WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 8.074
Volume 8, Issue 8, 246-253. Review Article ISSN 2277– 7105

A REVIEW ON THE POTENTIALITY OF MUSHROOMS AND ITS ALLERGY TO HUMAN HEALTH

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Article Received on
28 April 2019,

Revised on 18 May 2019,
Accepted on 07 June 2019,

DOI: 10.20959/wjpr20198-15239

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ABSTRACT

The mushroom is a form of plant life without leaves, buds, flowers, and is recognized as fleshy macro-fungi, a group of achlorophyllous organisms. These are sometimes tough and umbrella like sporophore (fruiting body) with spores, naturally grown in fields, forests, on manure heaps, water channels and hilly areas, mostly during and just after rains. Since earliest time, the mushrooms have been treated as special kinds of food. For overall nutrition mushroom falls between the best vegetables and animal protein sources. Mushroom has a lot of production potential and due to its rapid growth it gives so large amount of crop which could not be compared with any other crop. Mushrooms can also sensitize a person the way pollen and food allergies do. Mushroom pickers showed the cases of allergic rhinitis and asthma as well as anaphylactic reactions. However, so far there is fairly little information available on allergic respiratory passage symptoms caused by mushrooms. The mushrooms are antigenically rich and can have more than one allergen. Mushroom allergenicity, often referred to as basidiospore or basidiomycetes. Recent data suggest that mushroom allergy should not be confined to the Basidiomycotina, a positive correlation between high spore counts and asthma admission rates was found. Those genera producing distinguishable basidiospores are *Ganoderma, Boletus, Rhodophyllus, Thelephora, Russula* and *Lactarius.* Most of the spores can be categorized by colour or shape, or as spores of Tremellales or Polyporaceae. Like asidispores, most ascospores occur in high concentrations. in the air from late summer to autumn and mainly when it is wet. The occurrence of the ascospores of mildews resembles that of rusts and smuts with peaks in summer and dry weather. In this study we present about the

potentialities of mushroom against various diseases and aeriobiology data about mushroom spores with respect to respiratory allergies.

KEYWORDS: Mushroom, Allergy, Allergen, Basidomycetes, Basidiospore.

INTRODUCTION

Mushrooms are fruiting body-forming fungi normally belonging to Ascomycota or Basidiomycota. Mushrooms are ubiquitous organisms found in almost every ecosystem and play central roles in the recycling of organic matter. A considerable amount of literature has been published on the ecology, physiology, genetics, and biotechnology of mushrooms.[1-4] Typically mushroom belongs to the order Agaricals that occurs in class Agaricomycetes. The Genus is Agaricus, However not all members of Agaricals produce fruit body many variations occurs at the molecular levels. In the Agaricales the common fungi are the common fairy –ring mushroom, shitake, enoki, oyster mushrooms, fly agartics and other Amanitas, magic mushrooms like species of Psilocybe, paddy staw mushrooms, shaggy manes etc. There are 50, 000-200, 000 different species of fungi in the world, depending on the reference. Their taxonomy is based on different systems and undergoes constant revision.[5] The word mushroom refers mainly to macro-fungi with edible fruiting bodies, while toad-stool refers to those with poisonous fruiting bodies and other minor macrofungi. These fungi, with bolets and agarics mostly belong to the Basidiomycotina: fungi producing basidiospores. Consequently, mushrooms and macrofungi are often called "basi-diomycetes", Smuts (Ustilaginales) and rusts (Uredinales), which produce large quantities of spores in forests and fields, belong to the Basidiomycotin a, but being microfungi cannot be called mushrooms. Mildews (Erysiphe) are very similar to rusts and smuts but belong to the Ascomycotina. Some of the slime moulds (Myxomycota) are macroscopically identical with the jelly fungi that belong to Basidiomycotina, Mushroom allergenicity, often referred to as basidiospore or basidiomycetes, should not be confined to the Basidiomycotina. However, as basidiospores derive from both macro- and microfungi, Basidiomycotina microfungi are hard to exclude.

The mushrooms are known to have many therapeutic properties because of their chemicals.[6-9] and nutritional properties.[10-16] Mushroom are useful in the prevention of diseases such as hypertension, hypercholesterolemia and cancer.[17] As the mushroom possesses so much nutritional and therapeutic properties, production of edible mushrooms in indoor farms is increasing in India and many other countries like North America, Canada, Japan, Europe and

China. During harvesting, a large number of spores, billions from each mushroom, sometimes create a so called ‘spore fog’ in the large cultivating rooms, where it may impair visibility. A relationship between occupational respiratory allergies in subjects working in such environments and the mushroom spores has been suggested.[18 -23]

Allergy is the condition when body’s immune system reacts abnormally against any foreign substance. Macrophages/monocytes, natural killer (NK) and NK T cells are crucial in the initial host response to pathogens, which are complexes of lipid and carbohydrate moieties, while T cells are important in the later immunological responses. Discovery of new receptor molecules and recent functional studies raise several novel aspects of the cellular recognition of glycolipids.[24, 25] The allergenic properties of outdoor airborne basidiospores were first suggested by Gregory & Hirst in 1952.[26] The problem with basidiospores in aerobiologicalstudies is that most species or even genera cannot be distinguished microscopically. It is therefore important to know the fruiting times of the different species. Those genera producing distinguishable basidiospores are *Ganoderma, Boletus, Rhodophyllus, Thelephora, Russula* and *Lactarius.* Most of the spores can be categorized by colour or shape, or as spores of Tremellales or Polyporaceae.[27]

In a study reported from England where total daily spore counts from Derby correlated with daily asthma admissions in nearby Birmingham.[28] The aerobiology study performed in Canada and Finland showed that spore counts and pollen counts are not comparable as pollen are bigger than spores; however, the almost equal mean values for the total mass of individual pollen and spore indicates that basidiospores might be as potentially aeroallergenic as pollen or mould spores.[29, 30]

IMMUNOLOGICAL STUDIES

In the earlier works basidiospore allergenicity was assessed by skin and provocation tests only. The other immunological techniques to study the basidiospore antigenicity in man was studied with counterimmunoelectrophoresis (IE) and in rabbit with Ouchterlony's double-diffusion, counter-immunoelectrophoresis and crossed immunoelectrophoresis (CIE). RAST and crossed radioimmunoelectrophoresis (CRIE) was used to study allergenicity in man. *Tilletiopsis minor, Dacrymyces stillatus, Xylobolus frustulatus, Pleurotus ostreatus, Hypholoma sublateritum, Cantharellus cibarius* and *Coprinus comatus,* were used in the immunological studies and the antigens and allergens of these species are best known.[31, 32]

Macrophages/monocytes, natural killer (NK) and NK T cells are crucial in the initial host response to pathogens, which are complexes of lipid and carbohydrate moieties, while T cells are important in the later immunological responses. Discovery of new receptor molecules and recent functional studies raise several novel aspects of the cellular recognition of glycolipids.[33,34] CD1b+ CD14+ DP monocytes, NK cells and NK T cells act in innate immunity and contribute to primary defense mechanisms in mucosal tissue. All these cells were increased in mushroom workers on *in vitro* co-culture with mushroom antigens, suggesting that innate immunity is activated in mushroom workers.[35-37]

Kounis syndrome (KS) is a rarely diagnosed condition which should always be kept in mind when an acute myocardial infarction (AMI) happens in the context of anaphylactic reactions, with or without clinical history of atopy or allergy.[38] Kounis syndrome (KS) could be trigerred by Pleurotus ostreatus, the oyster mushroom, It is a common edible mushroom and was first cultivated in Germany as a subsistence measure during World War and is now grown commercially around the world for food.[39] It contains statins such as lovastatin which work to reduce cholesterol and benzaldehyde which is an aromatic aldehyde used in cosmetics as a denaturant.[40,41] Moreover a fibrinolytic enzyme was produced by the mushroom applied as a natural agent for oral fibrinolytic therapy or prevention of thorombosis.[42] Food allergy can occasionally be severe and difficult to diagnose, especially in the event of a rare allergen as to bay bolete mushroom.[43]

Mushrooms contain trehalose, mushroom sugar. To break it down, an organism needs trehalase, a digestive enzyme. Some people lack this enzyme and are unable to absorb mushroom sugar. As a consequence, abdominal problems will start hours after eating. The symptoms of trehalose intolerance resemble those in lactose intolerance connected with milk consumption. Trehalose intolerance is rarer than lactose intolerance.[44]

CONCLUSION

Mushrooms are antigenically rich and that a species can have more than one allergen. The difficulties of mushroom allergen research are very substantial because one usually has to rely on naturally growing mushrooms, where allergenic contamination by other allergen sources is frequent. Choice and recognition of species is also difficult. Virtually all known allergenic mushrooms and fungi are universal.[45] More studies are needed to correlate the allergic reactions with the different families such as Cortinariaceae, Russulaceae, Lactariaceae and Boletaceae.

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