Based on the results of scientific research, edible mushrooms can be classified as functional food and recommended as a valuable component of the daily diet. Their fruiting bodies are rich in components such as polysaccharides, phenolic and indole compounds, sterols, fatty acids, carotenoids, vitamins (mainly from the group of water-soluble: C, B_1, B_2, B_6 and in fats: D, E) and bioelements (Zn, Mg, Cu, Se). The content of the above-mentioned substances in fruiting bodies directly translates into their numerous biological effects: antioxidant, anticancer, antiatherosclerotic, neuroprotective, antidepressant, antiallergic, antibacterial, antiviral, hypoglycemic and, above all, anti-inflammatory. Edible mushrooms can also be effective in counteracting diseases related to the dysfunction of the human immune system.

The aim of the study was to assess the possibility of using selected fruiting bodies and mycelium from *in vitro* cultures of edible mushrooms (*Lentinula edodes*, *Hericium erinaceus* and *Pleurotus* spp.: *Pleurotus citrinopileatus, Pleurotus djamor* and *Pleurotus pulmonarius*) as food of preventive importance in preventing diseases considered to be so-called civilization diseases (which lowering the quality and duration of human life).

Among the species selected for research, *Lentinula edodes* is one of the most popular edible mushrooms obtained from crops. The fruiting bodies of this species are both dietary and medicinal because of the presence of β-glucans (e.g. lentinan), phenolic acids, lovastatin, ergothioneine, or bioelements and vitamins. The content of the above-mentioned biologically active metabolites, as well as the ability of mycelium from *in vitro* cultures to accumulate bioelements, which play a key role as anti-inflammatory factors, determined the choice of this species for research in the presented study.

Based on the results of the expression of proteins obtained with the Western blot technique: cyclooxygenase 2 (COX-2), nuclear factor Nrf2, or the peroxisome proliferator-activated receptor γ (PPARγ), it was shown that the addition of Zn, Cu or Se compounds may enhance the anti-inflammatory properties of mycelium extracts L. edodes. Selenium turned out to be the element most strongly enhancing the anti-inflammatory effect of *L. edodes* mycelium. Due to the lack of this element in the soils of central Europe, which results in its deficiency in livestock, and thus in the human body, subsequent studies determined the optimal concentration of selenium addition to obtain a mushroom-selenium preparation with an immunostimulating effect. The safety of the preparation was determined using cytotoxicity tests (MTT and LDH).

In the calves fed with Se-enriched *L. edodes* mycelium selected for the experiment, this element was determined at the physiological level in the blood serum and the weight gain was greater than in the control sample.

The ability of mycelia to accumulate bioelements was demonstrated in an experiment in which the world-renowned fruiting bodies and mycelia from in vitro cultures of *Pleurotus citrinopileatus, Pleurotus djamor* and *Pleurotus pulmonarius* were used. The research undertaken in the study was aimed at determining the effect of the addition of inorganic Mg and Zn salts to the culture media on the growth of biomass, as well as the degree of their accumulation. The bioavailability of selected metals (Mg, Zn) and ions (Cl^-, SO_4^{2-}) from the obtained enriched biomass was determined for the first time by extraction of freeze-dried mycelium in artificial digestive juices. As an addition to the culture media, the following salts were used: $ZnSO_4 \cdot 7H_2O$, $ZnCl_2$, $MgSO_4 \cdot 7H_2O$ and $MgCl_2 \cdot 6H_2O$. The content of Mg and Zn as well as organic compounds (phenolic compounds, indole compounds, amino acids) was determined in the obtained material. It has been shown that enrichment of the substrates causes an increase in biomass growth by 30% and an increase in the accumulation of bioelements. The addition of the salts selected for the study also influenced the content of biologically active organic compounds, including indole compounds.

In another experiment, indole compounds were also determined using the RP-HPLC method in the extracts of mycelium from *in vitro* cultures of *Hericium erinaceus* and the fruiting bodies obtained from them. It has been shown that *H. erinaceus* mycelium can be obtained *in vitro* and is a rich source of indole compounds (5-hydroxy-L-tryptophan, melatonin and tryptamine) with antidepressant and procognitive activity.

On the basis of the conducted experiments, it can be concluded that conducting *in vitro* cultures in optimized and controlled conditions allows to obtain material with an appropriate qualitative and quantitative composition, which can be considered a potential functional food supplementing the deficiencies of bioelements and organic compounds in the human body.