



Aspergillosis: A Life-Threatening Mycotic Disease of Humans and Animals

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Editorial

There are several mycotic diseases, such as cryptococcosis, candidiasis, aspergillosis, histoplasmosis, sporotrichosis, fusariosis, maduromycosis, blastomycosis, coccidioidomycosis, chromoblastomycosis, rhodotoruliosis, paracoccidioidomycosis, geotrichosis, pneumocystosis, zygomycosis, penicillosis Marneffe, dermatophytosis, and others, which are reported from developed and developing nations of the world [1]. Among these, aspergillosis is a highly infectious life threatening global mycotic disease of humans as well as animals including birds. The disease is important from public health and economic point of view. The association of *Aspergillus fumigatus* with keratitis in a buffalo calf and *A.niger* with abortion in a dairy buffalo was established for the first time by Pal in 1983 and 1988, respectively [2,3]. Disseminated *Aspergillus terreus* infection in a caged pigeon was reported for the first time in India by Pal 1992.

The first isolation of *Aspergillus fumigatus* from ornamental plants in India and Ethiopia was described by in 2004 and 2015, respectively [4,5,6] is credited to describe the first case of respiratory mycosis in chicks due to *Aspergillus fumigatus* in Debre Zeit, Ethiopia. *Aspergillus fumigatus*, the chief cause of aspergillosis, is implicated in about 90 % of cases, and results into 200,000 cases of invasive aspergillosis in humans annually. In addition, chronic pulmonary aspergillosis is diagnosed in 3 million people every year [7].

Presently, there are approximately 600 species of *Aspergillus*, of which around 27 species are found to be associated with aspergillosis [8]. The disease is primarily caused by *Aspergillus fumigatus*,

however, other species, such as *A. flavus*, *A. nidulans*, *A. niger*, *A. terreus*, *A. glaucus*, *A. deflexus*, *A. amstelodami*, *A.clavatus*, *A. restrictus*, *A.chevalieri*, *A.candidus*, and *A.sydowii* are also implicated in the etiology of the disease [9], [8,10]. Dual infection due to more than one species of *Aspergillus* has also been observed in chicks [1] and humans [3,11]. Natural infection has been reported in humans and also in several species of animals, such as bison, buffalo, cat, cattle, chicken, dog, dolphin, goat, penguin, parrot, pigeon, sheep, horse, monkey, pig, rabbit, swan, turkey, and whale [1,8,9,12]. The disease occurs both in sporadic and epidemic form producing considerable morbidity and mortality in humans and in animals including birds [1,8,13].

Respiratory tract is considered as the prime portal of entry of the pathogen. The source of infection is exogenous as humans and animals including birds acquire the infection through respiratory route by inhaling large number of infectious spores of the fungus from saprobic reservoirs. Nosocomial infection has been observed mainly in hospital environment. Accidentally, the infection can be introduced following a trauma to the skin by a contaminated object [1,13]. Aspergillosis is considered as saprozooses as the pathogen exist in the environment as saprobe. The fungus is ubiquitously prevalent in nature, and is frequently isolated from the variety of environmental materials including the soil, air, water, compost, fruits, vegetable, saw dust, rice husk, grains, litter, and other organic matter [1,8]. There are evidences to believe that humans as well as animals acquire aspergillosis from the soil that serve as the reservoir of infection [1].

Aspergillosis in humans is characterized by pulmonary lesion spreading to various organs including the skin and brain [14]. The clinical symptoms in humans include low grade fever, productive cough, breathlessness, malaise, prostration, haemoptysis, rhinitis, sinusitis, otitis, keratitis, dermatitis, hepatitis, myocarditis, endocarditis, and encephalitis [1,10]. The disease is more frequently observed in birds than in other animal species. The affected bird exhibits dullness, anorexia, fever, mucoid to mucopurulent nasal discharge, dyspnea, oedema of eyelid, lachrymation, foetid diarrhoea, torticollis, ataxia, in coordination, convulsion and death [1,12].

Aspergillosis is an opportunistic mycosis, causing the disease under immunocompromised situations of the host or when the humans and animals are exposed to an overwhelming number of infectious spores of the fungus. Certain occupational groups, such as poultry farmers, gardeners, and agricultural workers etc; seem to be more susceptible to aspergillosis [1,13,15]. Maximum cases are encountered immunocompromised hosts who are suffering from leukemia and organ transplant recipient. It is mentioned that mortality rate in humans due to *Aspergillus fumigatus* may reach 30 to 90% [7].

There are no specific signs that can help to make presumptive diagnosis. Hence, laboratory help is required to establish an unequivocal diagnosis of aspergillosis. Disease can be confirmed by direct microscopic demonstration of branched, septate, 2-4-micron thick hyphae in the clinical specimens by potassium hydroxide (KOH), technique and isolation of the organism on Sabouraud dextrose medium with antibiotic at 37°C. The author has isolated *Aspergillus fumigatus* and other species of *Aspergillus* from clinical and environmental on APRM (Anubha, Pratibha, Raj, Mahendra) medium that was developed by Dave and Pal [16]. The detailed morphology of the fungal culture recovered from clinical materials can be studied in Narayan stain [17]. Histopathological examination of biopsy or autopsy material by GMS, GMS-HE and PAS methods helps in the diagnosis of disease [1]. Immunological tests like agar gel immunodiffusion, immunoelectrophoresis and ELISA can demonstrate antibodies against *Aspergillus* infection [1,8,18,19]. The skin test is useful in allergic bronchopulmonary aspergillosis and in invasive bronchopulmonary aspergillosis. Very recently, the molecular tests such as PCR, RFLP and RAPD are also employed for the diagnosis of disease [1,8].

Currently, no vaccine is commercially available to immunize the susceptible people. The patient in early stage of disease may respond to prolonged treatment with antifungal drugs, such as amphotericin B, ketoconazole, fluconazole, flucytosine, itraconazole, and posaconazole [1,13]. In addition, surgical removal of fungus ball of the lungs can be done by lobectomy [1]. The control measures, such as use of face mask when working in poultry farms or handling mouldy feed, fitting of HEPA filters in the rooms of high risk groups, avoidance of feeding of moldy grains to birds, and pregnant dairy animals, decontamination of poultry pen, incubator,

water utensils, and feed hopper, proper disposal of infected materials may reduce the prevalence and incidence of disease [1]. It is emphasized that future studies on the ecology, epidemiology, and chemotherapy should be undertaken. The wider use of APRM medium for the isolation of *Aspergillus fumigatus* and other species of *Aspergillus* from various clinical specimens in microbiology and public health laboratories is recommended.

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Conflict of Interest

None

References

1. Pal M (2007) Veterinary and Medical Mycology. 1st Edition. Indian Council of Agricultural Research, New Delhi, India pp.105-223.
2. Pal M (1983) Keratomycosis in a buffalo calf (*Bubalus bubalis*) caused by *Aspergillus fumigatus*. *Veterinary Record* 113(3): 67.
3. Pal M (1988) *Aspergillus niger* associated with mycotic abortion in a buffalo (*Bubalus bubalis*). *Mycoses* 31: 17-19.
4. Pal M (1992) Disseminated *Aspergillus terreus* infection in a caged pigeon. *Mycopathologia* 119: 137-139.
5. Pal M (2004 a) *Aspergillus fumigatus* isolated from ornamental plants in India. *Revista Iberoamericana De Micologia* 21(4): 218.
6. Pal M (2015) First mycological investigation of *Aspergillus* species from soil of potted plants. *Ethiopian International Journal of Multidisciplinary Research* 3: 8-9.
7. Pal M (2016) First record of respiratory mycosis in chicks due to *Aspergillus fumigatus* in Debre Zeit, Ethiopia. *Journal of Mycological Research* 54: 151-154.
8. Brown GD, Denning DW, Gow NAR, Levitz SM, Netea MG, et al. (2012) Hidden killers: Human fungal infections. *Science Translation Medicine* 4: 1-6.
9. Pal M (2017) Aspergillosis: A highly infectious global mycosis of human and animal. *Clinical Biotechnology and Microbiology* 1: 46-49.
10. Mishra GS, Mehta N, Pal M (2004) Chronic bilateral otomycosis caused by *Aspergillus niger*. *Mycoses* 47: 82-84.
11. Dave P, Pal M (2015a) Otomycosis due to *Aspergillus flavus* and *Aspergillus niger* in a floor mill worker. *Ethiopian International Journal of Multidisciplinary Research* 2: 7-9.
12. Pal M, Tesfaye S, Mekonnen GA (2012) Aspergillosis: An important fatal mycotic disease of chicks. *International Journal of Livestock Research* 2: 69-73.
13. Dave P, Mahendra R, Pal M (2015) Etiologic significance of *Aspergillus terreus* in primary cutaneous mycosis of an agricultural worker. *Molecular Microbiology Research* 5: 1-4.
14. Emmons CW, Binford CH, Utz JP, Kwon-Chung KG (1977) *Medical Mycology*. Lea and Febiger, Philadelphia, USA pp. 285-304.
15. Pal M, Torres-Rodriguez JM (1990) *Aspergillus flavus* as a causative of pulmonary aspergillosis in an occupational worker. *Rev. Iberoam. Micol* 7: 33-35.

16. Dave P, Pal, M (2015b) New medium "APRM" for isolation of medically important fungi from clinical and environmental samples. *International Journal of Livestock Research* 5: 10-18.
17. Pal M (2004b) Efficacy of Narayan stain for the morphological studies of moulds, yeasts and algae. *Revista Iberoamericana de Micologia* 21: 219.
18. Kurup VP, Kumar A (1991) Immunodiagnosis of aspergillosis. *Clin. Microbiol. Rev* 4: 439- 456.
19. Latge JP (1999) *Aspergillus fumigatus* and aspergillosis. *Clin. Microbiol. Rev* 4: 310-350.