MYCOREMEDIATION - BIOTECHNOLOGICAL AND ENVIRONMENTAL ASPECTS FOR SAFETY OF HUMANS AND ANIMALS

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Abstract

Civilizational development causes increasing contamination with heavy metals, which leads to increased environmental pollution and accumulation such metals in food chains, posing a threat to the health and safety of humans and animals. Furthermore, commonly used active pharmaceutical ingredients (APIs) and their degradation products ending up in environment are currently a global problem. The elimination of pollution can be achieved by remediation through fungi, 'mycoremediation', which is a biological tool using the ability of mushrooms to degrade a wide variety of environmental pollutants e.g. APIs and to bind with toxic heavy metals present in the environment. Mycoremediation is a branch of biotechnology focuses mainly on the assessment of biodegradation capacity of different groups of mushrooms and enhancement their detoxification activity.

The main areas of our interest concentrate on the assessment of ability of mushroom-based remediation to accumulate and degrade cephalosporin antibiotics, azole antifungals and steroid hormones (testosterone and 17α-ethynylestradiol). Selected drug classes are widely used as active ingredients in pharmaceuticals, moreover, previous studies indicate their presence in sewage or surface water. In the case of azole antifungals, it is worth to highlight their widespread usage in topical preparations, and consequently their release unchanged to the environment as well as their subsequent persistence in environment. In all cases, the tested drugs were not detected at all or were detected in a lower amount in separated culture media, and therefore the usage of mycoremediation to remove them could be considered. The key stage of the research was the identification of presumable degradation products of the investigated APIs and their transformation pathways using LC/MS/MS. The potential of biomass from *in vitro* cultures of selected edible mushroom species, such as *Laetiporus sulphureus (Polyporaceae), Agaricus bisporus (Agaricaceae)* and *Imleria badia (Boletaceae)* in terms of the ability to accumulate Cd(II) and Pb(II) was also examined. The results confirm the possibility of using the tested mycelia from *in vitro* cultures, particularly the *L. sulphureus* species, in remediation.

Due to the high uptake capacity, efficiency, low cost and safety, mycoremediation is now becoming increasingly popular technique for removing pollutants. However, further efforts are needed to better understand a metabolic and enzymatic degradation of the drugs by mushrooms in order to increase the efficiency of mycoremediation process.

Key words: mycoremediation, edible mushrooms, in vitro cultures