

***Mucor* spp. – Risk group (RG) Fungi an Emerging Threat to Human Life**

Murali Sankar Perumal^{1*}, Shreedevasena Sakathibalan² and Kaviyarathinam T³

^{1*} Assistant Professor, Department of Plant Pathology, SRSIAT, Veda sandur

² Ph.D., Scholar, Department of Plant Pathology, UAS, GKVK, Bangalore

³ Assistant Professor, Department of Plant Pathology, SRSIAT, Veda sandur

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Introduction

Mucor spp. is a universal, ubiquitous filamentous fungus commonly found in the soil, plant ecosystem, wasted food items, rotten vegetables and dry matter. Mostly, it is causing moulds and food spoilage. *Mucor* spp. belongs to the order Mucorales. This order causes infections in rodents, ruminants, amphibians, plants and humans. Recently, this *Mucor* spp. cause disease “Mucormycosis” in severe form in humans and continuous deaths has occurred in the states of Bihar, Rajasthan, New Delhi and Tamil Nadu in India.

General characterization

Mucor spp. is rapidly fast-growing fungi with white to grey coloured colonies with development of sporangia. Sporangiospores are erect, simple or branched, forming large, terminal globose to spherical multi-spored sporangia without apophyses with well-developed columella. Usually, sporangial wall visualized base of the columella after sporangiospores dispersal. The sporangiospores are uninucleate, hyaline, grey or brownish, globose to ellipsoidal and smooth walled. Additionally, chlamydospores and sexual zygo spores are present; rhizoids and stolons are absent. Sporangium walls easily get ruptured to release which germinate on the new substrate or host available. During, sexual reproduction, short specialized hyphae formed as gametangia. Two complementary gametangia fuse to form sexual zygo spore. After karyogamy and meiosis, spores release to germinate and produce germ tube. They require optimum temperature of 5-25°C for growth and sporulation. Some of the thermo tolerant (>32°C) species viz., *M. amphibiorum*, *M. circinelloides*, *M. hiemalis*, *M. indicus*, *M. irregularis*, *M. racemosus*, *M. ramosissimus* and *M. mucedo* has been reported as human pathogenic nature.

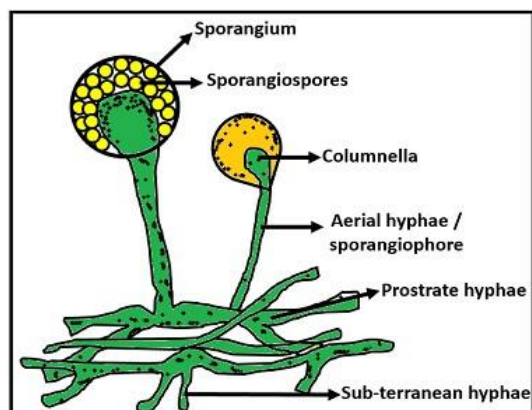


Figure 1. Structure of *Mucor* fungi

Risk group analysis (RGA)

Based on hazard, infections, disease severity, control strategies the fungi are categorized into risk groups. It consists of risk groups RG1 to RG4. It is described by national biosafety guidelines and world health organization.

RG1: Low risk – Organisms generally do not cause disease in healthy adult humans (most safe organisms) e.g. *M. circinelloides*, *M. indicus* and *M. ramosissimus*.

RG2: Moderate risk – Organisms can cause disease in humans, but the disease is treatable and sometimes it cause serious hazard to public health e.g. *M. irregularis* and *M. amphibiorum*.

RG3: High risk – Organisms can cause serious disease in humans but rare. Treatments and vaccines are usually available e.g. *M. mucedo* (Mucormycosis).

RG4: Extreme risk – Organisms can cause death in humans and there are no control measures for this.

Symptoms of Mucormycosis

There are different types of mucormycosis which infect humans viz., rhino cerebral, pulmonary, cutaneous (skin) and gastrointestinal. Now days, in India it is being noticed in post-covid and diabetic patients.

Rhinocerebral

- Symptoms like, one sided facial swelling, headache, nasal or sinus congestion, black lesions on nasal bridge and fever.

Pulmonary

- Fever, cough, chest pain and short breath.

Cutaneous

- Look like blisters, notching, infected area turns into black, pain, skin color change as excessive redness.

Gastrointestinal

- Abdominal pain, nausea and vomiting and intestinal bleeding. These infections occur when we got exposed to fungal spores and due to contamination of food items.

Management

- Use fresh vegetables and fruits for diet.
- Maintain hygiene in homes.
- Under clinical conditions, the antifungal compounds viz., amphotericin B, ketoconazole, itraconazole and voriconazole suppress the growth and infections very rapidly.

Conclusions

Mucor spp. is present in all ecosystems. This fungus is very fast growing and it spread by its spores. Normally, it is not highly pathogenic to humans and it mostly causes diseases like moulds and rots in agricultural crops. After infection it produces toxigenic compounds which make the produce non-edible and ultimately results in dropping the market price. It is advised to avoid its infection. Maintaining hygiene and using above-described antifungal compounds can help in managing this pathogen's infection at better level.