

وَقُلْ رَبِّ زِدْنِي عِلْمًا



# RESPIRATORY SYSTEM

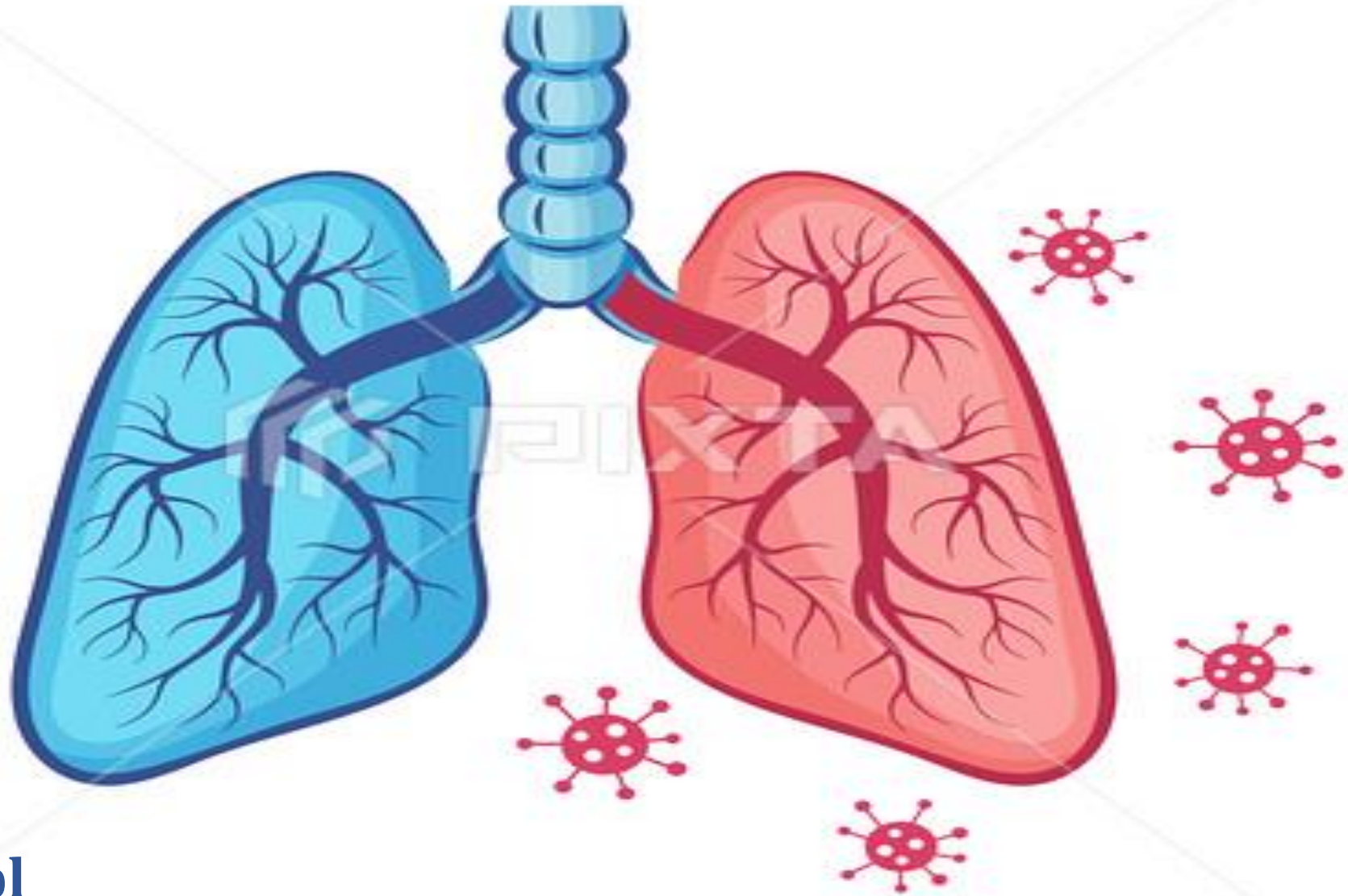
HAYAT BATCH

SUBJECT : \_\_\_\_\_

LEC NO. : 8

DONE BY : Tabark Aldaboubi

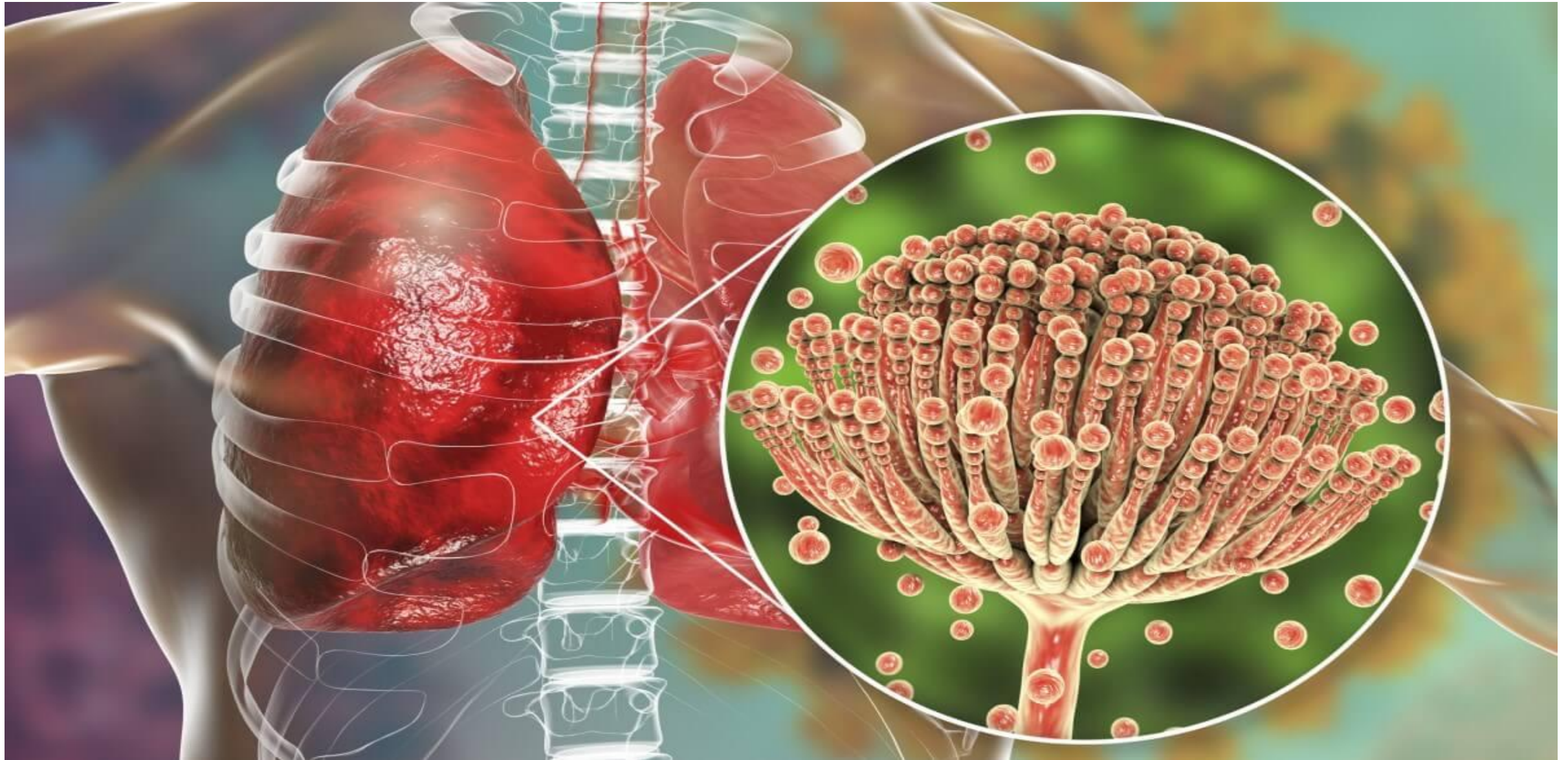
# RESPIRATORY TRACT INFECTIONS - VIII



By  
Prof. Hala Tabl



# Fungal Infections Of Respiratory Tracts



# Respiratory fungal infection - Etiology

## ➤ YEAST

- اخذناهم ➤ Candidiasis (*Candida* and other yeast)
- بالجينرال ➤ Cryptococcosis (*Cryptococcus neoformans*, *C. gattii*)

## ➤ Mould fungi

- Aspergillosis (*Aspergillus* species)
- Zygomycosis (*Zygomycetes*, e.g. *Rhizopus*, *Mucor*)
- Other mould

Opportunistic

↓  
immunocompromised

## ➤ Dimorphic fungi

- Histoplasma capsulatum
- Paracoccidioides brasiliensis
- Blastomyces dermatitidis
- Coccidioides immitis

Primary  
infections



# ASPERGILLOSIS

➤ It is a group of **opportunistic** mycoses caused by Aspergillus Fungi which are common **saprophytic molds** frequently found on soil, decaying vegetation, buildings,...

اماكن وجودها :

(التي فيها رطوبة)

respiratory tract infection

➤ Medically important species that cause RTIs are:

Aspergillum جايته فن

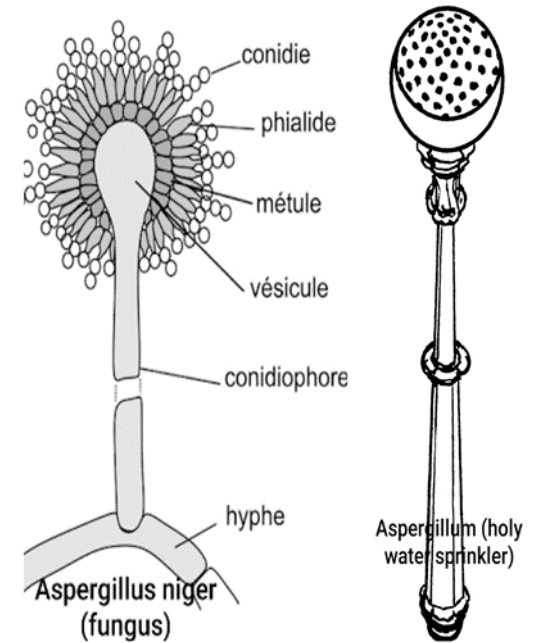
(الرشاش المائي المحقن الذي يستخدم بالرشاش)

الرشاش

1- **Aspergillus Fumigatus.**

2- **Aspergillus Niger.**

black



# Aspergillus Fumigatus:-

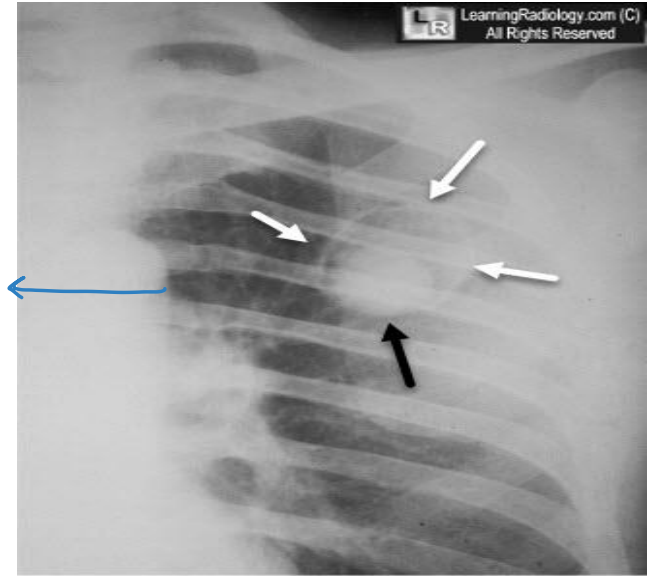
Causes **pulmonary Aspergillosis**, (in patients with a pre-existing lung disease).

Infection acquired by inhalation of conidia (spores) which commonly associated with certain occupational settings e.g. construction works. ← اكثر ناس معرفة للاصابة

## 1- Aspergilloma or " Fungus ball":

Tumor ← شبة ال ← X-ray ← بين بال

- Fungus grow in a pre- existing cavity e.g. T.B. cavity. ← ينوجدوا ال ← cavity
- X- ray shows fungus ball (radiopaque structure).



## 2- Invasive Aspergillosis:

- Mainly occurs in **immunocompromised** persons, and usually fatal.
- Fungus invades lung tissues giving rise to pneumonia and hemoptysis. (blood in sputum)
- Dissemination to other organs occur leading to **disseminated Aspergillosis**.



### 3- Allergic bronchopulmonary aspergillosis (ABPA).

attack of bronchial Asthma

- Leads to asthmatic attacks (coughing and wheezing) with high level of IgE in serum. Usually occur in hypersensitive persons who repeatedly exposed to dust contaminated with its spores, they expectorate brownish bronchial plugs containing hyphae.

Atopic Patient

sputum →

### Aspergillus Niger:

#### III- Infections of the ear:

##### Otitis Externa:

- Pseudomonas aeruginosa.
- Aspergillus niger (otomycosis).

- Causes **otomycosis**, chronic infection of the external auditory meatus.
- Manifested by pain, itching and ear discharge.

↓  
لونها اسود زي لون ال Fungus



↓  
Fungus (لون اسود)

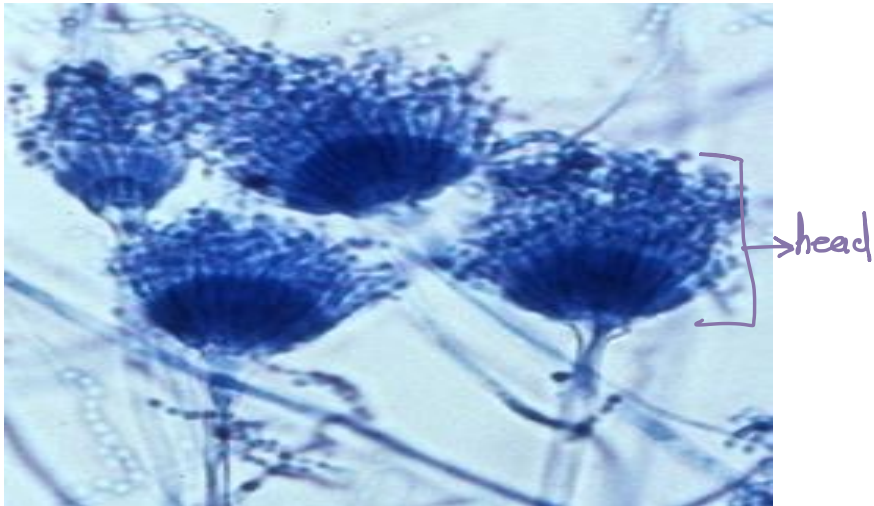
# Laboratory Diagnosis: otomycosis, pulmonary Aspergillosis,

➤ **Specimen:** Sputum, Ear discharge

العينة من ورن اخذها بتختلف حسب العرق

➤ **Direct Microscopy:-** lactophenol cotton Film  
يظهر septate hyphae وبخلاف الأنواع عن بعضها بشكل ال head

Shows filamentous septate hyphae with characteristic aspergillus head in lactophenol cotton blue preparations.



*A. Fumigatus*  
Flask shaped head



*A. Niger*  
Rounded head



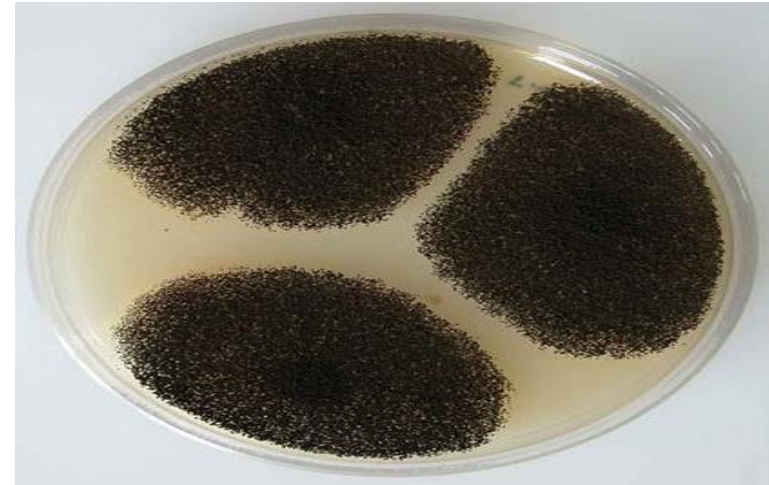
➤ **Culture:-** On Sabouraud's agar, in room temperature → بوجدت حوالي ٣ اسابيع

Pigmentation of **aerial growth** can identify the Aspergillus species:

- *A. Fumigatus* → White filaments with **smoky green** spores.
- *A. Niger* → White filaments with **black** spores.



*A. Fumigatus*



*A. Niger*

➤ **Antigen detection in serum:** is of value in invasive aspergillosis,   
invasive , desiminateed ↙

## Treatment:

- In invasive pulmonary Aspergillosis and disseminated diseases:  
اكثر من نوع مع بعض  
Combined treatment with: I.V. Amphotericin B, itraconazole, caspofungin.
- In otomycosis: Nystatin ear drop.  
inflammation of the ear
- Surgical removal in case of fungal ball is helpful + Antifungal drug
- Patients with ABPA can be treated with corticosteroids and antifungal agents.



# HISTOPLASMA CAPSULATUM

non capsulated but surround refractive halo → تسبب ( capsule )

histocyte ←

(Tissue macrophage)

intracellular organism infected the macrophage

## "HISTOPLASMOSIS"

➤ It is a **dimorphic** fungus (exists as a **mold** in soil and as a **yeast** in tissue).

mold بدرجة حرارة الغرابة ينمو ك / Yeast بدرجة حرارة ٣٠-٣٥ ينمو ك

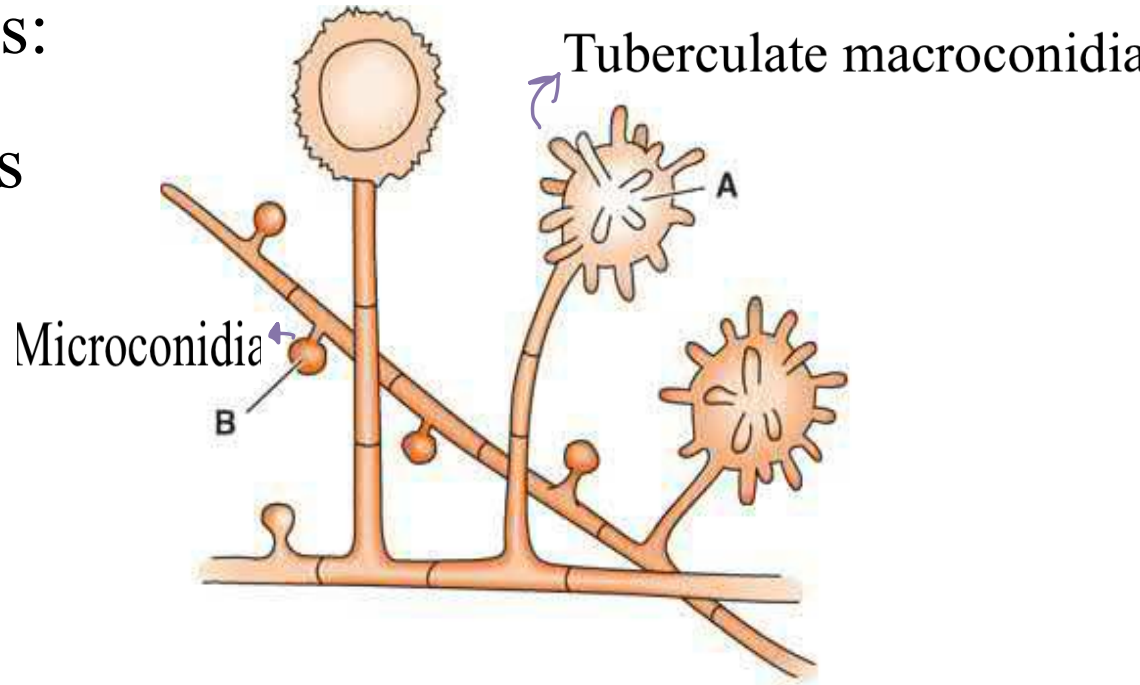
➤ The mold forms two types of asexual spores:

(1) Tuberculate macroconidia, with thick walls  
(important in laboratory identification).

كبير بالحجم

(2) Microconidia, with small thin walls  
(if inhaled, transmit the infection).

➤ It is not capsulated (had a refractive halo mimicking a capsule, hence the name)



Source: W. Levinson, P. Chin-Hong, E.A. Joyce, J. Nussbaum, B. Schwartz: Review of Medical Microbiology & Immunology: A Guide to Clinical Infectious Diseases, Seventeenth Edition: Copyright © McGraw Hill. All rights reserved.

## Transmission & Pathogenesis: infecte human , animal , bird

- It grows in soil, particularly if the soil is heavily contaminated with bird excreta, especially **bats**.
- Histoplasmosis is an occupational disease results from **inhalation of microconidia** during exploration of bat infested caves (for fertilizer).
- It is an **intracellular organism** which particularly infect **reticuloendothelial cells (macrophages)**.
- Inhaled spores are engulfed by alveolar macrophages, resist intracellular killing and develop into **budding cells**. It may spread from the lung to other part of the body, bone marrow, liver, and the spleen.



# Clinical findings:

Infection may be either:

- **Asymptomatic:** in majority of cases.
- **Acute pulmonary disease:** fever, headache, chills, cough, and chest pain.
- **Chronic progressive histoplasmosis:** fever, dyspnea, and productive cough, **cavitary lung lesions** may be seen on chest radiographs. These clinical features resemble tuberculosis and the two must be distinguished.   
*necrosis بنزهي*
- **Severe disseminated histoplasmosis:**
  - Especially in infants and **immunocompromised**.
  - **Ulcerated lesions on the tongue** are typical of disseminated histoplasmosis.   
*روح ال infection على ال different organ ناعه reticuloendothelial system ال liver و spleen و بيبير*
  - Pancytopenia, lymphadenopathy, hepatosplenomegally.





# Laboratory diagnosis

**Specimen:** Sputum, Bone marrow aspirate or blood.

## Direct Microscopy

In **Giemsa** stained preparations, yeast form can be seen intracellular as round or oval **budding cells**.

**Culture:** On sabouraud's agar

- At room temperature, produce filamentous growth.

A lactophenol cotton blue stained film from this culture shows septate hyphae and rounded thick walled spores with finger like projections.

- At 37°C produce the yeast form (budding cells)

**Antigen detection:** in serum and urine by ELISA

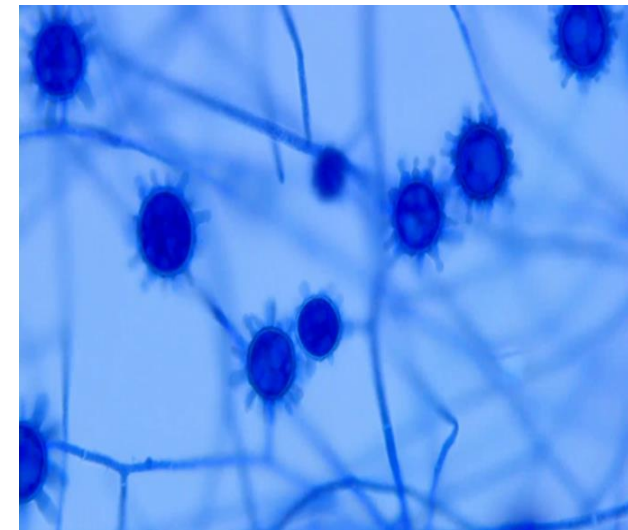
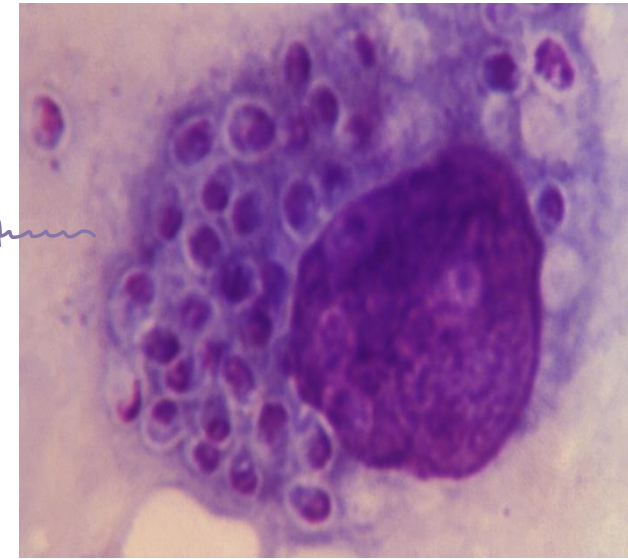
**PCR**

اذا ما عرفت

افضل ال organism

بجمل Antigen detection

intracellular  
macrophage داخل ال  
budding cell يظهر ك





# Treatment

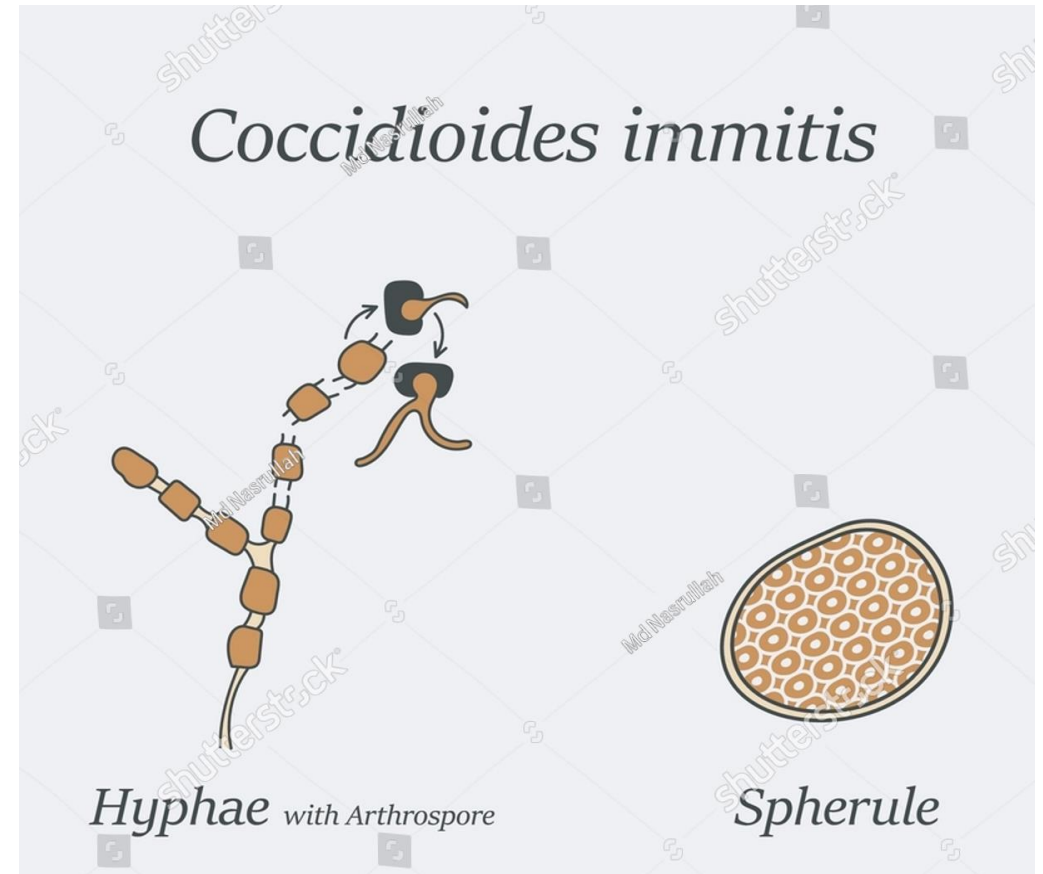
With progressive lung lesions, oral itraconazole is effective.

In disseminated disease, parenteral itraconazole (or amphotericin B) is the treatment of choice.

# COCCIDIOIDES IMMITIS

## “Coccidioidomycosis”

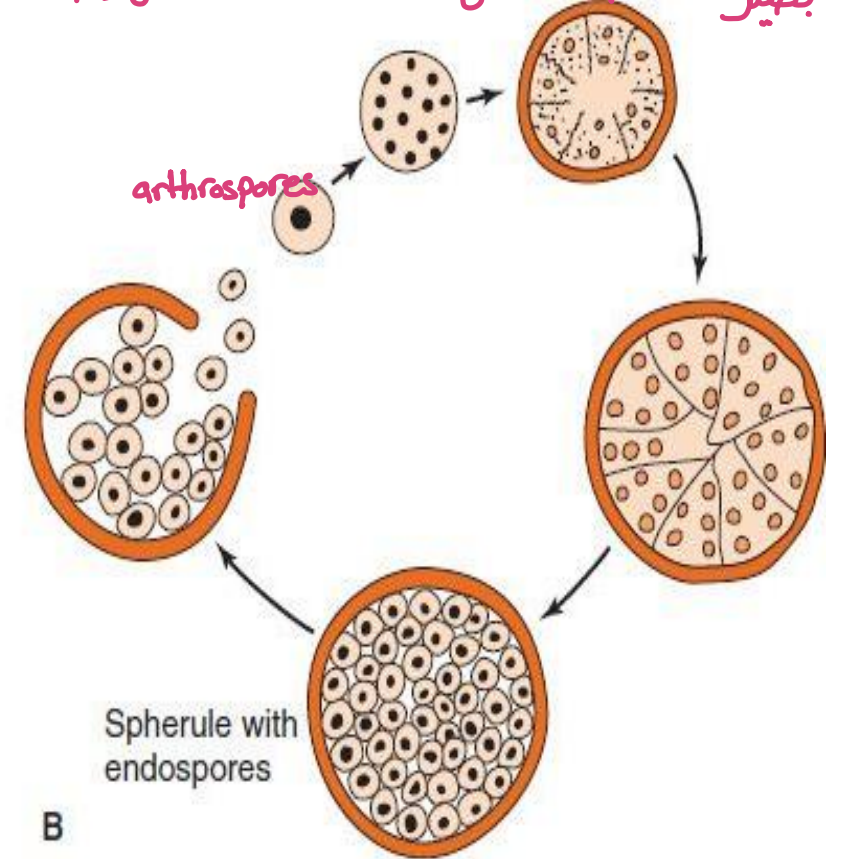
- It is a **dimorphic** fungus.
  - mold outside the body
  - spherul in the tissue
- In soil, as a mold, **arthrospores** (Barrel shaped, Rectangular) at the ends of hyphae.
- In tissues, as a **spherule**, have a thick, double wall, and are filled with endospores.



## Pathogenesis:

- The infection acquired by **inhalation** of arthrospores (arthroconidia).
- In the lungs, arthrospores form spherules. Upon rupture, endospores are released and differentiate to form new spherules that induce immune response in the form of granulomatous lesions.

arthrospores يتخلل ال lung تكبر ويتحول الى spherules  
بصير جواتها multiple division لحرمان نقل من جوا بعديت  
بصير rupture يتخلل ال endospores كل وحدة يتبرأ مسايكل جديدة



وجود ال spores وال spherul جوا ال lung  
يعل induce cell mediate immunity  
في صورة granuloma

## Clinical findings:

➤ **Asymptomatic:** in endemic areas (e.g. Arizona, New Mexico, California).

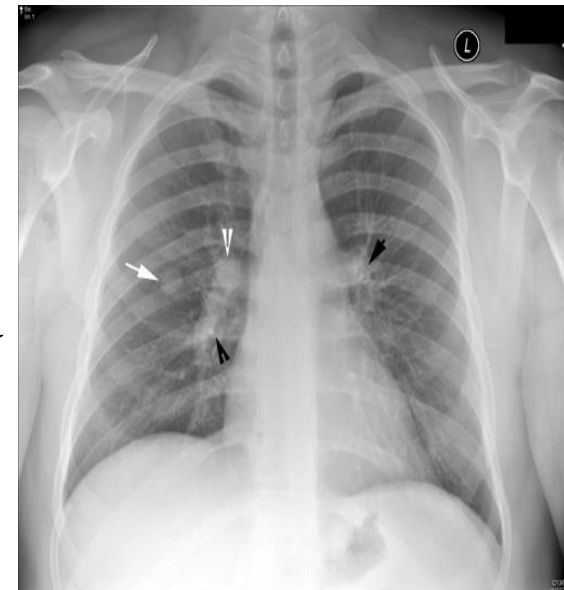
➤ **Acute Coccidioidomycosis** “Valley fever” “Desert rheumatism”: Triad,

- Respiratory manifestations (<sup>1</sup>fever and <sup>2</sup>cough), <sup>2</sup>erythema <sup>3</sup>nodosum (EN) and <sup>3</sup>arthralgias.  
↳ self limited

➤ **Chronic Coccidioidomycosis:** prolonged cough &   
بتبين بال X ray (سبب ال granuloma الحبي تكونت) ➤  
Pulmonary nodule commonly seen on chest radiographs.

➤ **Disseminated Coccidioidomycosis:**

In immunocompromised persons. Affect any organ; specially the meninges (meningitis) and bone (osteomyelitis).





## Diagnosis:

lung biopsy <sup>microscope</sup> →

spherules ليشوق الـ

➤ In tissue specimens, spherules (filled with endospores) are seen microscopically.

➤ Cultures on Sabouraud's agar at room temp.: mold.

show septate hyphae with arthrospores with

بنظري <sup>هيئت</sup> →

lactophenol cotton blue stain. <sup>بسن استخدم هاي المصبغة</sup>

➤ Serologic testing to detect specific antibodies.  
disseminated disease



## Treatment:

- In severe or disseminated cases: Amphotericin B & itraconazole.
- In meningitis: Fluconazole

# Pneumocystis jiroveci

كانوا مفكرين انها Parasite  
لأنها موجودة جوال Tissue بمهارة  
cyst

➤ It was long considered a **parasite** based on morphology (In tissue, it appears as a cyst that resembles the cysts of protozoa).

➤ However, molecular and biochemical analysis indicate that it is a **yeast**, and its cell wall contain

**$\beta$ -glucan** , although,

تختلف عن ال Fungi ب :

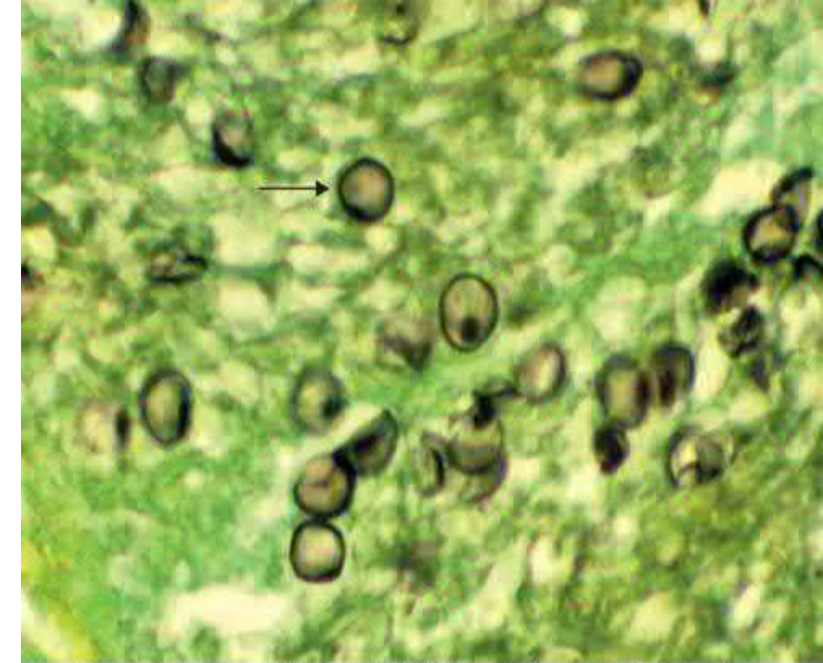
□ chitin

فيها glycan بس ما فيها

• It **lacks ergosterol** so, antifungal drugs targeting ergosterol are ineffective

• It does not grow on fungal media.

Sabouraud's agar مثل



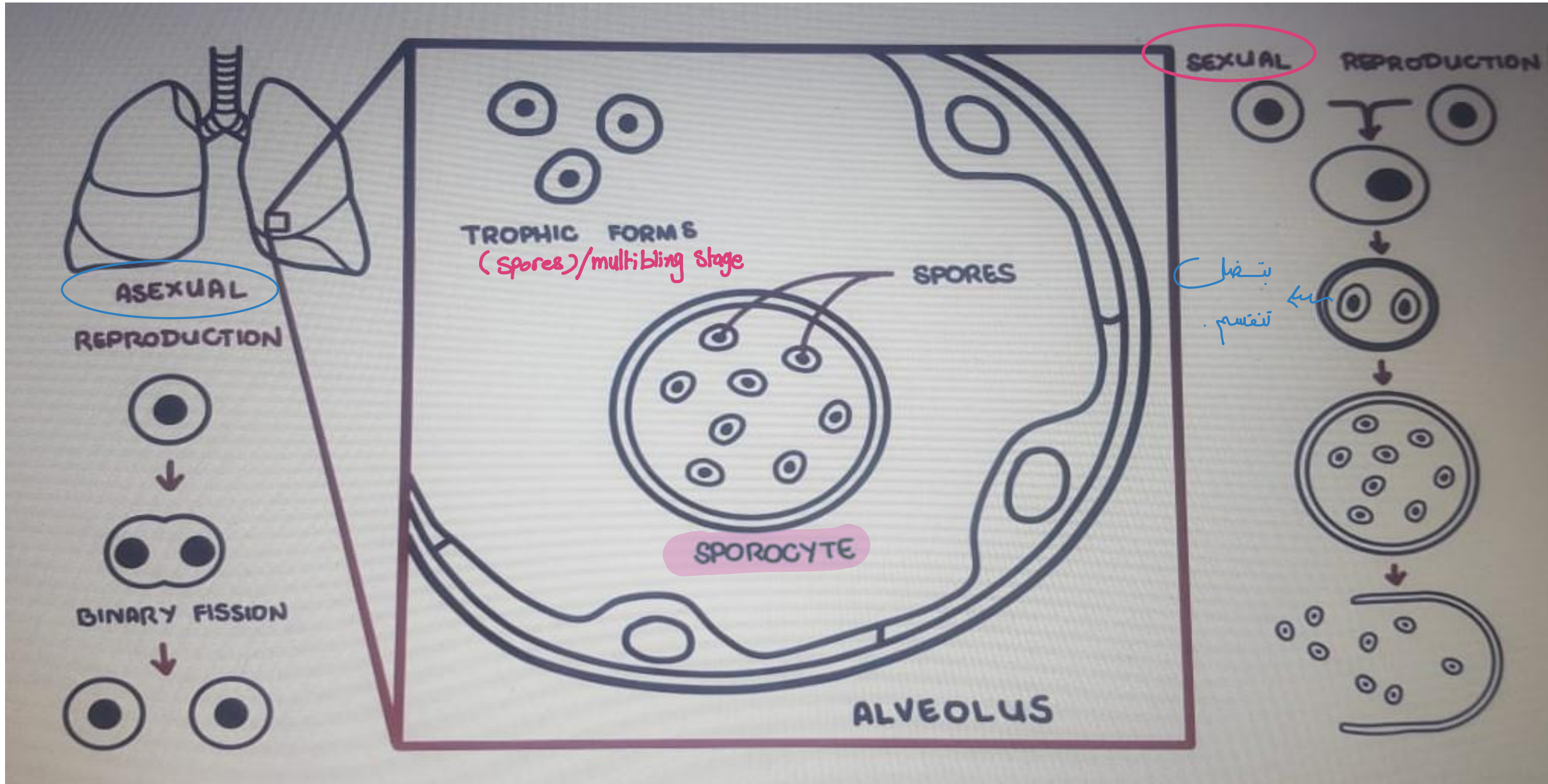


Alveolar space

و بتحب تعيش بال lung

وحبته لل

# Life Cycle





يتجنب تعيش بال alveolar space لمدة طويلة بدونها تنقل مشاكل اذا الشخصين healthy

## Pathogenesis:

- Pneumocystis jiroveci is an important cause of pneumonia **in immunocompromised individuals (Pneumocystis pneumonia).**
- The organism does not invade the lung tissue.
- The presence of cysts in the alveoli induces an inflammatory response consisting primarily of plasma cells **“plasma cell pneumonia”** and resulting in alveolar foamy exudate & edema (that blocks oxygen exchange) and interstitial fibrosis.

بتجميع فيج عدد كبير من الخلايا

# Clinical Findings

➤ Asymptomatic infection is common in normal individuals.

HIV ↘

➤ The sudden onset of fever, nonproductive cough, dyspnea,

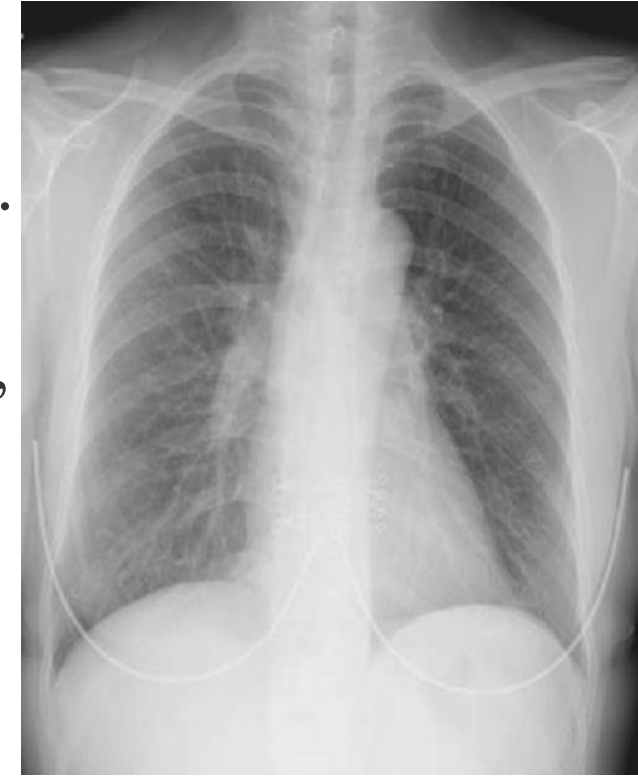
بہکی عطول ↘

and tachypnea is typical of *Pneumocystis pneumonia*.

➤ Chest X-ray shows **bilateral “ground glass”** infiltrates.

➤ Extra-pulmonary infections rarely occur in the late stages of AIDS and affect primarily the liver, spleen, lymph nodes, and bone marrow.

➤ The mortality rate of untreated *Pneumocystis pneumonia* approaches 100%.

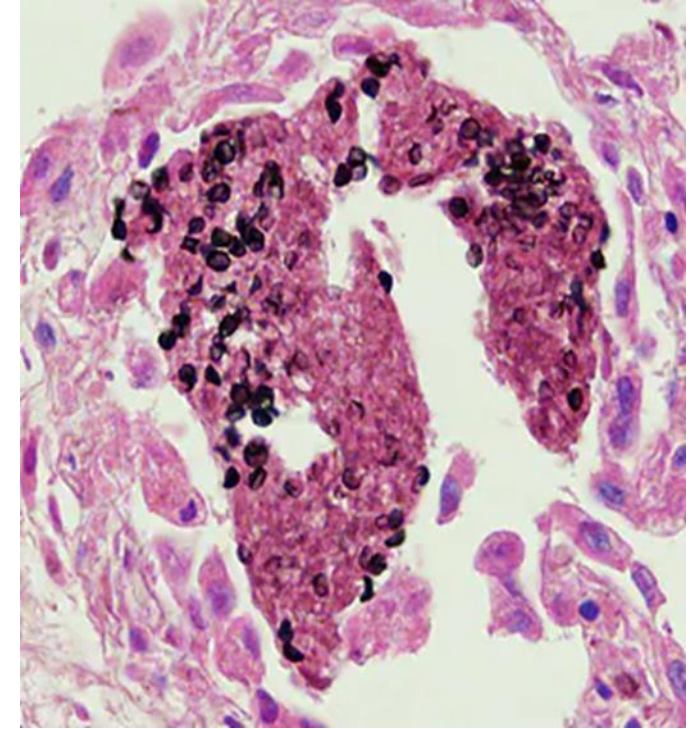


موتیوں کی شرح

100%

## Laboratory Diagnosis

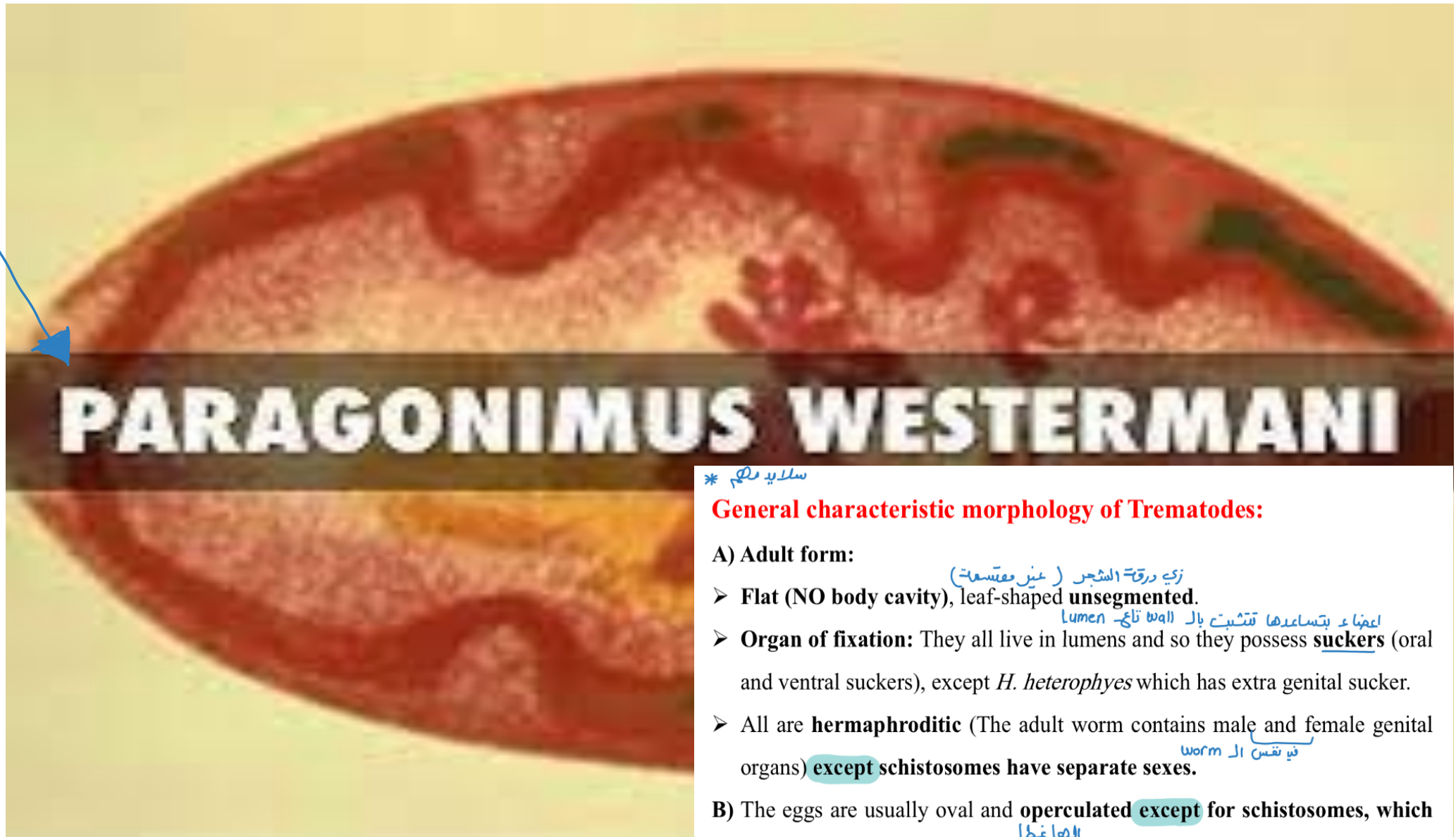
- **Sample:** Broncho-alveolar lavage, or lung biopsy.
- **Microscopic examination:** The cysts can be visualized with silver, Giemsa, or other tissue stains.  
*اسماء صبغاتی مستخرمانہ*
- **Detection of  $\beta$ -glucan.** → *سبب کثیر بال diagnosis*
- **PCR**



## Treatment:

- The treatment of choice is a combination of trimethoprim and sulfamethoxazole.

# Trematode of the lung (lung fluke)



Uncapsulate  
Flat

\* سلايد رقم

## General characteristic morphology of Trematodes:

### A) Adult form:

- Flat (NO body cavity), leaf-shaped **unsegmented**.  
زبي درق الشجر ( غير مقسمات )
- **Organ of fixation:** They all live in lumens and so they possess **suckers** (oral and ventral suckers), except *H. heterophyes* which has extra genital sucker.  
اعضاء بتساعدتها تثبت بال wall تاج- Lumen
- All are **hermaphroditic** (The adult worm contains male and female genital organs) **except schistosomes have separate sexes**.  
في نفس ال worm

B) The eggs are usually oval and **operculated** **except** for schistosomes, which are spined.  
الصفا غطا



# Morphology:

**Adult:** Short, reddish brown in color, resembles a coffee bean.

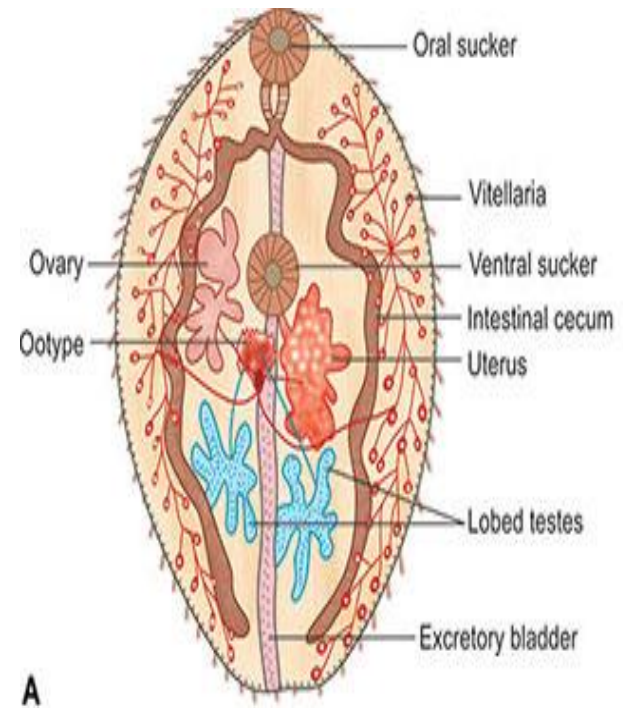
They possess oral and ventral suckers

(organs of attachment).

**Hermaphroditic.**

**Eggs:** Oval and operculated.

**Metacercaria:** Spherical in shape.



**Metacercaria**



**Egg**

Suputon بنتطلع ال lung عيشة بال lung adult warm

# Life cycle

**Habitat:** Lung.

**Definitive host:** Man.

**Reservoir host:** Dogs, cats, pigs

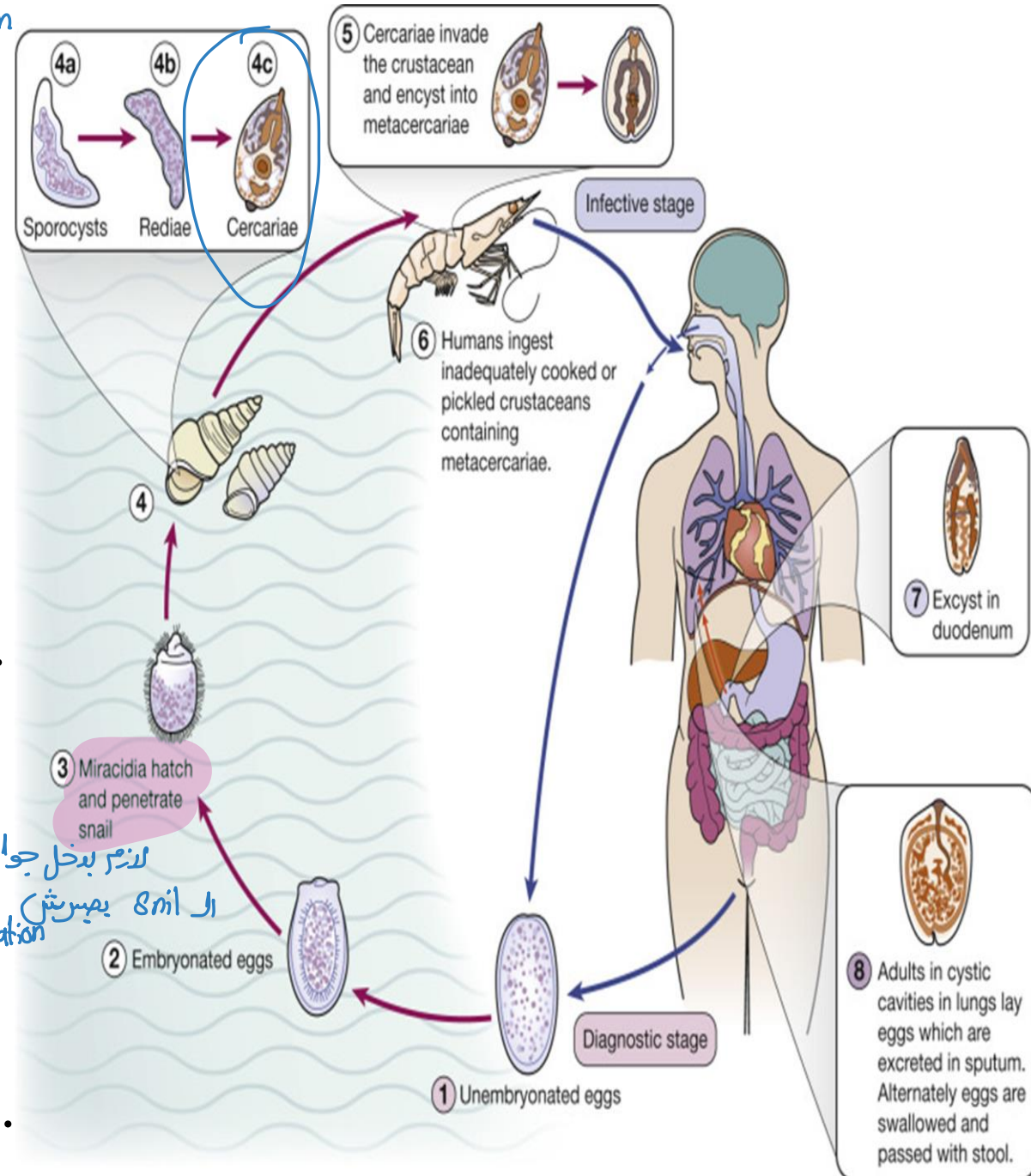
**1<sup>st</sup> Intermediate host:** Snail.

**2<sup>nd</sup> Intermediate host:** crabs and crayfish.

**Infective stage:** Metacercariae.

**Mode of infection:** eating raw freshwater  
crabs and crayfish.

**Diagnostic stage:** Eggs in sputum or stool.



## Pathogenesis & Clinical findings:

- Paragonimiasis is endemic in far east countries, where eating raw, undercooked or Drunken (wine soaked) crustaceans and spitting habit is common.
- Within the lung, the worms can **persist for years** and exist in a fibrous capsule and stimulates an inflammatory response (granuloma). Secondary bacterial infection frequently occurs.
- The main symptom is a **chronic cough** with bloody sputum, dyspnea and pleuritic chest pain.
- Ectopic lesions may rarely occur e.g. brain, liver, heart, skin, ..

## Laboratory Diagnosis:

- Eosinophilia اوسم خليا
- Finding the typical **operculated eggs** in sputum or feces.
- Serologic tests to detect specific antibodies e.g. ELISA (The eggs may not be present in sputum or stool until 2 to 3 months after infection).

## Treatment & Prevention:

- Praziquantel is the treatment of choice.
- Cooking crabs properly is the best method of prevention.
- Snail control.



المحاضرة ما فيها حكي كثير الحمد لله، زفأي اشي بتكون الدكتور قراءته قراءة او شغلوات ما  
بتحتاج الكتابة

بلا مبالغة انا، خطأ انا تقصير ما تقصير، انا ما انا.

@Esraa Elgdawy

" أوعى تستسلم  
بسرعة؛ الحياة  
دي عاوزة حد شجاع  
يواجهها "