



# A REVIEW OF CANCER PREVENTION AND FUTURE PERSPECTIVES RELATING TO EDIBLE AND NUTRITIONAL MUSHROOMS

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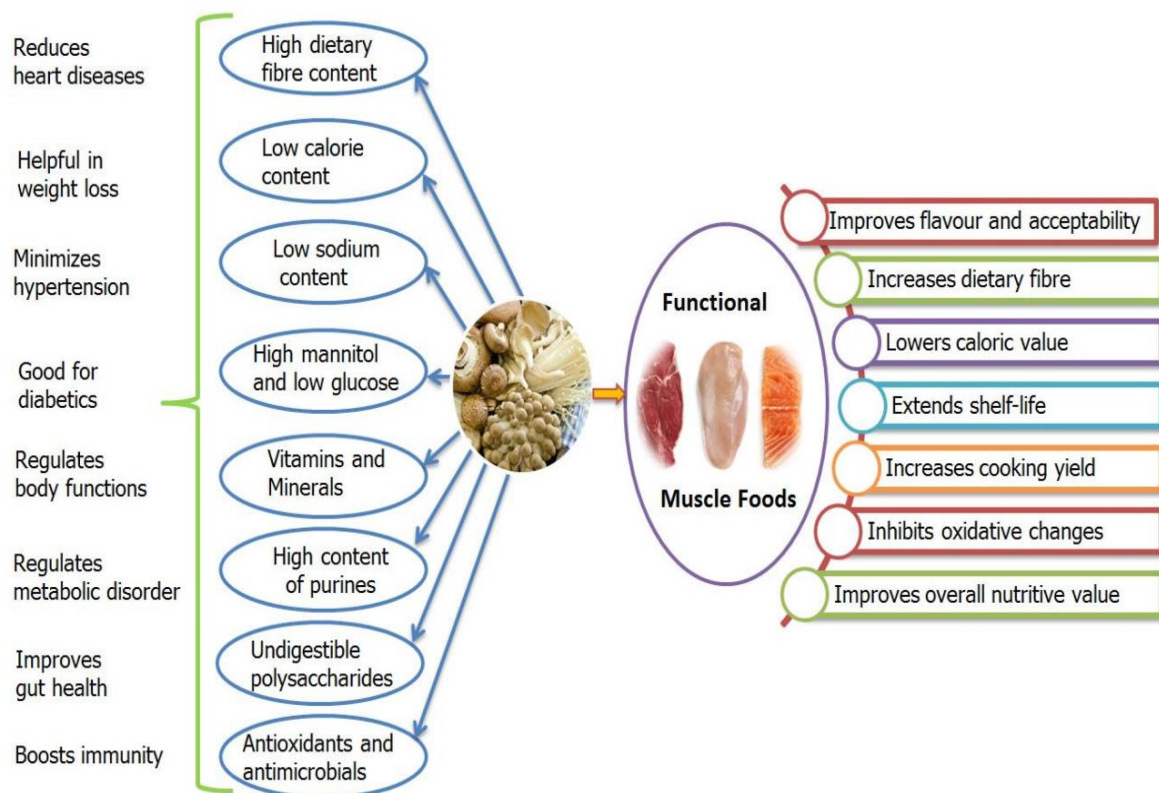
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**Abstract:** More people are looking for wholesome, nutritional muscle food that is low in sodium and fat and is good for their health. Food makers are constantly looking for natural bioactive substances since they provide health advantages beyond nutrition without degrading the product's quality. Since fungi are the source of antibiotics, microfungi are important economically. In addition to their economic significance, macrofungi that produce fruiting bodies known as mushrooms have also been used directly as food. In Chinese culture, edible mushrooms have long been revered as a source of health and vigour. Acids, terpenoids, polyphenols, sesquiterpenes, alkaloids, lactones, sterols, metal chelating agents, and nucleoside analogues are just a few of the bioactive compounds found in edible mushrooms. Mushrooms are effective for treating cancer, hepatitis, and high cholesterol in addition to antiviral, hepatoprotective, immunopotentiating, and hypocholesterolemic applications because they contain biologically active chemicals. The Phellinus genus contains several mushrooms that are believed to be effective against cancer, including Pleurotus, Agaricus, Ganoderma, Clitocybe, Antrodia, Trametes, Cordyceps, Xerocomus, Schizophyllum, Flammulina, Suillus, Inonotus, Inocybe, Funlia, Lactarius, Albatrellus, and Fomes. The anticancer substances work to increase reactive oxygen species, block mitotic kinase, prevent angiogenesis, and inhibit topoisomerase, all of which stop the growth of cancer cells. In this article, we assembled the most recent studies on the advantages of eating edible mushrooms for your health. As a result, it can be inferred that including mushrooms in your diet on a regular basis may help with cancer therapy.

**Key word-** Edible Mushroom, Bioactive compounds, Immunopotentiating, Anticancer

## I. INTRODUCTION

Filamentous fungi have been utilised as both food and medicine throughout history. The fruiting bodies of filamentous fungus that grow on the ground's surface are called mushrooms [1]. Mushrooms have been used as a health food and elixir of health since the beginning of time. While the Romans considered mushrooms to be "Food of the Gods," the ancient Greeks thought they provided power for warriors. Mushrooms have been valued as a food of health in the Chinese culture for many years and still are now. They have a high nutritional value because to their high protein, essential amino acid, and fibre contents. They have a low fat level, but a fantastic amount of beneficial fats [2]. Mushrooms are regarded as a nutritious food for a number of reasons, including the fact that they include vital amino acids (lysine and leucine), a high protein content (>20%), a low fat level (3%), and vitamins including thiamine, riboflavin, niacin, biotin, and ascorbic acid [3]. Several anti-microbial substances, primarily secondary metabolites like terpenes, steroids, anthraquinones, benzoic acid derivatives, and quinolones, as well as primary metabolites like oxalic acid, peptides, and proteins, may be produced by mushroom extract. The main assigned species, lentinusedodesis, appears to have an antibacterial effect on both gram-positive and gram-negative bacteria [4].



**Figure 1:** diagram showing the impact of mushroom nutrients on human health

In the past, people have used mushrooms to treat diabetes, cancer, and to strengthen their immune systems [3]. Cancer is a leading cause of death in the world. The current anti-cancer medications are not target specific and exhibit a lot of adverse effects and problems in clinical care of many forms of cancer, therefore new effective and less toxic approaches are urgently required. In this regard, both the active components of mushrooms and those with established anti-cancer capabilities are of great interest. Numerous clinical investigations have shown the efficacy of commercial formulations incorporating medicinal mushroom extracts in the treatment of cancer [5].

## II. MUSHROOM NUTRIENT IN CANCER PREVENTION

In low and middle-income nations, where resources for cancer prevention, diagnosis, and treatment are scarce or non-existent, cancer is a primary cause of mortality. According to WHO projections, millions of people will die from the disease if it is not treated. Cancer is a chronic illness that can lead to death or have long-term repercussions that span the patient's entire lifetime. Finding a cure for cancer is the biggest problem the entire planet is facing [6]. The traditional methods used to treat cancer vary depending on the type of cancer and the stage of tumour development and include surgery, chemotherapy, and radiation therapy. Anticancer treatment is complicated in clinical management and has a variety of side effects. Reduced calorie intake and impaired nutritional absorption are two of these side effects, which could endanger and lower the quality of life for cancer patients [7].

Additionally, they harm and weaken the patient's natural immune system defences. Some mushroom extracts have proven to have a major impact on cancer treatments. The origin of their physiologically active chemicals lies in their ability to thrive in conditions of extreme competition and darkness. To defend themselves from the assault of other organisms, they created organic defences. Numerous compounds from various mushrooms have been identified in scientific investigations with potential human health benefits [8].

TABLE 1: Summary of a bioactive mushroom ingredient with anticancer properties [10-41]

| Sr. No. | Mushroom Species     | Bioactive Component        | Mechanism of anticancer activity   | Example of cancer   | Refer-ence |
|---------|----------------------|----------------------------|--|---|------------|
| 1       | Agaricus bisporus    | Homogeneous Polysaccharide | Using the mitochondrial death pathway to trigger apoptosis.  | Prostate cancer, colon cancer, lung cancer, ovarian cancer          | [10]       |
| 2       | Pleurotus ostreatu   | Homogeneous Polysaccharide | Limit the BGC-823 cells' ability to form colonies and invade new areas.  | Breast cancer, Colon cancer   | [11]       |
| 3       | Pleurotus eryngii    | Homogeneous Polysaccharide | HepG-2 cells proliferation is reduced, while their output of lactate dehydrogenase (LDH) is increased.   | Colon cancer, breast cancer, lung cancer                            | [12]       |
| 4       | Lentinula edodes     | Homogeneous Polysaccharide | Stimulate immunological responses to stop cell growth, possibly through p53-dependent signalling, and to cause cell death through the caspase 3-dependent signalling pathway.                    | Gastritis cancer, liver cancer                                      | [13]       |
| 5       | Flammulina velutipes | Heteropolysaccharide       | Boost macrophage production and cell lysis   | Breast cancer, lung cancer, liver cancer                            | [14]       |
| 6       | Ganoderma lucidum    | Homogeneous polysaccharide | In HL-60 acute leukaemia cells, turn on the MAPK pathways.   | Breast cancer, lung cancer, liver cancer, prostate cancer, leukemia | [15]       |
| 7.      | Ganoderma applanatum | Lectin                     | Anti-HT-29 colon cancer cells and pro-apoptotic actions.   | Breast cancer, lung cancer, liver cancer, prostate cancer           | [16]       |
| 8.      | Macrolepiota procera | Lectin                     | Permit protein medicines to enter cancer cells by binding to two glycoproteins (integrin $\beta 3\alpha 1$ and aminopeptidase N (CD13), which are overexpressed on the membrane of tumour cells. | Colon cancer, breast cancer, leukemia                               | [17]       |
| 9.      | Ganoderma applanatum | Lectin                     | Against HT-29 colon cancer cells, cytotoxic and pro-apoptotic activity.  | Colon cancer, breast cancer, leukemia.                              | [18]       |

|     |                       |          |  |   |      |
|-----|-----------------------|----------|--|---|------|
| 10. | Ganoderma atrum       | FIPs     | Causes breast cancer cells to experience growth inhibition and cell death.   | Colon cancer, breast cancer, leukemia breast cancer, lung cancer, liver cancer, prostate cancer   | [19] |
| 11. | Ganoderma microsporum | FIPs     | Induce apoptosis via autophagy/caspase-7-dependent and survivin- and ERCC1-independent pathway of lung cancer cells.     | Ovarian cancer, lung cancer, breast cancer, liver cancer, leukemia, colon cancer, prostate cancer | [20] |
| 12. | Hypsizigum marmorosus | RIPs     | Inhibit proliferation of hepatoma HepG2 cells and breast cancer MCF-7 cells with a higher potency than a variety of RIP. | Ovarian cancer, lung cancer   | [20] |
| 13. | Inonotus srickii      | Laccases | Anti-proliferative activities towards HepG2 and L1210 cells.   | Prostate cancer, colon cancer, gastritis cancer, ovarian cancer                                   | [21] |

RIF: Ribosome inactivating proteins, FIPs: Fungal immunomodulatory proteins

### III. CURRENT SCENERIO AND FUTURE PERSPECTIVES

Still unexplored for their potential value addition in food items are several kinds of edible mushrooms. These unique mushroom species differ from commonly utilised species in that they have a variety of nutritional and sensory qualities. The use of mushrooms in muscle foods is likely to keep expanding given the growing desire from consumers for healthier and more sustainable diets. Given its potential impact, special attention must be paid to the relationship between vitamin D and insulin resistance. When treating cancer Products made from mushrooms could revolutionise medical practises. Worldwide, many businesses are creating goods based on mushrooms. A Chinese pharmaceutical business that specialises in mushroom development is Zhejiang Fangge Pharmaceutical & Healthcare Products Co. Ltd. From the fungi *G. frondosa*, *L. edodes*, *G. lucidum*, *A. blazei*, *Cordyceps sinensis*, and *H. erinaceus*, it produces and exports polysaccharides. A Korean company called Fine Co. Ltd. creates anti-cancer formulas using medicinal mushrooms. A ground-breaking mushroom company called Mushroom Wisdom, based in the USA, creates dietary supplements to prevent cancer. Aloha medicinal Inc., situated in the USA, produces a variety of medical mushroom products, including Ganoderma pills that prevent cancer. Numerous businesses will start producing mushrooms that are used as cancer treatments in the near future. A better understanding of the molecular principles driving mushroom action can hasten the commercial manufacture of medicines for cancer treatment. Overall, we were able to confirm that the mushrooms' range of different health benefits activities was heterogeneous, and it is anticipated that, given the current state of our understanding of nutrigenomics and molecular nutrition, mushrooms will rank among the best nutraceutical foods that can be consumed as a daily supplement. However, in order to develop functional meals more effectively in the future, more knowledge and fresh perspectives concentrating on its physiological qualities would be required.

### IV. CONCLUSION

Additionally, because to their enormous nutritional superiority, mushrooms and the numerous bioactive nutraceuticals they contain could be used as an effective building block for the creation of functional foods. These bioactive substances, such as polysaccharides, terpenoids, proteins, and polyphenols, demonstrated a crucial role in boosting immune function, reducing and preventing cancer risks, obstructing tumour growth, and protecting the nervous system from ageing, among other things. Additionally, the prebiotic effects of mushrooms were thought to be attractive to researchers, and in particular, links between the control of the gut microbiota and host health issues like gut immunological function, obesity, gut inflammation, colon cancer, and neurological disorders.

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