



Indoor Air Pollution – A Cause of Concern

Rambal Kavita

Department of Botany, Maharishi Dayanand College of Arts, Science & Commerce. Parel, Mumbai – 400012.

Email id : kavita.rambal@gmail.com

Manuscript details:

Available online on
<http://www.ijlsci.in>

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Editor: Dr. Arvind Chavhan

Cite this article as:

Rambal Kavita (2018) Indoor Air Pollution – A Cause of Concern, *Int. J. of. Life Sciences*, Special Issue, A9: 11-14.

Copyright: © Author, This is an open access article under the terms of the Creative Commons Attribution-Non-Commercial - No Derives License, which permits use and distribution in any medium, provided the original work is properly cited, the use is non-commercial and no modifications or adaptations are made.

ABSTRACT

Indoor air pollution which is of chemical and biological origin is a cause for worry. Various studies related to indoor air pollution have revealed that it can cause many complications like irritation in the eyes and throat, dizziness, fatigue, allergy, rhinitis, and other respiratory problems besides sick building syndrome and poor visibility. Indoor air pollution affects all especially children and immunocompromised people or people suffering from other ailments. Studies have revealed that the outdoor environment also affects it. Especially fungal spores or mould spores which are normally present in the outdoor air intrude into the indoor environment. In the present paper a review of literature related to indoor air fungi as pollutant has been undertaken and to find ways to improve the indoor air quality.

Keywords: Pollution, Indoor, Outdoor, Particulate matter, Agricultural wastes, Indoor plants.

INTRODUCTION

Outdoor air pollution has been a cause of worry from a lot of time and lot of studies pertaining to it have been carried out. It being one of the reasons for indoor air pollution has become a cause of concern, as people spend more time indoors as compared to outdoors. It is a burning problem, for instance Delhi the air pollution level has crossed the permissible levels and is causing havoc. It has become a health hazard. One can imagine what must be the levels indoors. Pollution be it outdoors or indoors has chemical and biological components. Increasingly attention is being paid to microbial components present in the indoor air, as exposure to microbial components especially fungi. Fungi are ubiquitous and can grow on almost all natural and synthetic materials and can cause a spectrum of diseases. In the present study an attempt has been made to find possible ways to overcome this problem.

Indoor Air Pollution

Indoor air pollution like outdoor pollution is of chemical and biological origin. The main source of indoor air pollution is outdoor pollution and it becomes more harmful as it gets concentrated indoors. Since people spend more time indoors, it directly affects the health and wellbeing of individuals. Indoor air pollution refers to physical, chemical, and biological characteristics of air in the indoor environment or in other words it refers to chemical, biological, and physical contamination of indoor air. Both outdoor and indoor sources determine the constituents of indoor air. Since people spend 80 – 95% of their time indoors the indoor air quality directly affects their health and wellbeing (Dacarro, et al., 2003).

Biological contaminants or pollutants which affect indoor air quality include allergens such as pollen from plants, hair from pets, fungi, and some bacteria. Fungi infested pollution of indoor environments is considered and rather is a serious threat to public health. (Samet and Spengler, 2003), (Khan, et al., 2009). Lot of work related to isolation of fungi from the indoor environments has been carried out world over. (Agarwal, et al., 1969, Agarwal and Shivpuri, 1974), (Burge, 1990, 2001), Davies, 1969, Dubey, et al., 2011, (Gravesen, 1972, 1978), Jain, 1994, Lumpkin's, et al., 1973, Santra and Surnimal, 1989, Singh, 2005, Portnoy, 2003, Usha, et al., 1989, Verma, 1987, Rambal, 2012 (Bhuvaneshwari and Vittal, 2005), (Tilak, 1989, 2009), (WHO, 1990, 2009), (Gravesen, et al., 1999). Indoor air fungi are recognised as second only to cause respiratory allergy and other related diseases in humans (Agarwal, et al., 1969, 74, Agarwal and Shivpuri, 1974).

Indoor air mould fungi and their metabolites are gaining importance as they contribute to a spectrum of clinical diseases and sick building syndrome, (Bhuvaneshwari, 2005), WHO, 1990. These also release chemicals which include allergens, glucans, Mycotoxins, Trichothecenes and microbial volatile compounds (MVOC'S) which can cause many diseases like toxin induced inflammation, allergy, or infection. These fungi are also responsible for musty odour. (Curtis, et al., 2004, Gordon, et al., 1993, Yoshida et al., 1989.

Allergenic nature of hyphal fragments and spores of *Rhizopus*, *Alternaria*, *Aspergillus* and *Curvularia* etc have been proved by clinical investigations, WHO 1990, 2009, Yoshida and Araki, 1989. Studies carried out in India, indicate the following allergenic spore types and hyphal fragments of following fungi *Rhizopus*, *Chaetomium*, *Basidiospores*, *Alternaria*, *Aspergillus*, *Penicillium*, *Cladosporium*, *Curvularia*. (Singh 2005, Tobin, et al., 1987).

Presence of fungi is associated with presence of moisture and humidity. Paper and glue used in indoor surfaces have been reported as good growth substrates for most of the fungi besides, fiber glass insulation, ceiling & tiles etc. The fungi frequently isolated include *Aspergillus*, *Cladosporium* and *Penicillium* species (Yazicioglu, et al., 2004). Fungi even colonize inorganic materials as these absorb dust and moisture serve as good substrates. Painted surfaces and acrylic painted surfaces have been reported to be colonized by fungi like *Alternaria*, *Cladosporium* and *Aspergillus* (Shirakawa, et al., 2011)., even air filters and ventilation ducts have also been reported to be colonised by fungi (Noris, et al., 2011).

Fungi indoors have been associated with allergy, Neuro psychiatric problems and immune diseases. Volatile fungal metabolites released by fungi have been reported to cause respiratory irritation and allergy. Volatile organic compounds, released have been associated with headache, nasal irritation, dizziness, fatigue, and nausea. (Weinhold, 2007, Burton, et al., 2008).

There are many factors responsible for the growth and colonization of fungi indoors which include moisture, humidity, organic matter (dust and dirt), etc. poor ventilation and leaking air conditioners and coolers are the cause for their colonisation.

Ways to improve the indoor air quality

From the literature available and studies so far carried out the measures include.

Primarily, the indoor Environment should completely be moisture free and humidity needs to be controlled by using dehumidifiers. Indoor area be it building, rooms, hall etc should be cleaned daily and crawl

spaces should be cleaned regularly. No dust dirt should be allowed to settle on the shelves and other spaces. Leaking pipes and coolers should be fixed. Proper ventilation needs to be carried out. Ventilation with proper management of humidity and temperature needs to be taken care of. It should be distributed effectively throughout spaces and stagnant air zones need to be avoided (WHO 1990). Besides all these control measures indoor plants need to be planted. NASA has even suggested some indoor plants like *Dracaena*, *Spathiphyllum*, *Chrysanthemum*, *Anthurium*, *Pothos* etc. These plants have been found to purify the air and keep the indoors safe in a natural way. Volatile phytochemicals released by leaves of these plants have been reported to play an important role in controlling airborne microbes and mould spores. (Kobayashi, et al., 2007). Installation of artificial air filters should be avoided under all circumstances, as air outside cannot be filtered. Burning and non-administered decomposition of agricultural wastes in the open should be avoided as it indirectly adds to the indoor air pollution.

Conflicts of interest: The authors stated that no conflicts of interest.

REFERENCES

- Agarwal MK and Shivpuri DN (1974) Fungal Spores their role in respiratory allergy. *Adv. Pollen Spores Res.* 1: 78 - 128.
- Agarwal MK., Sing K and Shivpuri DN (1974) Studies on the atmospheric fungal spores and pollen grains - their role in the etiology of respiratory allergy. *Ind. J. Chest Dis.* 16 : 1 - 20.
- Agarwal MK, Shivpuri DN and Mukherjee KG (1969) Studies on allergenic fungal spores of Delhi, India, Metropolitan area, Botanical aspect. *J. Allergy.* 44 - 193 - 203.
- Bhuvneshwari S and Vittal BPR (2005) Study on airborne Fungi I the residence of asthmatics. *Ind J Aerobiol.* 18 (1) : 47.
- Burge H (1990) Bioaerosols. Prevalence and health effects in the indoor Environments. *J. Allergy Asthma Immunol* 87 (Suppl) : 52 - 56
- Burge HA (2001) Fungi Toxic killers or unavoidable nuisances. *Ann. Allergy Asthma Immunol.* 87 (Suppl) 52 - 56
- Burton NC, Adhikari A, Iossifova Y, Grinshpun SA, Reponen T (2008) Effect of gaseous chlorine dioxide on indoor microbial contaminants. *Journal of the Air Waste Management Association.* 58 : 647 - 656.
- Curtis L, Allan Liberman, Merth S, William R, Marsha V (2004) Adverse Health effects of Indoor Molds. Review *Journal of Nutritional and Environmental Medicine.* (Sept 2004), 14 (3) : 261 - 274
- Dacarro C, Picco AM, Grisoli R, Redolfii M (2003) Determination of aerial microbiological contamination in Scholastic Sports environment. *J. Appl. Microbiol* 95: 904-12
- Davies RR (1969) Visible molds in house dust. *Trans. Br. Mycol. Soc.* 43 : 617 - 630
- Dubey S, Lanjewar S, Sahu M, Pandey K and Kutti U (2011) *Journal of Phytology*, 3(4) : 13 -14
- Gordon KE, Masotti RE, Waddell WR (1993) Tremorgenic Encephalopathy; a role of Mycotoxins in the production of CNS disease in humans? *Can J. Neurol Sci*; 20:237-239.
- Gravesen S, Nielsen PA, Iversen R, Nielsen KF. Microfungal contamination of damp buildings - examples of risk construction and risk materials. *Environmental Health Perspectives.* 107 Suppl. 3 : 505 - 8.
- Gravesen S (1972) Identification of indoor airborne microfungi during 12 months from 44 Danish homes. *Acta : Allergol.* 27 : 327 - 354
- Gravesen S (1978) Identification and prevalence of culturable mesophilic microfungi in home dust from 100 Danish homes. *Allergy.* 33 : 268 - 272
- Jain AK (1994) Progress of Aerobiology in Madhya Pradesh - A Review. *Current Trends in Life Science.* 20:153 -159.
- Khan AAH, Karuppayil SM, Chary M, Kunwar IK, Waghary S (2009) Isolation, identification, and testing of allergenicity of fungi from air-conditioned indoor environments. *Aerobiologia*; 25-119-123
- Kohayeshi KD, Andrew JK, John G and James M (2007) Using Houseplants to clean Indoor Air. Co-operative Extension Service Ornamentals and Flowers. College of Tropical Agriculture and Human Resources University of Hawaii Minowa.
- Lumpkins EDD, Corbit SL and Tidemdn GM (1973) Air borne fungal Survey. I. Culture plates Survey of the home environment. *Ann. Allergy.* 31: 361 - 369.
- Noris F, Siegel JA, Kinney KA (2011) Evaluation of HVAC filters as a sampling mechanism for indoor microbial communities. *Atmospheric Environment* 45 (2) : 338 - 346.
- Portnoy JM (2003) Evaluation of indoor mold exposure is what allergists do best. *Annals of Allergy, Asthma. Immunology* 90 : 175.
- Rambal Kavita (2012) Fungi and Indoor Air Pollution. *Indian J. Applied and Pure Bio:* 27 (2) : 223 - 230.
- Samet JM, Spengler JD (2003) Indoor Environments and health. Moving into the 21st century. *American Journal of Public Health*; 93(9): 1489-1493.
- Santra S and Surnimal C (1989) Airborne Fungal Flora in Indoor environments of the Calcutta metropolis, India. *Grana.* 28 : 141 - 145.
- Shirakawa MA, Gaylarde PM, John V, Gambale W (2002) Fungal colonization and succession on newly painted

- buildings and the effect of biocide. *FEMS. Microbiology Ecology*. 39 (2) : 165 - 173.
- Singh J (2005) Toxic moulds and Indoor Air Quality. *Indoor Built Environ*. 14 : 229 - 234.
- Tilak ST (1989) Airborne Pollen and Fungal Spores. Vijayanti Prakashan Aurangabad.
- Tilak ST (2009) Aero mycology. U.S. Science Publication. Pune.
- Tobin RS, Baranowski E, Gilman A, Kuiper - Goodman T, Miller JD and Giddings M (1987) Significance of Fungi in Indoor Air; report from a working group. *Can. J. Public Health* 8 (Suppl) : S1 - S30.
- Usha Sree, Shrivastava U and Shrivastava, G.P 1989. Proc. Nat. Symp. *Aeroallergens, Rewa*. 50 - 52.
- Verma KS (1987) In atmospheric Biopollution (Ed N. Chandra) Environmental Publication. Karad. 193 - 197.
- Weinhold B (2007) A spreading concern inhalational health effects of mold. *Environmental Health Perspectives*, 115 : A 300 - A305.
- WHO : 1990. Indoor Environment. Health Aspects of air quality, thermal environment, light and noise, Geneva, World Health Organisation.
- WHO (2009) WHO Guidelines for Indoor Air Quality : Dampness and mould. Geneva, World Health Organisation.
- Yazicioglu M, Asan A, Ones U, Vatansever U, Sen B, Ture M, Bostancioglu M ad Pale O (2004) Indoor airborne fungal spores and home characteristics in asthamatic children from Edirne region of Turkey. *Allergologia et immunopathologia*. 32: 197 - 203
- Yoshida, K, Ando M, Araki S (1989) Acute Pulmonary a severe case of oedema in a storehouse of moldy oranges: a severe case of the Organic dust toxic syndrome, *Arch Environ Health*: 44 : 382 - 384.

© 2018 | Published by IJLSCI

Submit your manuscript to a IJLSCI journal and benefit from:

- ✓ Convenient online submission
- ✓ Rigorous peer review
- ✓ Immediate publication on acceptance
- ✓ Open access: articles freely available online
- ✓ High visibility within the field

Email your next manuscript to IRJSE
: editorirjse@gmail.com
