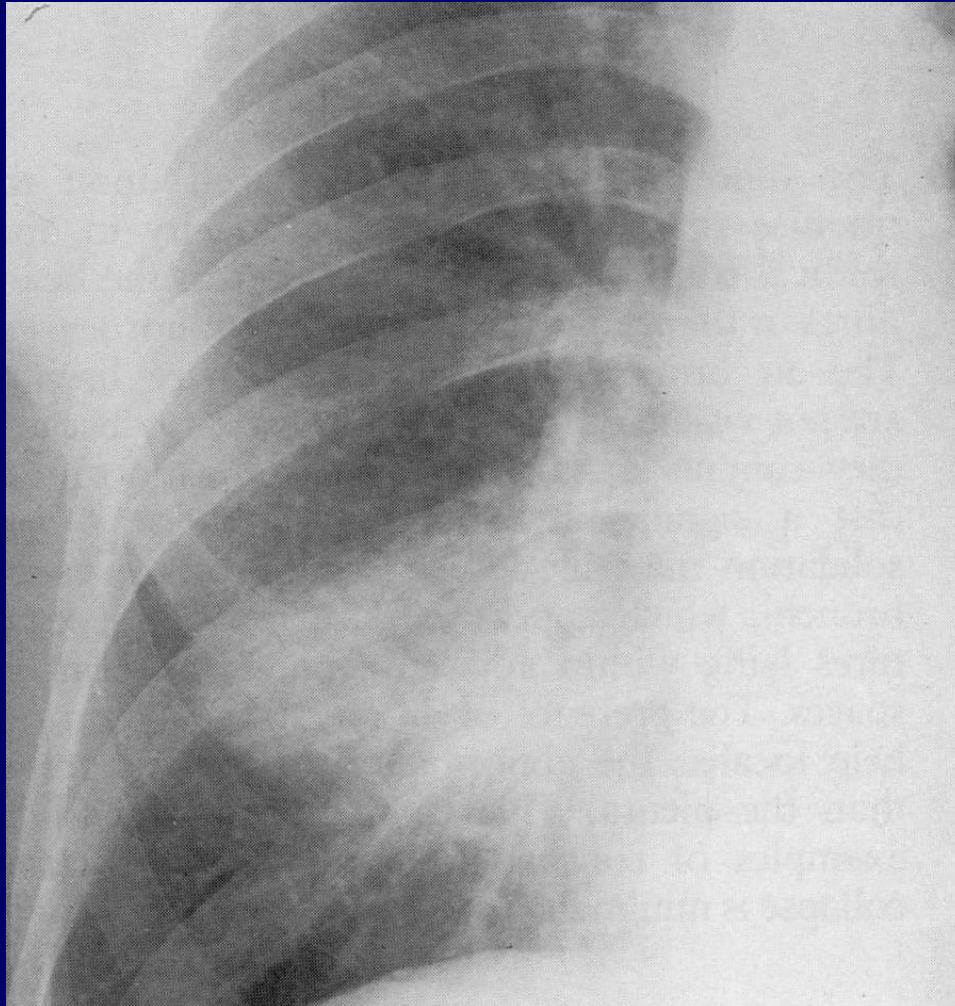
Examination:

Tachypnoea (70%), tachycardia (45%), crackles (80%), consolidation (30%)

INVESTIGATIONS

- Confirm diagnosis
 - Assess severity
- Detect complications

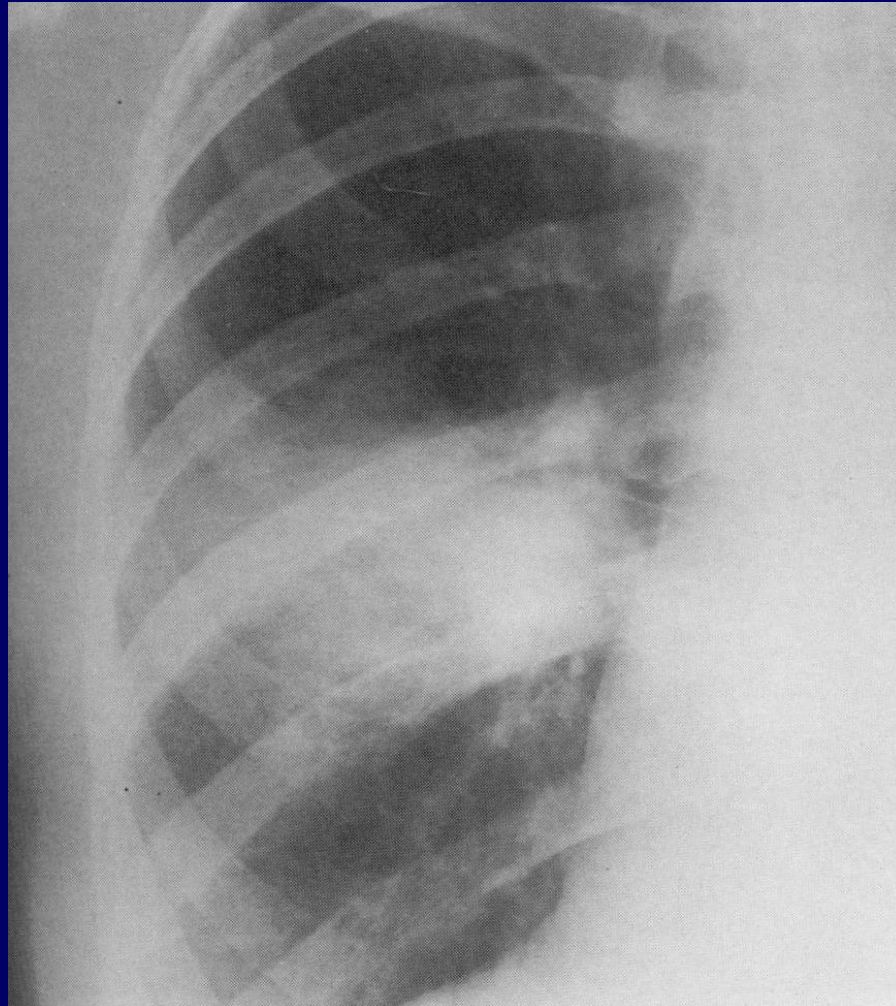
RADIOLOGY: PA CXR



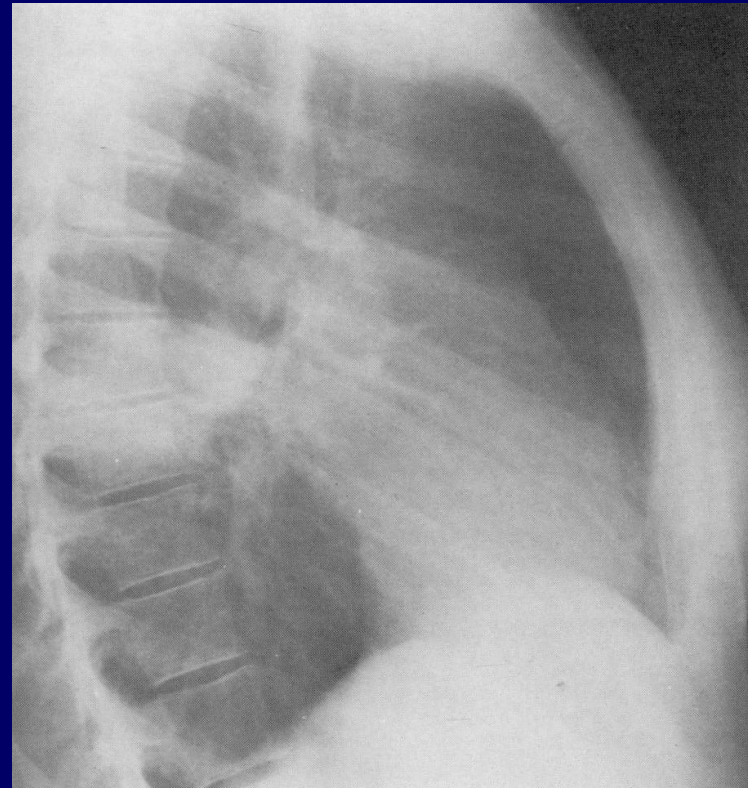
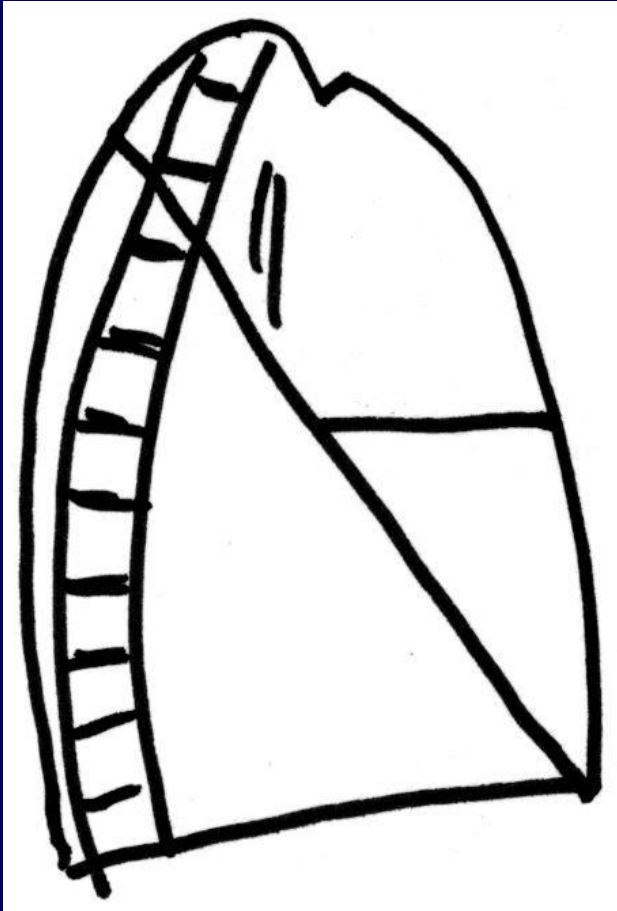
Right
middle
lobe
consolidation

RADIOLOGY:

Where's the lesion?

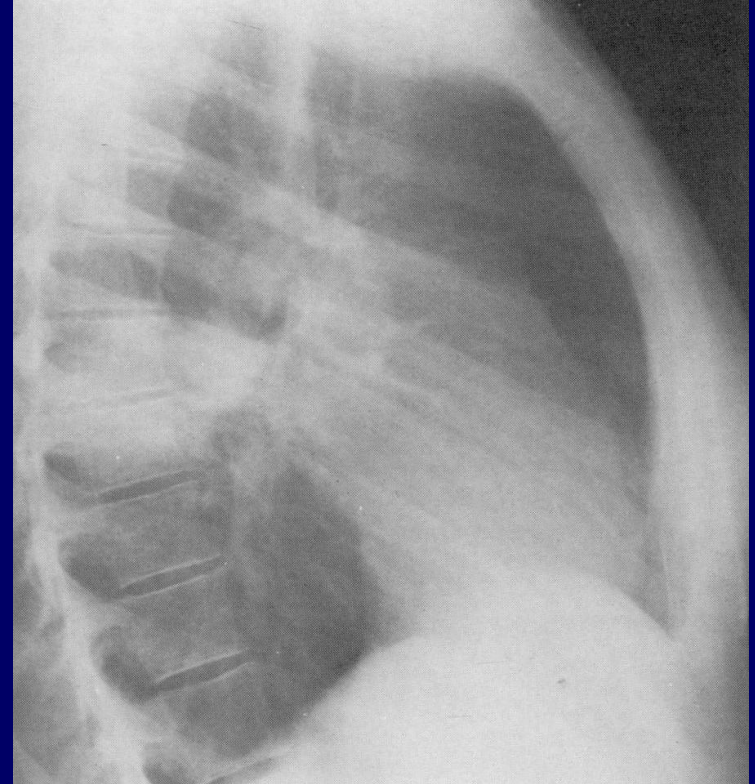
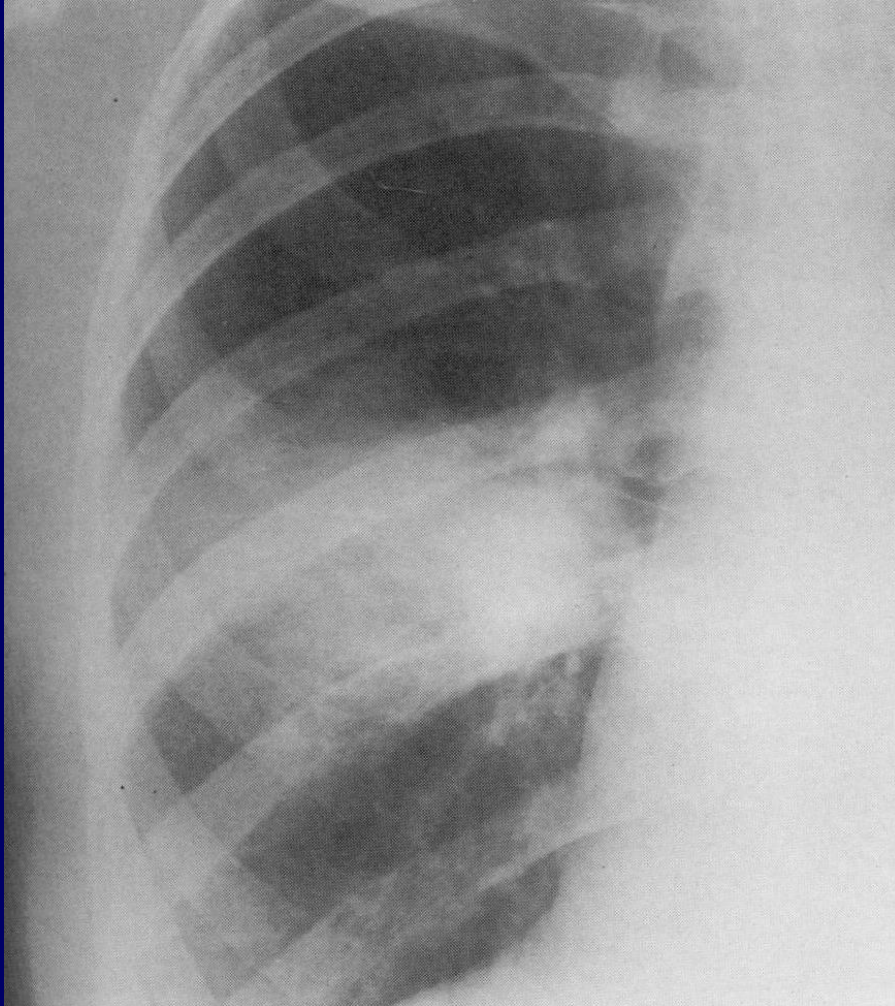


RADIOLOGY: The lateral CXR



RADIOLOGY:

Value of the lateral CXR

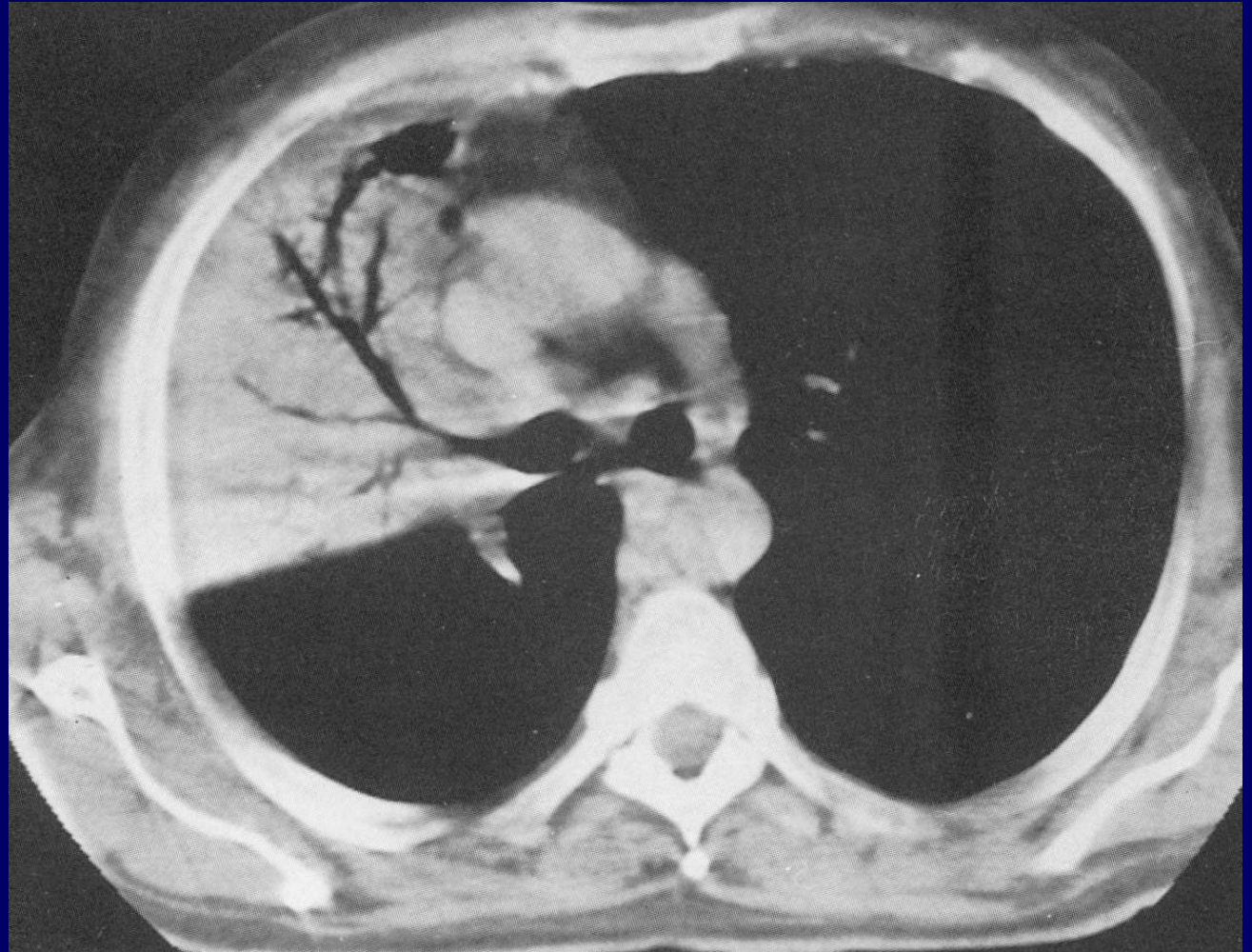


Apical segment RLL

RADIOLOGY:

When is it consolidation?

Air
bronchograms



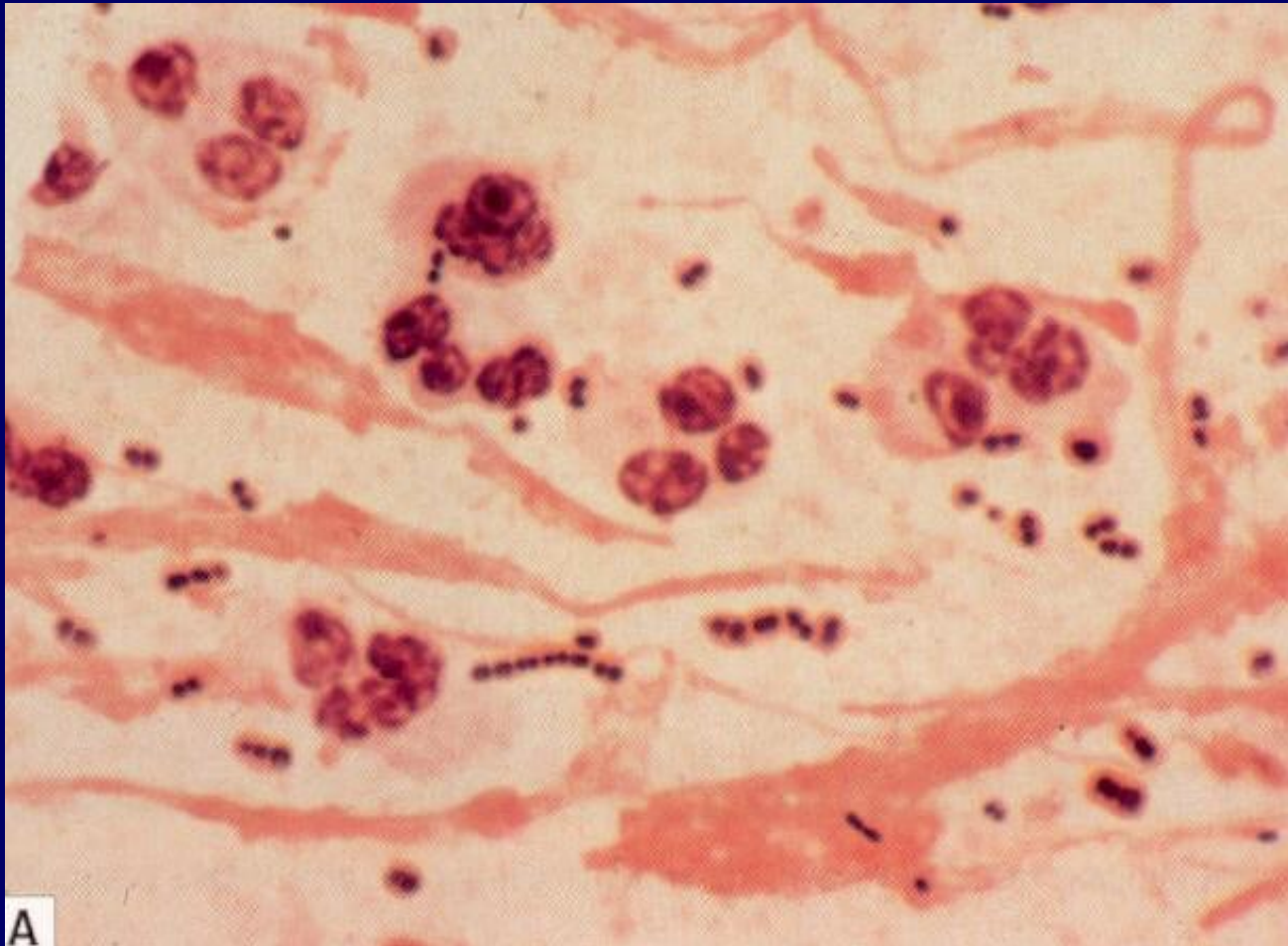
MICROBIOLOGY

How useful is it?

- With rigorous laboratory investigation a definitive diagnosis is only made in 50%
- Gram stain: low sensitivity (10%), high specificity if positive (75%)
- Blood culture: low sensitivity (20%) but high specificity if positive (>90%)
- Culture: undermined by contamination and prior antibiotic therapy

MICROBIOLOGY:

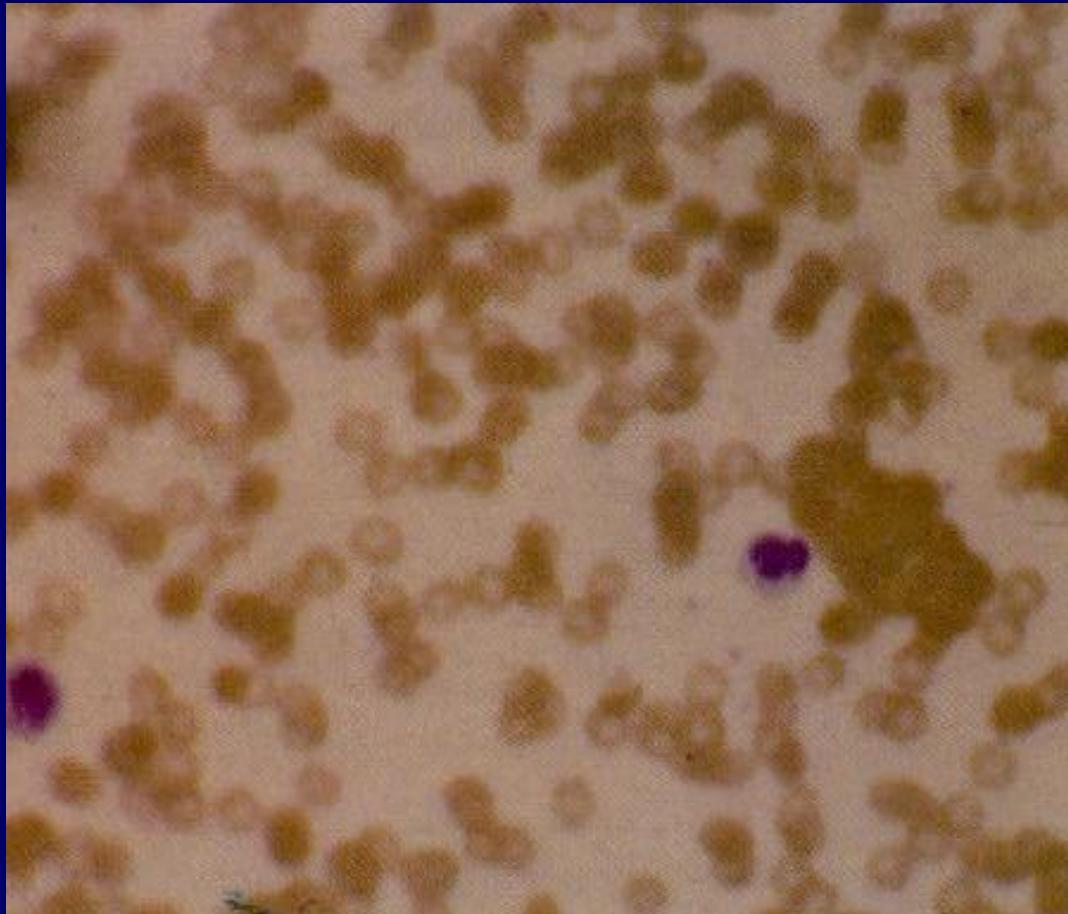
Gram stain of pneumococcus



SEROLOGY

- 4-fold rise in specific antibody titre between early illness and 10-14 days later. Used to detect atypical pneumonias
- Antigen detection in pneumococcal disease
 - Pneumococcal polysaccharide capsular antigen
 - 80% sputum positive, urine 40%, serum 15%
- Reduces the problem of prior antibiotic therapy but complicated by 'colonization vs. infection' argument

SEROLOGY: Cold agglutinins in mycoplasma



SIMPLE POINTERS TO SEVERITY

Table 11. Features associated with severe pneumonia.

<i>Clinical features</i>	<i>Laboratory features</i>
Age more than 60 years	Hypoxaemia $pO_2 \leq 8 \text{ kPa}$ (60 mmHg)
Underlying disease	Leucopenia $WBC \leq 4000 \times 10^9/l$
Confusion	Leucocytosis $WBC \geq 20,000 \times 10^9/l$
Respiratory rate $\geq 30/\text{minute}$	Raised serum urea $\geq 7 \text{ mmol/l}$
Diastolic blood pressure $\leq 60 \text{ mmHg}$	Hypoalbuminaemia
Atrial fibrillation	Bacteraemia
Multilobar involvement	

BTS Guidelines, Br J Hosp Med 1993; 49; 346-350

CURB-65 and CRB-65 Severity Scores

Clinical factor	Points
Confusion	1
Blood urea nitrogen > 19 mg per dL	1
Respiratory rate \geq 30 breaths per minute	1
Systolic blood pressure < 90 mm Hg or Diastolic blood pressure \leq 60 mm Hg	1
Age \geq 65 years	1
Total points:	

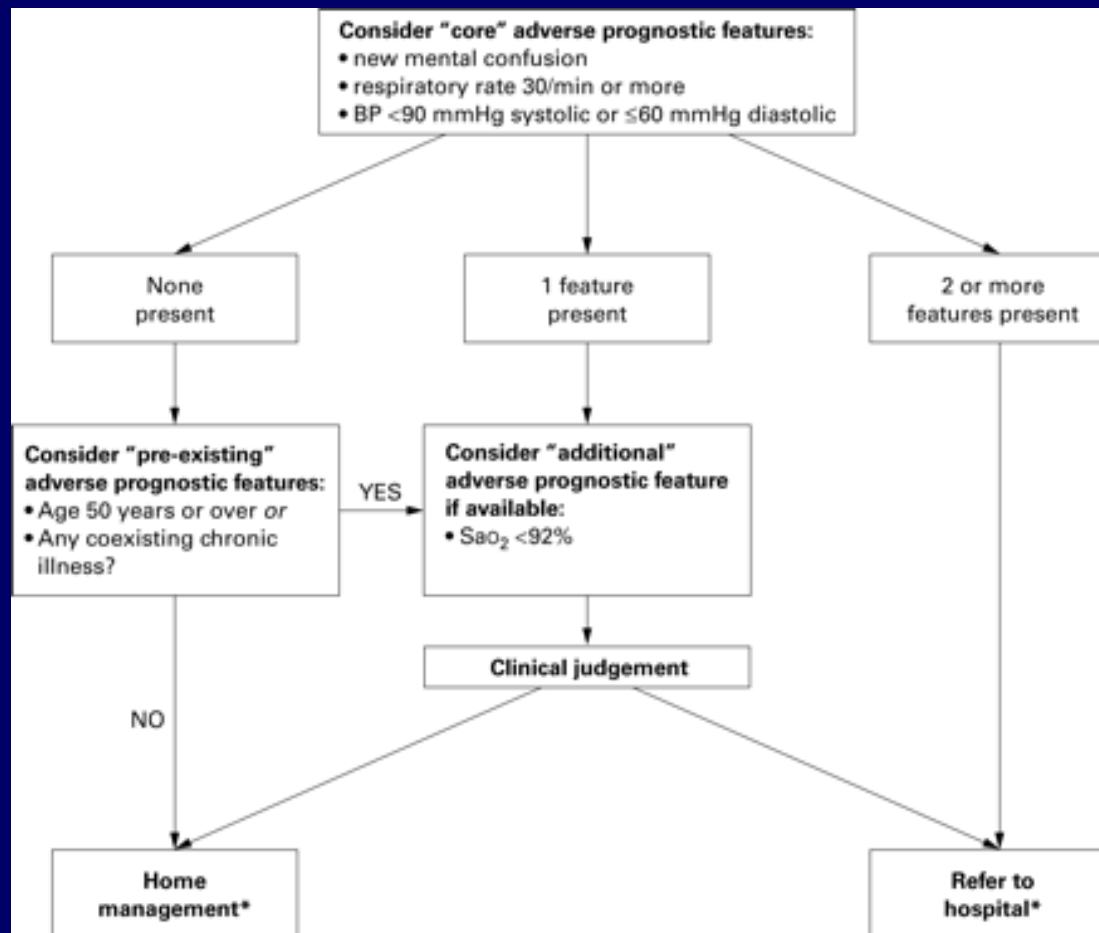
CRB-65

CRB-65 score	Mortality (%)	Recommendation
0	0.9	Very low risk of death; usually does not require hospitalization
1	5.2	Increased risk of death; consider hospitalization
2	12.0	
3 or 4	31.2	High risk of death; urgent hospitalization

CURB-65

CURB-65 score	Mortality (%)	Recommendation
0	0.6	Low risk; consider home treatment
1	2.7	
2	6.8	Short inpatient hospitalization or closely supervised outpatient treatment
3	14.0	Severe pneumonia; hospitalize and consider admitting to intensive care
4 or 5	27.8	

Where to treat



GENERAL CONSIDERATIONS

- Bed rest, push fluids and correct fever & hypoxaemia
- 50% never have a microbiological diagnosis; very few have a diagnosis made prior to starting treatment
- An aetiological diagnosis CAN NOT be made reliably on clinical grounds
Must cover 'typicals' and 'atypicals'

CHEMOTHERAPY:

Penicillins

Amoxycillin

- well absorbed, 2% gastric intolerance, 3% skin rashes,
- Good lung penetration
- Pneumococcus and sensitive haemophilus

CHEMOTHERAPY:

Cephalosporins

1st generation

- E.g cephalexin: poor activity against haemophilus

2nd & 3rd generation

- E.g. cefuroxime: better activity against both pneumococcus and haemophilus

CHEMOTHERAPY: Sulphonamides and Tetracyclines

No longer first choice agents

- Increasing bacterial resistance
- High incidence of adverse reactions

Tetracyclines still useful in certain atypical infections e.g. psittacosis and Q fever

CHEMOTHERAPY:

Macrolides

Erythromycin

- Initially used as an alternative to penicillin
- Now used first line against atypical infections:
Mycoplasma, *Legionella* and *Chlamydia*
- Well known adverse reactions: GI disturbance in 20%

CHEMOTHERAPY:

Which macrolide?

AZITHROMYCIN & CLARITHROMYCIN:

Major improvements on erythromycin

- Broader spectrum of activity (e.g. penicillin-resistant *Haemophilus*)
- (Much) less GI adverse effects
- Reduced dosage frequencies
- Less drug metabolism interaction

CHEMOTHERAPY:

Fluoroquinolones

Ciprofloxacin & Ofloxacin

- Well absorbed, few adverse effects
- Good activity against Gram negative organisms, especially *Pseudomonas*
- BUT questionable activity against pneumococcus

Not first line agents for CAP

- Gatifloxacin and levofloxacin have enhanced activity against pneumococcus

CHEMOTHERAPY:

Blind therapy

Mild disease:

- Oral aminopenicillin (amoxycillin or ampicillin) PLUS macrolide

Severe disease:

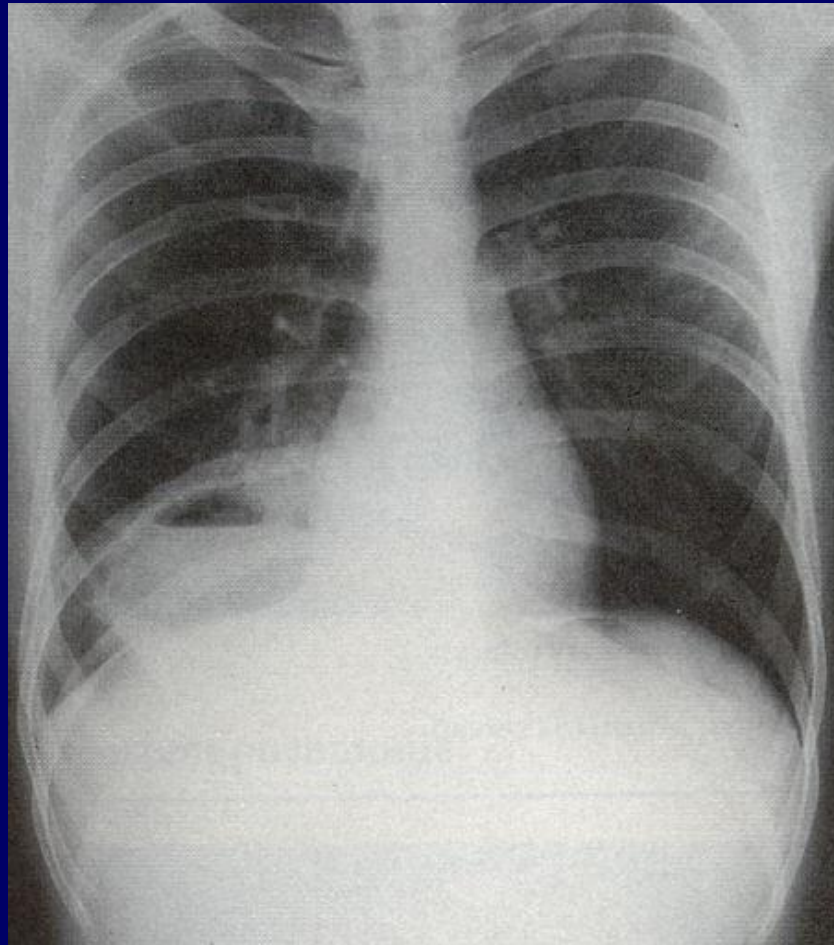
- Intravenous 2nd generation cephalosporin (e.g. cefuroxime) PLUS macrolide

RESPONSE TO THERAPY

- Usually prompt resolution if previously well
 - Fever 2.5 days, leucocytosis 4 days, cough 8 days, crackles 8 days, CXR 4-10 weeks
- Slow to resolve pneumonia
 - Less than complete clearing of CXR by 4 weeks

COMPLICATIONS:

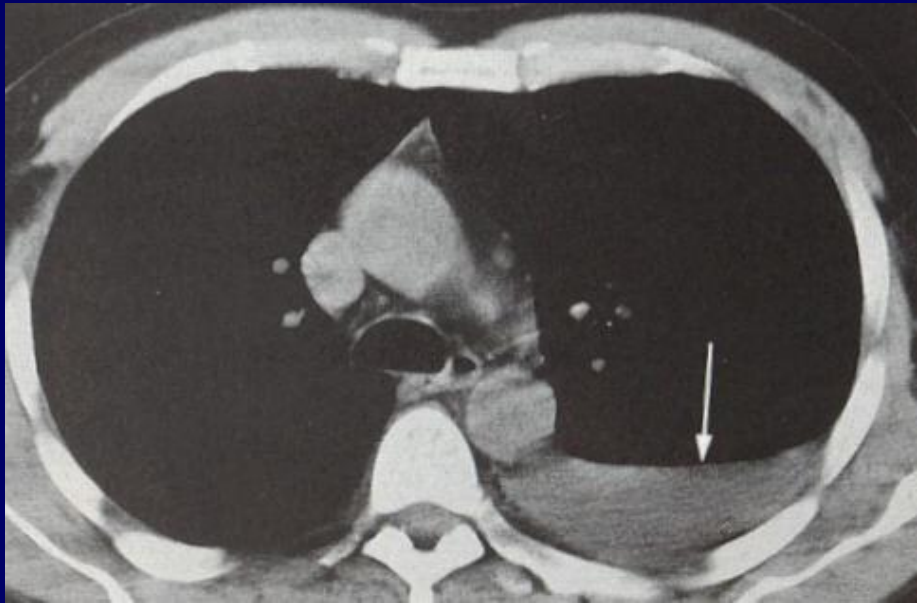
Lung abscess



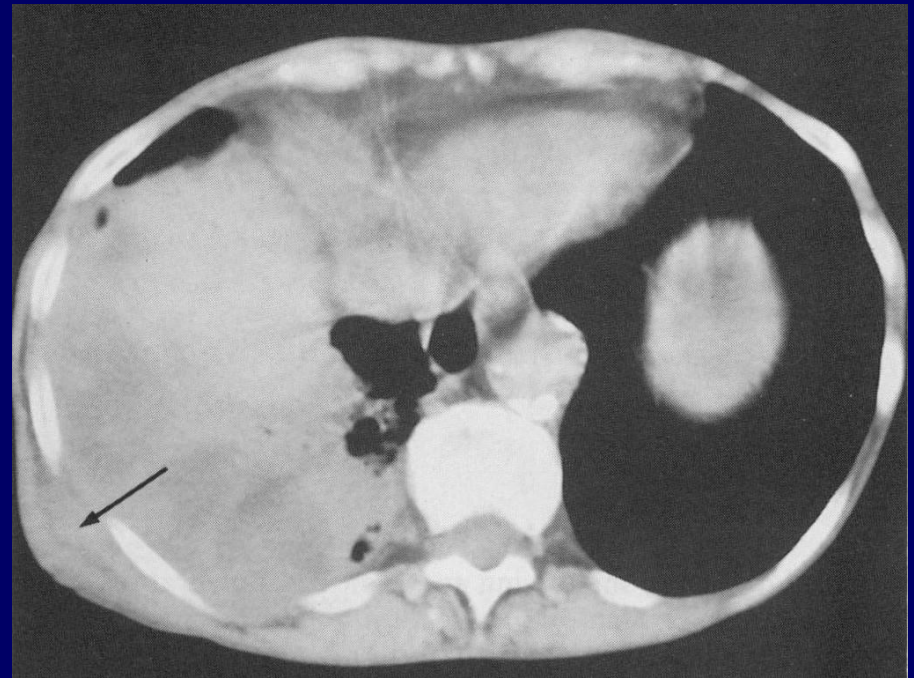
Right
lower
lobe lung
abscess

COMPLICATIONS:

Pleural disease



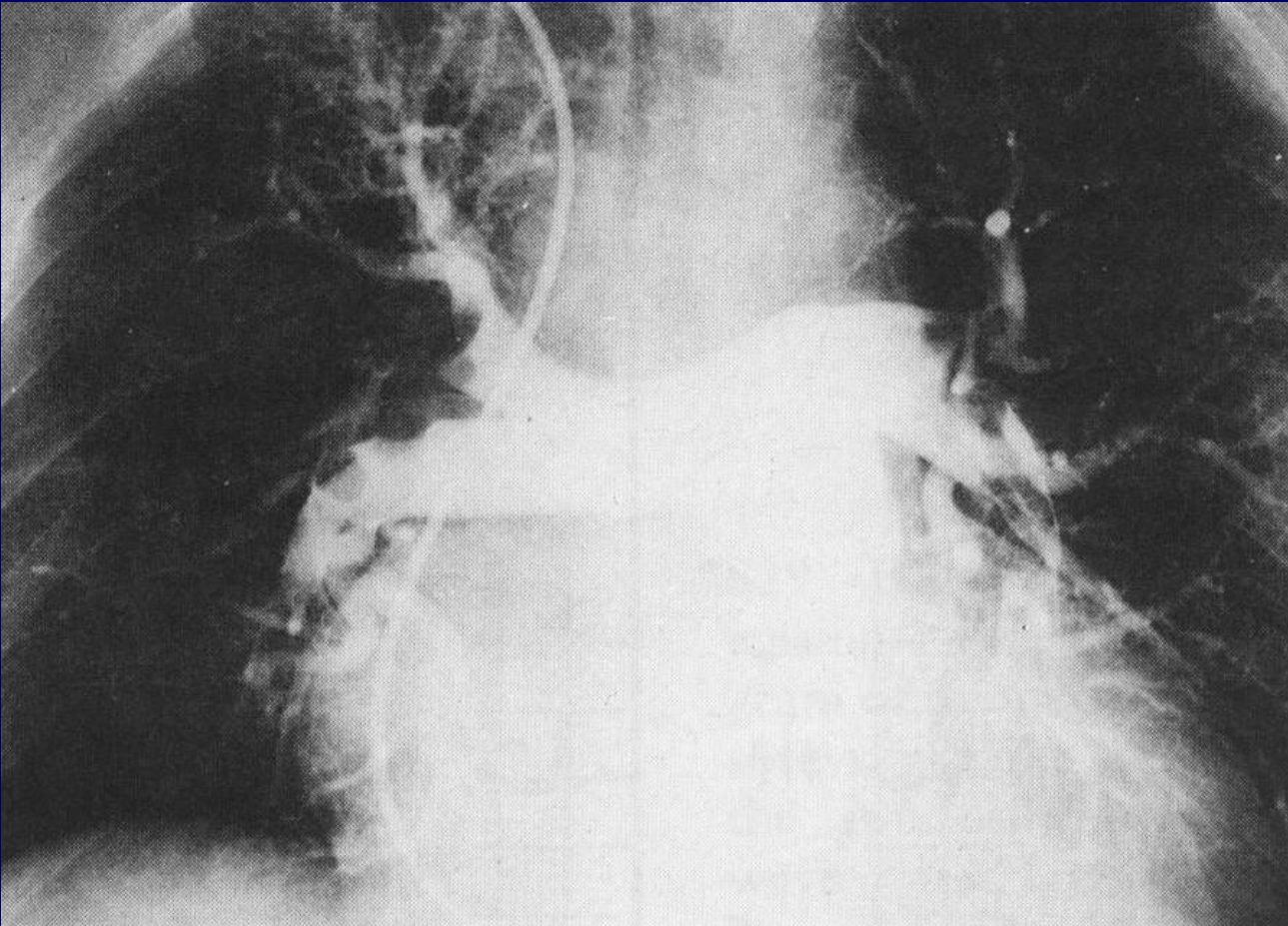
Simple effusion



Chronic empyema

COMPLICATIONS:

Pulmonary embolism

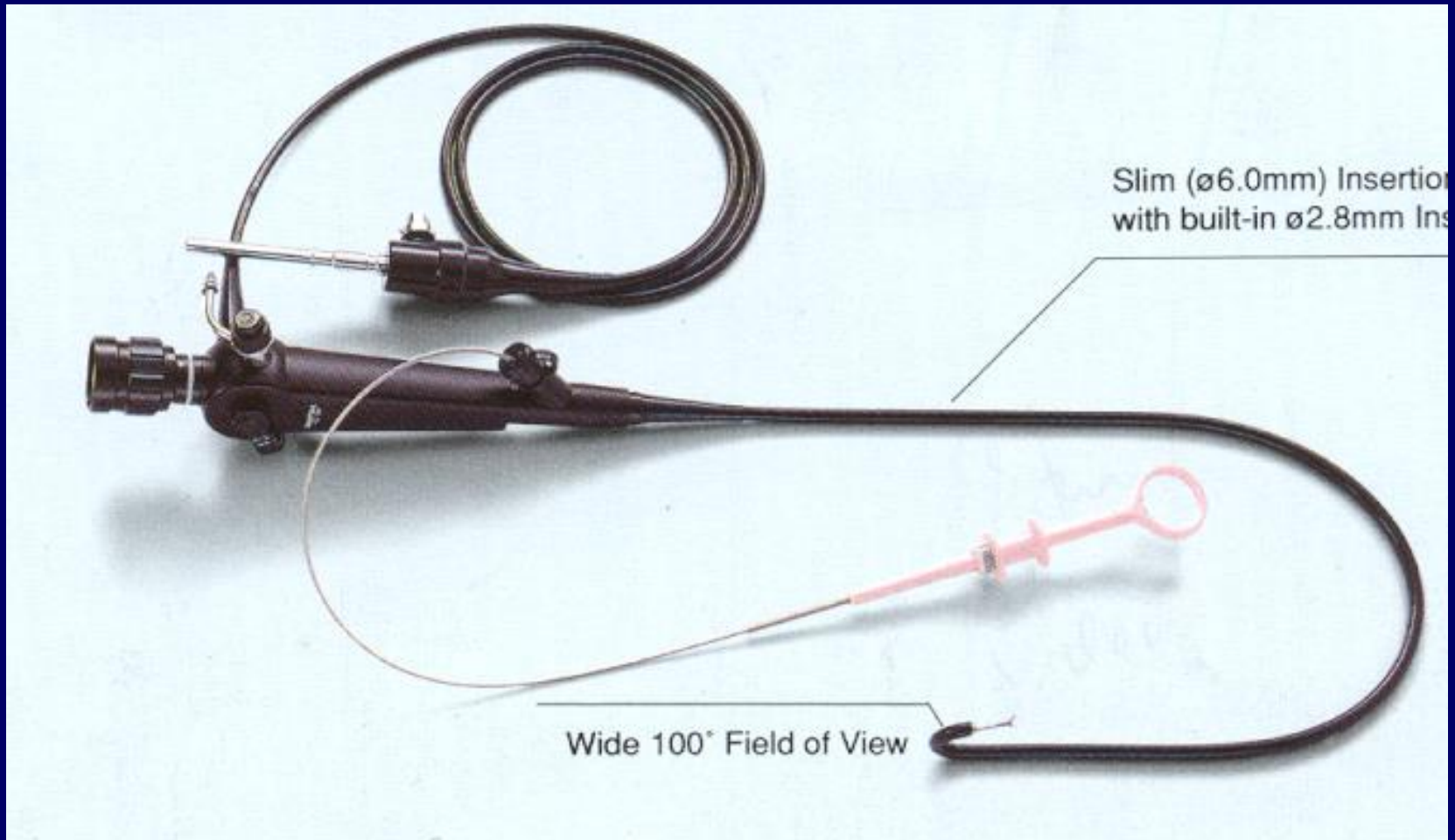


Massive PE
with multiple
filling defects

FAILURE TO RESPOND

- Incorrect diagnosis:
 - PE, pulmonary oedema, pulmonary eosinophilia
- Resistant organism:
 - Ampicillin resistant *H. influenzae*, tuberculosis
- Complications:
 - Empyema, abscess, PE, drug fever
- Underlying disease:
 - Ca bronchus, immunodeficiency

FIBRE-OPTIC BRONCHOSCOPE



ENDOBRONCHIAL APPEARANCES



Normal right main bronchus



With purulent secretions

SUMMARY

- Definition
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- Epidemiology
- Aetiology
- Clinical features
- Investigation
- Management
- Prognostic factors
- Complications

REFERENCES

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