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Perspective

Pharmaceutical Fungal Enzymes: A Perspective from an Occupational Allergen

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INTRODUCTION

Since ancient times, fungi have been used for many industrial purposes. Many fungi species are used commercially in addition to their role as saprophytes in the environment, such as mushrooms as food sources, ingredients in food preparation (such as *Penicillium roqueforti*, which adds cheese flavour), alcohol fermentation, and the conversion of sugars in bread dough to carbon dioxide (*Saccharomyces cerevisiae*). *Aspergillus oryzae* is a crucial component in the making of soy sauce and the fermented beverage sake in Asia. Cellulolytic, proteolytic, lipolytic, and pectinolytic enzymes are only a few of the many enzymes secreted by *Rhizopus* species, which are utilised to make meals like Indonesia's tempe. Additionally, *Rhizopus oryzae* has been recognised as a biocatalyst for the generation of biodiesel fuel.

More recently, *Yarrowia* lipolytica and other fungi have been used to biodegrade industrial goods. Researchers have been able to recognise and use a variety of enzymes and proteases that fungi create to break down plant material in the environment that contains carbohydrates and lignin thanks to developments in industrial enzymology after World War II. Nearly 200 fungus-derived enzymes have so far been isolated from fungus cultures and their biochemical and catalytic characteristics have been described. The pharmaceutical, agricultural, food, paper, detergent, textile, waste treatment, and petroleum industries all benefit greatly from the use of these enzymes.

High molecular weight proteins called industrial fungal enzymes act as catalysts. The three enzymes from the genus *Aspergillus* that are most commonly employed in industrial settings are amylase, xylanase, and cellulase. Additional enzymes from rhizosphere-dwelling fungi of the genera *Rhizopus* and *Humicola* are also used. Typically, these enzymes play intracellular or other functional tasks related to apical hyphal development. People in the general population rarely become exposed to and sensitised to these antigens. In actuality, the frequency of sensitivity to fungi's enzymes has increased in the general population.

DESCRIPTION

However, there is a higher chance of enzyme sensitization in the workplace for those who handle refined fungal enzymes. In particular, this is true for employees whose jobs include debagging, sieving, weighing, dispensing, and combining enzymes. When compared to jobs that sieve, vocations that weigh enzyme preparations have the lowest average exposure, according to eight-hour time-weighted average exposures. The Threshold Limit Value (TLV) for inhalable dust is 4 mg m^3, yet these employees are frequently exposed to quantities over that. Workplace exposure is higher in production areas and laboratories for other industrial contexts that employ lipase and cellulose in production.

The industrial industry continues to recognise the value of fungal enzymes in the degradation of xenobiotics and organic substances. Today, a wide range of applications for fungi enzymes are found in numerous sectors. Other potentially allergenic proteins can now be produced because to improved biochemical and molecular methods. In 2001, more than 186 commercial enzymes were manufactured in the European Union, many of which were genetically modified or generated using recombinant technology. A list of the main fungi enzymes used in industrial settings can be found. All of the enzymes discussed above have been found to be significant occupational allergens; however, the ability of the other listed.

CONCLUSION

Several of the enzymes have been found to be environmental bioaerosol allergens rather than occupational allergens. The entomopathogenic fungus *Metarhizium anisopliae* has catalase, a fungal enzyme used in hygiene goods, medicines, and textiles, identified as an allergen. Pectinase is employed in the brewing and wine-making, food-processing, and paper sectors, and occupational exposure has been linked to pectinase allergy. *Hevea brasiliensis* (natural rubber latex) has been linked to allergies by the enzyme esterase.

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