**Endemic Dimorphic Fungi – FRCPath Part 2 “Exam-Complete” Revision Sheet**

(Primary source = Oxford *Textbook of Medical Mycology*, Ch 16 PDF)

## **1 Quick “Where-they-sit” Taxonomy**

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| **Family** | **Genera now examined in FRCPath** | **Notes** |
| **Ajellomycetaceae** | *Histoplasma*,  *Blastomyces* (incl. ***B. gilchristii***),  *Paracoccidioides*,  *Emmonsia* complex | Classic soil dimorphics of the Americas;  Emmonsia = emerging opportunist |
| **Onygenaceae** | *Coccidioides immitis / posadasii* | True desert fungus; arthroconidia in dust |
| **Trichocomaceae** | *Talaromyces (Penicillium) marneffei* | SE-Asian pathogen; red-pigment mould phase |

## **2 Core Concepts (apply to all endemic dimorphics)**

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| **Topic** | **High-yield facts** |
| **Thermal dimorphism** | Mould (≤ 25 °C) → yeast (37 °C); switch is virulence factor. |
| **Acquisition** | Inhalation of conidia/arthroconidia → primary lung focus → possible haematogenous spread. |
| **Determinants of disease** | Inoculum size + host cell-mediated immunity (Th1, Th17). |
| **Lab safety** | All cultures **BSL-3; Class II BSC**. |
| **Standard therapy rule-of-thumb** | Mild/moderate = itraconazole;  severe/CNS/immunosuppressed = liposomal amphotericin B then azole step-down. |

## **3 Epidemiology & Incubation / Latency Points**

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| **Fungus** | **Endemic zone & ecological cue** | **Incubation / latency “exam numbers”** |
| **Histoplasma** | Bat/bird-guano soil – Ohio/Mississippi, C./S. America | 3 – 17 days typical. |
| **Blastomyces** | Moist soil/decaying wood near waterways – Mississippi & Great Lakes/Ontario basin | 3 – 6 weeks. |
| **Coccidioides** | Desert SW USA; dust storms & **earthquake outbreaks** | **1 – 3 weeks** |
| **Paracoccidioides** | Rural Latin America; coffee & tobacco farms | Often **decades-long latency** – chronic adult form via reactivation. |
| **Talaromyces marneffei** | SE Asia; bamboo-rat reservoir | Latency uncertain; **reactivation seen years after leaving endemic area**. |
| **Emmonsia spp.** | Southern Africa, China, N America; HIV & transplant hosts | Unknown; consider when “Histoplasma” Rx fails. |

## **4 Pathogenesis & Host Immunity Highlights**

* **Coccidioides:** spherule-outer-wall glycoprotein (SOWgp), urease-generated ammonia, melanin, metalloproteinases blunt macrophage killing; mixed Th1/Th2/Th17 response.
* **Talaromyces marneffei:** conidia bind fibronectin/laminin; intracellular yeast neutralises ROS; control requires CD4-driven Th1 cytokines → disease when CD4 < 100.
* **General rule:** Th1/Th17 = protection; Th2 skew or CD4 deficit = dissemination.

## **5 Diagnosis – From Bench to Bedside in One Slide**

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| **Fungus** | **Rapid / specialty test to quote** | **Classic microscopy clue** |
| **Histoplasma** | Urine/serum galactomannan EIA | Yeast 2-4 µm in macrophages; mould tuberculate macroconidia. |
| **Blastomyces** | Same galactomannan EIA; emerging real-time PCR | **Broad-based budding yeast** (8-10 µm). |
| **Coccidioides** | Complement-fixation & immunodiffusion antibody panels **± antigen EIA**; PCR developing | **Spherules (≤ 120 µm) packed with endospores**. |
| **Paracoccidioides** | Serology (gp43 antigen) + microscopy | **“Pilot’s-wheel” multiple-budding yeast**. |
| **Talaromyces marneffei** | Whole-blood PCR; β-D-glucan positive; MALDI-TOF (yeast phase) | Yeast with **central transverse septum**; red pigment on Sabouraud. |
| **Emmonsia complex** | Definitive ID requires **sequencing (ITS, LSU, β-tubulin)**. | Histology mimics Histoplasma/Blastomyces. |

**Safety reminder:** open plates only within BSC; subculture sealed.

## **6 Organism-Specific Clinical Spectrum**

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| **Organism** | **Clinical patterns** | **Examiner “extras”** |
| **Paracoccidioidomycosis** | * **Juvenile: reticulo-endothelial** * **chronic-adult (90 %) – lungs, mucocutaneous ulcers, adrenal i**nsufficiency. | Male : female 13 : 1; β-oestradiol blocks switch. |
| **Histoplasmosis** | * **Acute self-limited pneumonia;** * **chronic cavitary (COPD);** * **disseminated** in HIV & anti-TNF users. | Healed focus can calcify like TB. |
| **Blastomycosis** | * **Pulmonary** mass/cavity can **mimic lung cancer**; * **Verrucous or ulcerated skin lesions** most common dissemination. |  |
| **Coccidioidomycosis** | * **“Valley fever” ± erythema nodosum** * **meningitis if immunosuppressed, pregnancy, African/Filipino a**ncestry. | Earthquake/dust outbreak questions. |
| **Talaromycosis** | Fever, cytopenias, molluscum-like papules, hepato-splenomegaly; rapid multi-organ failure in AIDS. | Always treat if CD4 < 100. |
| **Emmonsiosis** | Disseminated febrile illness with skin plaques & **neurological disease**; very high mortality if amphotericin delayed. | Think when “Histoplasma” therapy failing. |

## **7 Treatment Algorithms (quote durations!)**

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| **Setting** | **First-line** | **Notes** |
| Mild-moderate endemic mycosis | **Itraconazole** 200 mg bd (6–12 m)\* | \*Blastomycosis often 6 – 12 m; Paracoccidioidomycosis ≥ 9 m. |
| Severe/disseminated or CNS | **Liposomal amphotericin B** (3–6 mg/kg/d) → oral itraconazole / fluconazole | Duration guided by clinical/radiological response. |
| **Talaromyces marneffei in HIV** | L-AmB 2 wk → itraconazole 10 wk **+ secondary prophylaxis until CD4 > 100**. |  |
| **Coccidioidal meningitis** | Fluconazole ≥ 400 mg/d **lifelong**; intrathecal AmB if failure. |  |
| **Emmonsia complex** | Start with amphotericin B; azoles **alone** have higher mortality. |  |

## **8 Buzz-Word / Pattern-Recognition Mnemonic Sheet**

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| **Cue ➜ Answer** |
| **Pilot’s-wheel yeast** ➜ Paracoccidioides |
| **Tuberculate macroconidia** ➜ Histoplasma |
| **Broad-based bud** ➜ Blastomyces |
| **Large spherule with endospores** ➜ Coccidioides |
| **Transverse-septate yeast & red pigment** ➜ *T. marneffei* |
| **Emerging “Histoplasma-like” in HIV, needs sequencing** ➜ Emmonsia |
| **Earthquake / dust storm outbreak** ➜ Coccidioidomycosis |
| **Red pigment + bamboo-rat ecology** ➜ *T. marneffei* |
| **Sequencing required for ID** ➜ Emmonsia complex |

## **9 Structured Answer Framework (use in viva / SAQ)**

1. **Name organism & geography** (mention family classification).
2. **Describe pathogenesis** (inhalation → thermal switch → immune evasion molecule).
3. **Quote incubation & latency** (numbers above).
4. **Set out clinical forms** (acute, chronic, disseminated ± unique features).
5. **Laboratory diagnosis** (direct microscopy clue → culture morphology & growth time → rapid antigen/serology/PCR, plus BSL-3 precautions).
6. **Management plan** (drug, dose, duration; when to give prophylaxis).
7. **Complications & prognosis** (e.g., adrenal failure in PCM, meningitis in Cocci).

**Self-check mantra:** *“One incubation fact, one antigen or PCR test, one pathogenesis molecule, one therapy nuance for every dimorphic.”* If you can recite that for all six, you are exam-ready!