



Diagnosis of Mucormycosis: An Update

Presenter:

Ali Ahmadi

PhD Candidate in Medical Mycology,

Department of Medical Parasitology and Mycology, School of
Public Health, Tehran University of Medical Sciences, Tehran, Iran.



Prevention of black fungus disease



Avoid going to the dusty area or construction sites, wear N95 mask if not able to avoid going to area with a lot of dust.



Clean the skin injuries with warm water and antiseptic liquid to avoid having skin infection. Maintain personal hygiene including thorough scrub bath.



If you have had a stem cell transplant or organ transplant talk to your doctor for antifungal medication to prevent fungal infections.



Avoid activities that has direct contact with dust or soil. Wear shoes, long trousers, long sleeve shirts, gloves while handling soil (gardening), moss or manure.

- Control high blood sugar and monitor blood glucose level post COVID-19 discharge
- Use steroid as per prescribed dosage and duration.
- Use clean sterile water for humidifiers during oxygen therapy
- Use antibiotics / Antifungals wisely
- Watch out warning signs of black fungus disease that need immediate medical attention and don't delay incase of any warning signs and symptoms.



T: 0404848688
Hyderabad, Telangana, India.

Warning signs of black fungus disease



Patients showing symptoms including a swollen eyelid is when either the lower or upper eyelid (or both) become enlarged, discharge from the eyes, paralysis of eyelid muscles, fever, nausea, vomiting, facial pain, nasal congestion and identified as black fungus infection that can affect sinus and can spread to the brain but wherein infection spreads through the bloodstream and can affect other body parts and organs such as heart, spleen and skin.



Swollen Eyes, Redness around Eyes & Nose



Facial pain, numbness and tingling sensation



Fever and Headache



Coughing



Chest Pain & Shortness of Breath



Bloody vomiting



Altered mental Status



Infected skin area turning black

Past

Global incidence rate 0.005 to 1.7 per million population

Prevalence in India is around 140 per million population (80 times that of developed countries)

Around 46% patients with the disease reportedly die with 68% risk with disseminated and 31% with cutaneous mucormycosis

Present

Current data (May 5-July 12, 2021) reports 41,512 cases and 3,554 deaths due to mucormycosis in India



Around 80% of patients with COVID-19 associated mucormycosis have diabetes

COVID-19 Associated Rhino-Orbital-Cerebral Mucormycosis: Clinical Features, Antifungal Susceptibility, Management and Outcome in a Tertiary Hospital in Iran

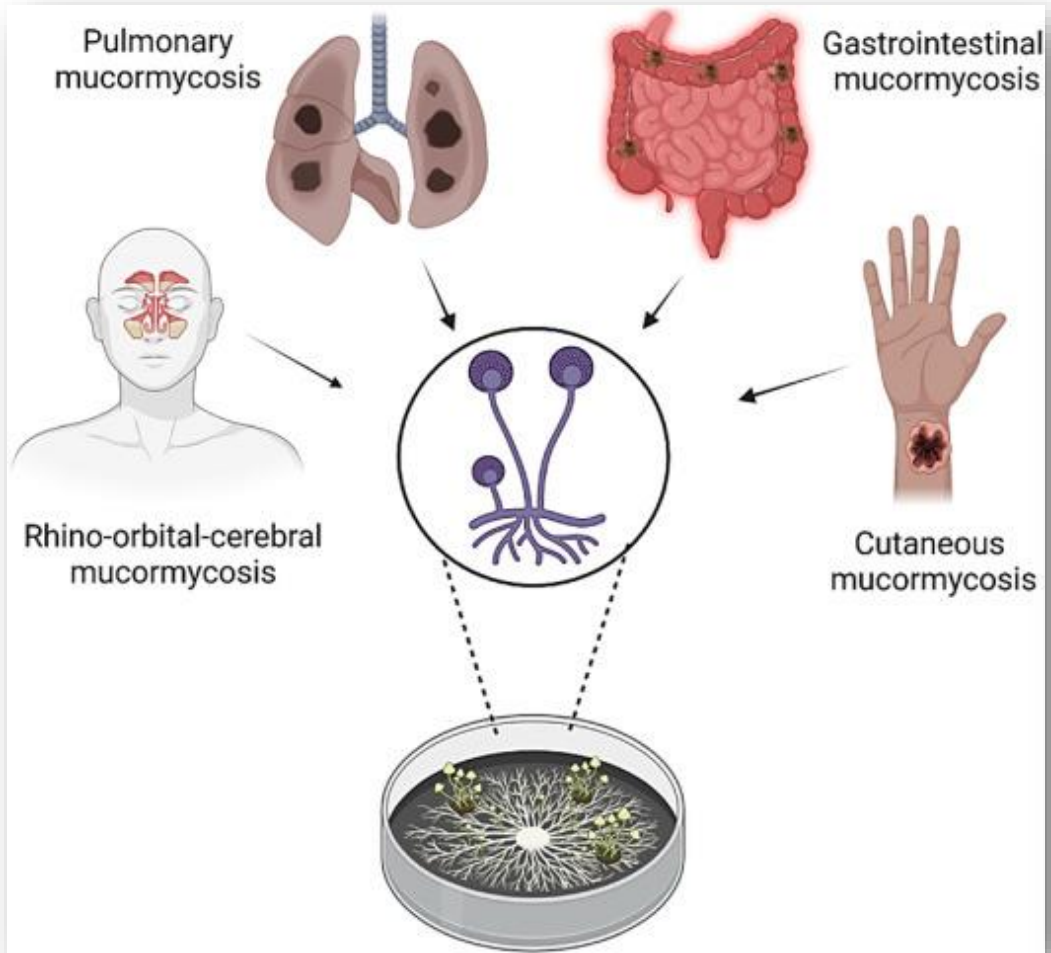
Original Article | [Published: 06 September 2023](#)

Volume 188, pages 783–792, (2023) [Cite this article](#)

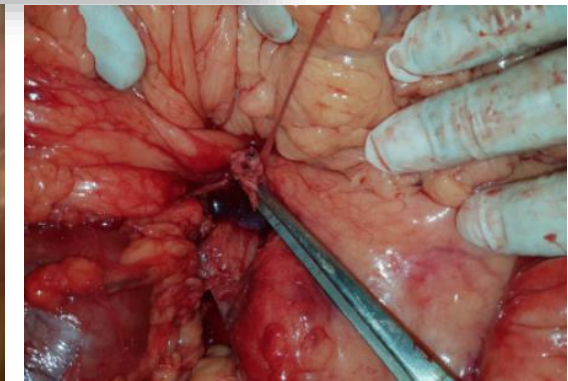
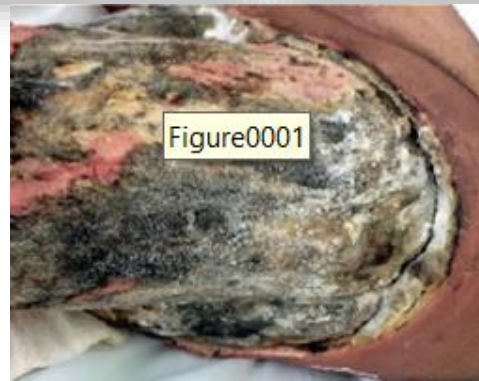
62 Mucorales isolates: **100%** *Rhizopus*

[Mahsa Abdorahimi](#), [Farzad Pakdel](#), [Mohammadreza Salehi](#) , [Laura Alcazar-Fuoli](#), [Seyed Jamal Hashemi](#), [Roshanak Daie Ghazvini](#), [Fardin Ahmadkhani](#), [Kazem Ahmadikia](#), [Alireza Abdollahi](#), [Juan Carlos Soto Debran](#), [Azin Tabari](#), [Fatemeh Farrokh](#), [Atefeh Mousavand](#), [Pegah Afarinesh Khaki](#), [Arezoo Salami Khaneshan](#), [Ashraf S. Ibrahim](#) & [Sadegh Khodavaisy](#) 

Clinical Manifestations



Host Factor	Associated Clinical Syndrome
Diabetes mellitus, particularly with ketoacidosis	ROCM
Corticosteroid use	ROCM
Haematologic malignancies	Pulmonary or disseminated infection
COVID-19	ROCM
Haematopoietic cell transplantation	Pulmonary
Solid organ transplantation	Disseminated infection
HIV/AIDS	Disseminated infection
Treatment with deferoxamine	ROCM
Iron overload	ROCM
Injection drug use	Isolated cerebral
Major trauma	Cutaneous
Burns	Cutaneous



Early Diagnosis of Mucormycosis

Diagnosis

Prevention of angioinvasion

Prevention of extension into critical sites: eyes, brain, ...

Prevention of dissemination

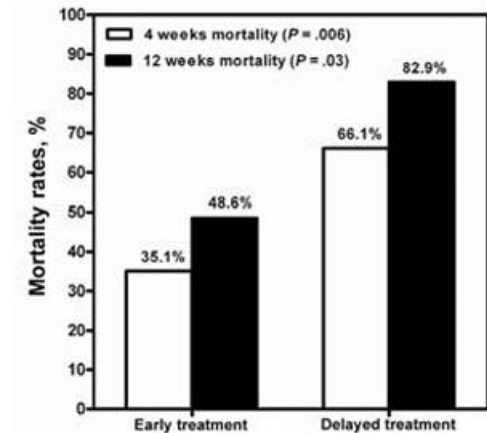
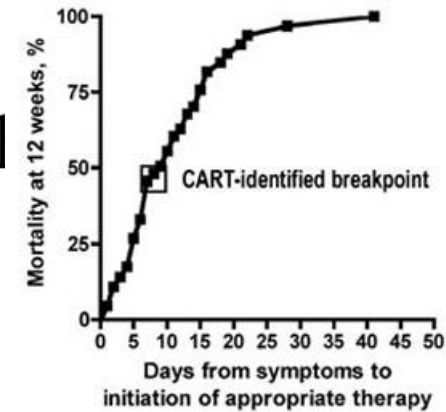
Reduced need for surgical resection

Improved outcome and survival

Delaying Amphotericin B–Based Frontline Therapy Significantly Increases Mortality among Patients with Hematologic Malignancy Who Have Zygomycosis

Georgios Chamilos,¹ Russell E. Lewis,^{1,2} and Dimitrios P. Kontoyiannis^{1,2}

¹Department of Infectious Diseases, Infection Control and Employee Health, The University of Texas M. D. Anderson Cancer Center, and ²University of Houston College of Pharmacy, Houston, Texas



Clinical Infectious Diseases

MAJOR ARTICLE



Revision and Update of the Consensus Definitions of Invasive Fungal Disease From the European Organization for Research and Treatment of Cancer and the Mycoses Study Group Education and Research Consortium

Diagnosis



HHS Public Access

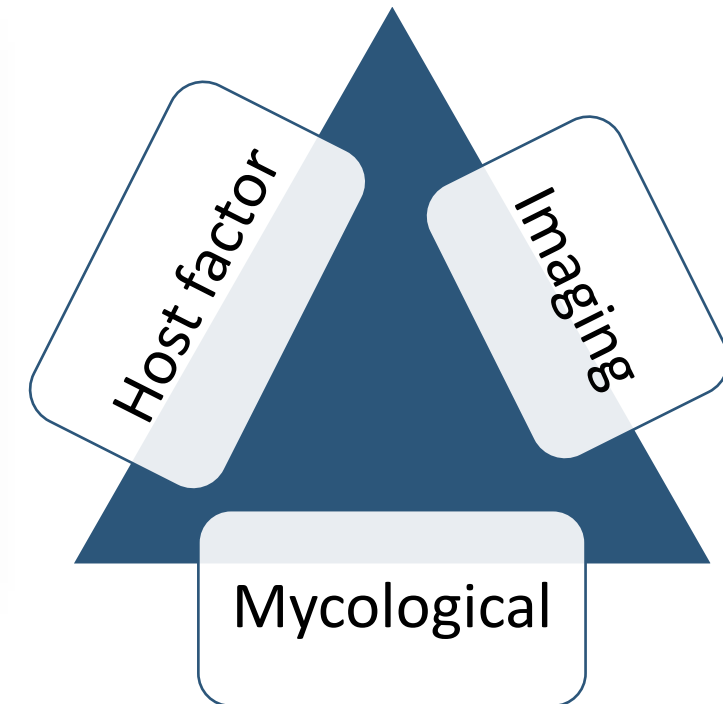
Author manuscript

Lancet Infect Dis. Author manuscript; available in PMC 2021 November 01.

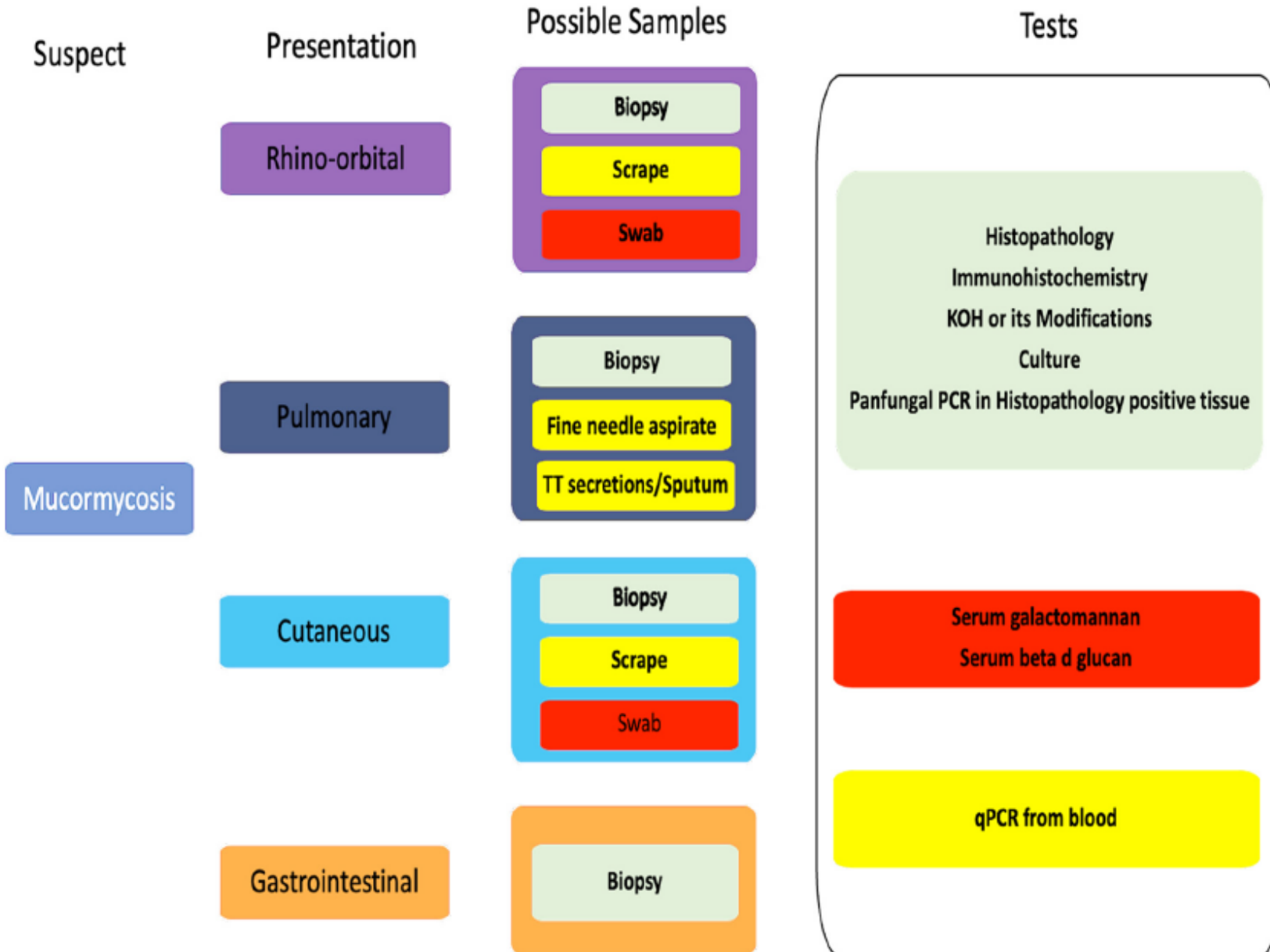
Published in final edited form as:

Lancet Infect Dis. 2019 December ; 19(12): e405–e421. doi:10.1016/S1473-3099(19)30312-3.

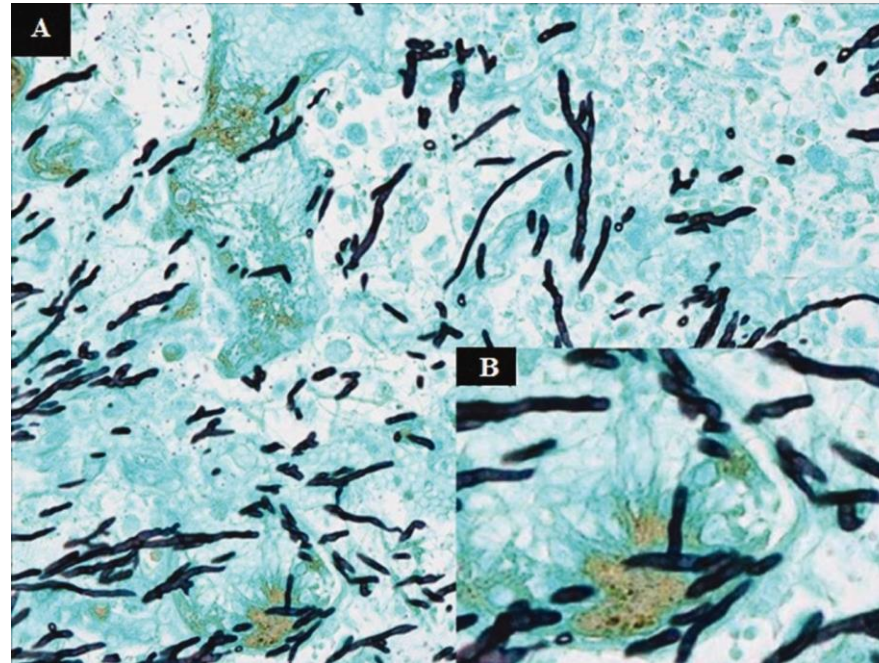
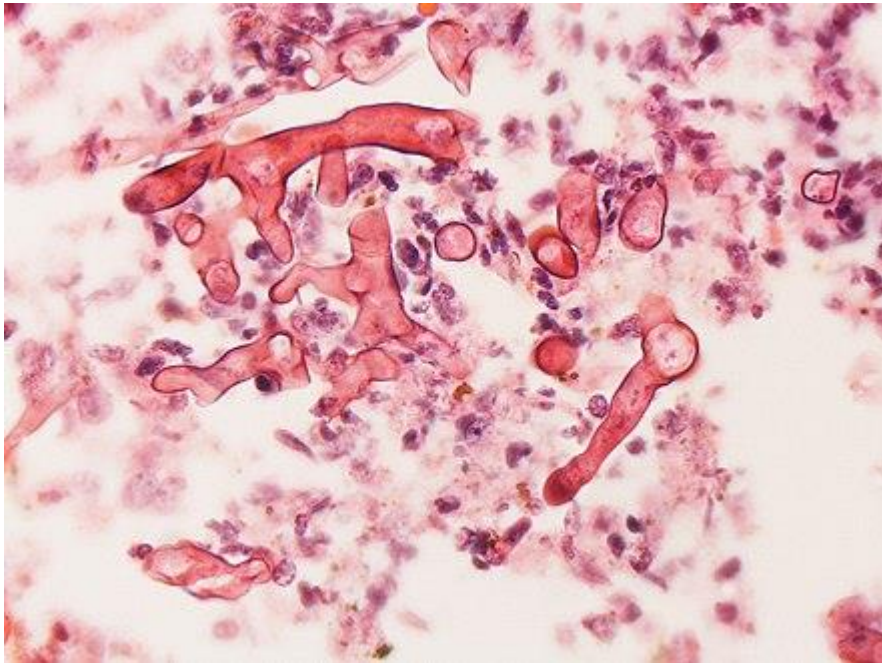
Global guideline for the diagnosis and management of mucormycosis: an initiative of the European Confederation of Medical Mycology in cooperation with the Mycoses Study Group Education and Research Consortium



Mycological

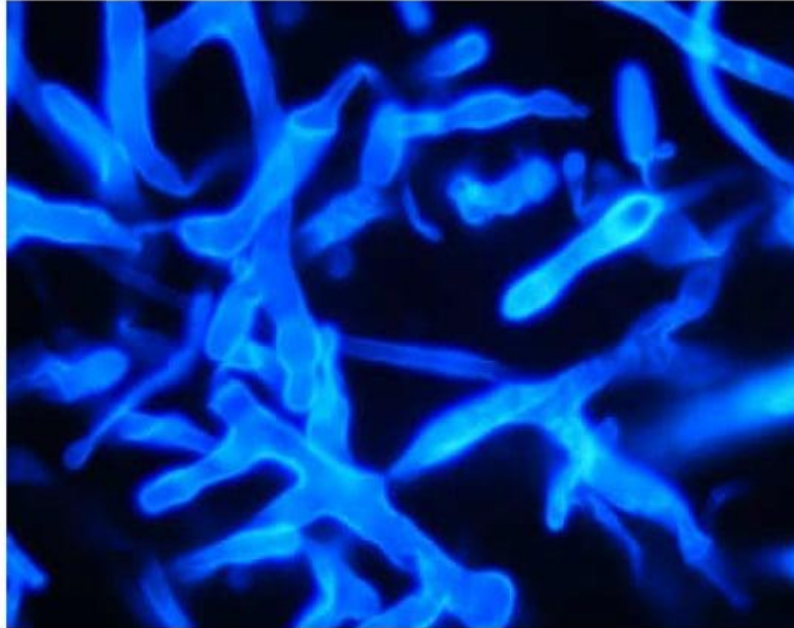


- Histopathology, the **gold standard** for diagnosis, detects typical broad ribbon-like, pauci-septate or aseptate with right-angle branching mucoralean hyphae that invade into tissue and blood vessels leading to thrombosis and infarction, a characteristic feature of mucormycosis.

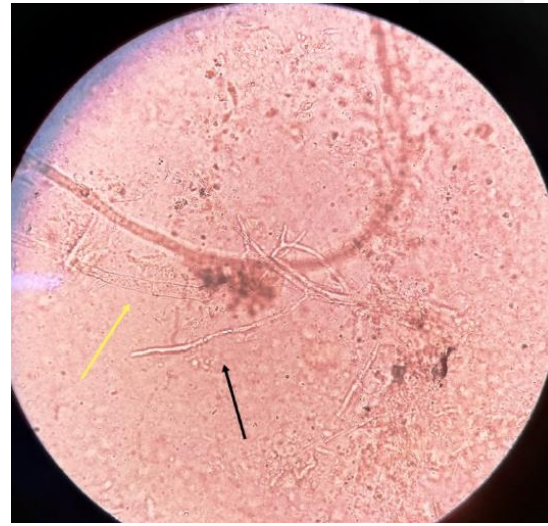
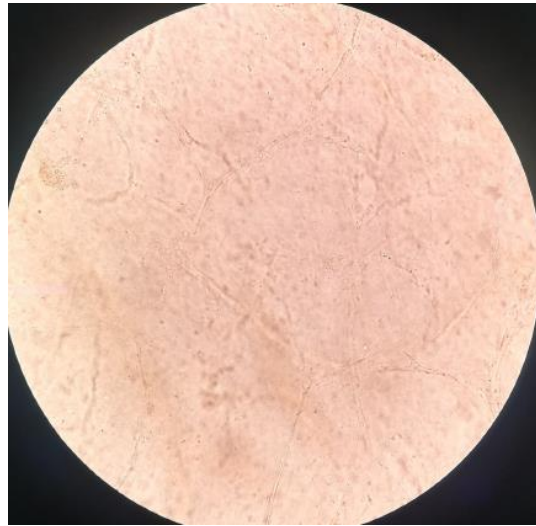


- KOH
- Calcofluor-white

Direct
examination



Challenges

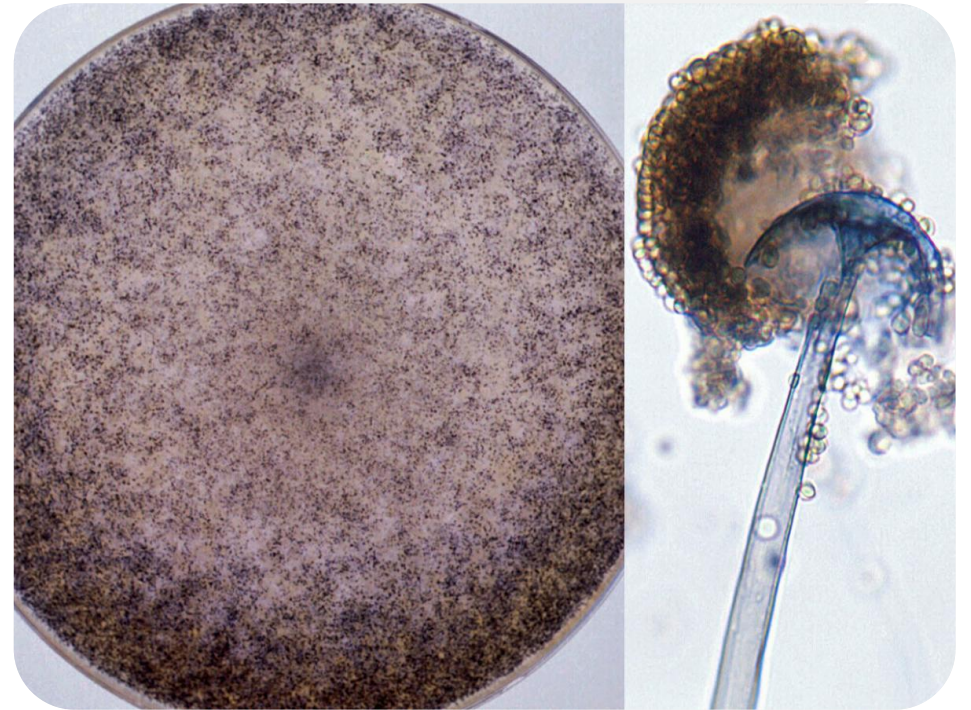


Mycology

Microbiology

Sample	Mycology		Microbiology	
	Microscopy ^a	Culture	Microscopy ^b	Culture
Tissue, thigh	Large amounts pauciseptate hyphae (5 h)	<i>Mucor circinelloides</i> (d4)	Not performed	<i>M. circinelloides</i> (d4)
Left nasal mucosa	Moderate amounts pauciseptate hyphae (2 h)	<i>Lichtheimia corymbifera</i> (d4)	Gram + ve cocci	Mixed bacteria <i>L. corymbifera</i> (d5)
Nasal septum	Large amounts pauciseptate hyphae (2 h)	<i>Lichtheimia corymbifera</i> (d4)	Not performed	Not performed
Nasal septal cartilage	Large amounts pauciseptate hyphae (2 h)	<i>Lichtheimia corymbifera</i> (d4)	Gram + ve cocci	Mixed bacteria
Left inferior turbinate	Moderate amounts pauciseptate hyphae (2 h)	<i>Lichtheimia corymbifera</i> (d4) + MICs (d6)	Negative	Mixed bacteria

- Fungal culture is an essential diagnostic modality for Mucorales **identification** to genus and species level and **antifungal sensitivity testing**.
- Ruling out contamination is crucial, and correlation with **clinical** and **radiological features** is essential.
- However, culture yields are often low (50% sensitivity) due to various factors such as sample collection, storage at 4 °C, and tissue grinding.



[CITATION] Cell wall fucomannan is a biomarker for diagnosis of invasive murine mucormycosis

C Orne, [A Burnham-Marusich](#), C Baldin... - Proceedings of the 28th ..., 2018

Development of a monoclonal antibody and a lateral-flow device for the rapid detection of a Mucorales-specific biomarker

 Christopher R. Thornton^{1,2*}  Genna E. Davies^{2†}  Laura Dougherty¹

¹ Biosciences, Faculty of Health and Life Sciences, University of Exeter, Exeter, United Kingdom

² ISCA Diagnostics Ltd., Hatherly Laboratories, Exeter, United Kingdom



PCR-Based Approach Targeting Mucorales-Specific Gene Family for Diagnosis of Mucormycosis

Authors: Clara Baldin, Sameh S. M. Soliman, Heewon H. Jeon, Sondus Alkhazraji, Teclegiorgis Gebremariam, Yiyu Gu, Vincent M. Bruno

, [SHOW ALL \(14 AUTHORS\)](#), [Ashraf S. Ibrahim](#) | [AUTHORS INFO & AFFILIATIONS](#)

DOI: <https://doi.org/10.1128/jcm.00746-18> • [Check for updates](#)

JOURNAL ARTICLE

Diagnosis of mucormycosis using a simple duplex PCR assay: Analysis of 160 clinical samples from COVID-19 patients [Get access >](#)

Shima Aboutalebian, Mahzad Erami, Amir Hossein Ahsaniarani, Mansooreh Momen-Heravi, Alireza Sharif, Mahboubeh Hadipour, Hossein Mirhendi ✉

Medical Mycology, Volume 61, Issue 9, September 2023, myad091, <https://doi.org/10.1093/mmy/myad091>

JOURNAL ARTICLE ACCEPTED MANUSCRIPT

Performance of Mucorales spp. qPCR in bronchoalveolar lavage fluid for the diagnosis of pulmonary mucormycosis [Get access >](#)

Xavier Brousse, Sébastien Imbert, Nahéma Issa, Edouard Forcade, Maxime Faure, Jeremy Chambord, Hanta Ramarosan, Hannah Kaminski, Pierre-Yves Dumas, Elodie Blanchard ✉

Medical Mycology, myae006, <https://doi.org/10.1093/mmy/myae006>

Published: 30 January 2024

Molecular methods



Limitation

The main disadvantages of PCR-based methods are the lack of standardization and clinical evaluation.

The performance and sensitivity of all PCR-based methods is highly dependent on the DNA/RNA extraction.

The choice of primers and PCR platforms.

Disease causing agent or colonization.

They are costly and need expertise.





THANK YOU
