Phytology

Medicinal and therapeutic potential of *Trametes versicolor* (L.) lloyd: bioactive compounds, pharmacological properties and clinical perspectives

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Abstract

Trametes versicolour (L.) Lloyd, referred to as the turkey tail mushroom, is a medicinal polypore fungus that has garnered significant scientific attention due to its several bioactive constituents and prospective therapeutic uses. Historically employed in Asian therapeutic practices, this fungus is currently under investigation for its immunomodulatory, anticancer, antioxidant, antibacterial, anti-inflammatory, and metabolic properties. The primary bioactive components encompass polysaccharide-K (PSK), polysaccharopeptide (PSP), β-glucans, phenolic substances, and other fungal metabolites. PSK has garnered notable interest for its use as a supplementary therapy to traditional cancer treatments in Japan. Empirical studies indicate that these substances could affect immune cell function, cytokine communication, oxidative stress, and cancer-related biological processes. Nonetheless, the substantiation for these activities differs significantly, with the most robust clinical studies pertaining to certain standardised formulations utilised in oncology. Numerous additional suggested applications, such as diabetic management, liver protection, antibiotic treatment, and manipulation of the gut flora, are primarily in the preclinical stage. This analysis investigates the principal bioactive components of *T. versicolour,* explores their documented pharmacological effects, assesses existing clinical data, and highlights issues with standardisation, safety, and therapeutic application. Additional meticulously structured clinical trials and thorough chemical analysis are essential to ascertain the effectiveness and safety of certain formulations.

Keywords: *Trametes versicolor,* Mushroom, Polysaccharide-K, Polysaccharopeptide, Immunomodulation, Anticancer activity, Pharmacological potential

Introduction

In the past few decades, scientific inquiry has progressively explored fungi as reservoirs of biologically active substances with prospective pharmacological and nutraceutical uses (Mazumder and Sarkar, 2023; Sarkar and Mazumder, 2024) [23, 37]. *Trametes versicolor* has become a significant focus of study due to its polysaccharide-dense structure and its purported influence on immune response and cancer-related molecular mechanisms. Formerly it is known as *Coriolus versicolor*. Taxonomically it belongs to the family Polyporaceae. This wood-decomposing basidiomycete is found in several parts of the globe. Its distinctive slender, fan-like fruiting structures exhibit concentric stripes of brown, grey, cream, and several other hues, reminiscent of a turkey's tail (Lowenthal *et al*., 2023) [20]. The fungus plays a role in forest nutrient cycling by breaking down lignocellulosic substances. It is increasingly used in the formulation of dietary supplements and functional foods (Saldanha *et al*., 2026) [34]. Traditional applications and modern investigations have focused particularly on its immunological properties and potential role as an adjunct to cancer therapy (Darshan *et al*., 2024) [9]. It is frequently ingested as tea or decoction to foster general health, boost vitality, and aid longevity (Ajibola *et al*., 2024) [1].

Many studies have thoroughly recorded the possible medicinal attributes and therapeutic benefits of this species, encompassing antifragility, antimelanoma, anti-Toxoplasma gondii, neuroprotection, and safeguarding against neurological disorders (Lowenthal *et al*., 2023; Sharma *et al*., 2023) [20, 38]. The medicinal interest in *T. versicolor* is largely associated with its polysaccharide–protein complexes, particularly PSK and PSP. The predominant therapeutic effects of *T. versicolour* outlined previously are primarily attributed to the capabilities of its polysaccharide component (Ajibola *et al*., 2024) [1]. These compounds have been investigated for their capacity to modulate immune responses and influence tumour development. Additional studies have explored antioxidant, antimicrobial, anti-inflammatory, hepatoprotective and metabolic activities. Despite these promising findings, it is important to distinguish between biological effects demonstrated in laboratory experiments and therapeutic benefits established in human clinical studies. The purpose of this review is to summarize the current understanding of the medicinal and therapeutic potential of *T. versicolor*, with particular emphasis on its bioactive constituents, proposed mechanisms of action, clinical relevance and future research requirements.

Bioactive constituents of *Trametes versicolor*

The pharmacological potential of *T. versicolor* is associated with a complex mixture of polysaccharides, proteins, phenolic compounds, lipids and other fungal metabolites (Yang and Zhang, 2009) [45]. The relative abundance and biological activity of these constituents depend on the fungal strain, cultivation conditions, substrate and extraction method.

a) Polysaccharide-K (PSK)

Polysaccharide-K, commonly known as Krestin, is a protein-bound polysaccharide preparation derived from selected strains of *T. versicolor* (Blagodatski *et al*., 2018) [5]. It is one of the most extensively investigated constituents of this mushroom. PSK contains polysaccharide chains associated with protein components (Jhan *et al*, 2016) [17]. Its biological activity has been investigated in relation to immune-cell regulation, cytokine signalling and adjunctive cancer treatment. *T. versicolor* polysaccharides have similarly demonstrated prebiotic effects, stimulating the proliferation of probiotic microorganisms (Mili and Rami, 2022) [28].

b) Polysaccharopeptide (PSP)

Polysaccharopeptide is another protein-bound polysaccharide preparation obtained from *T. versicolor* (Blagodatski *et al*., 2018) [5]. Although PSP shares several characteristics with PSK, the two preparations differ in their chemical composition and production origin. PSP has been investigated for immunomodulatory and anticancer effects in experimental systems. Proposed activities include changes in immune-cell function, regulation of inflammatory signalling and effects on tumour-associated processes. Further studies are required to determine how differences in molecular structure influence its biological activity, bioavailability and clinical effectiveness.

c) β-Glucans

β-Glucans are polysaccharides found in fungal cell walls and are among the important constituents associated with the immunological activity of medicinal mushrooms. Certain β-glucans can interact with receptors involved in innate immune recognition, including pathways associated with macrophages, dendritic cells and other immune cells (Elkhateeb *et al*., 2020) [10]. These interactions may influence immune signalling and cytokine production. The biological effects of β-glucans depend on their molecular weight, branching pattern, solubility and structural configuration. Therefore, not all β-glucan preparations should be assumed to have equivalent therapeutic properties.

d) Phenolic compounds and other metabolites

Phenolic compounds and other low-molecular-weight metabolites have also been investigated in *T. versicolor*.

Medicinal and Pharmacological Properties

a) Immunomodulatory activity

Immunomodulation is one of the most extensively studied biological properties of *T. versicolor*. Several investigations have shown that PSK and PSP stimulate both cellular and humoral immunity in the host (Mili and Rami, 2022) [28]. Its polysaccharide preparations may influence both innate and adaptive immune responses. Experimental research has examined interactions involving macrophages, natural killer cells, T lymphocytes and cytokine-signalling pathways. These effects may alter immune-cell activation and the communication between different components of the immune system. The constituents of *T. versicolor* augment the activation marker cluster of differentiation 69 (CD69) on monocytes and lymphocytes. The expression of the cell surface marker CD69 will be enhanced on several immune cell types, leading to the activation of natural killer (NK) cells and their tumor-eradicating functions (Jensen and Hart, 2006) [16]. PSK and PSP have been studied particularly for their ability to influence immune responses in cancer-associated settings. These polysaccharide-peptides contribute to the immune response by both stimulating and inhibiting particular immune cells, as well as mitigating inflammation. PSK and PSP seem to invigorate dendritic cells, activate natural killer cells, and strengthen immunological responses that are crucial for recognising and eradicating abnormal cells (Lu *et al*., 2011; Akagi and Baba, 2010) [21, 2]. It has been indicated that the PSP amplifies monocyte activation to strengthen immunity and combat infection by phagocytosis and cytokine release (Saleh *et al*., 2017) [35]. However, immunomodulation does not necessarily mean that immune function is uniformly increased; different preparations and biological contexts may produce different effects (Benson *et al*., 2019) [4]. TLR-2, TLR-4, TLR-6, and complement receptor (CR3) are identified as immunological receptors for β-glucans, which activate various immune cells that express these receptors, including natural killer cells, neutrophils, monocytes, macrophages, and dendritic cells (Chan *et al*., 2009; Elkhateeb *et al*., 2020) [6, 10]. As a result, both the innate and adaptive immune responses will be influenced by β-glucans, either directly or indirectly.

T. versicolor also seems to activate enzyme systems involved in the prevention of oxidative damage, such as glutathione peroxidase (Matijasevic *et al*., 2016) [22]. PSP stimulates the complement system and enhances antibody production by stimulating T cells, B cells, and macrophages (Zhang *et al*., 1994) [48]. PSP enhances the function of antioxidant enzymes and glutathione (GSH), leading to an expedited scavenging of free radicals by diminishing nitric oxide synthase (NOS) activity and lowering nitric oxide (NO) levels. Consequently, augmenting the body's antioxidant potential. Moreover, PSP significantly contributes to the reduction of tumor-associated immune cell dysfunction while also alleviating the negative side effects of cancer therapies, such as pain, exhaustion, and nausea (Elkhateeb *et al*., 2020) [10].

b) Anticancer activity

The anticancer potential of *T. versicolor* is a major focus of its medicinal research. Several clinical studies indicate that *T. versicolor* exhibits significant anticancer properties against various malignancies, especially breast, lung, stomach, and

colorectal cancers (Lu *et al*., 2011; Stamets, 2012; Rosendahl *et al*., 2012; Fritz *et al*., 2015) [21, 39, 33, 11]. Investigations have examined immune-mediated tumour control, changes in tumour-associated signalling and possible effects on cancer-cell growth. Chay *et al*. (2017) [7] conducted a human trial utilising C. versicolour extract by enlisting fifteen suitable hepatocellular cancer patients in Singapore who were either unresponsive to or unsuitable for conventional treatment. The randomised placebo-controlled trial administering 2.4 g daily for approximately 5.9 weeks demonstrated an improved quality of life, albeit without a notable change in the primary outcome of median time to progression. In the last ten years, research has repeatedly demonstrated the anticancer effects of *T. versicolor* polysaccharide on cancer cell lines like MCF-7 and lung carcinoma (Nguyen *et al*., 2023) [31]. Zhang *et al*. (2000) [49] indicated that PSK demonstrates anti-invasion properties by diminishing invasion factors (TGF-β1, μPA, MMP-2, and MMP-9) in the pancreatic cancer cell line (NOR-P1) and the gastric cancer cell line (MK-1P3), without affecting cell survival, proliferation, or adhesion. The inhibition of TNF-α synthesis in mice by cytotoxic anticancer drugs (5-fluorouracil, cyclophosphamide, and bleomycin) was also demonstrated to be enhanced by PSK, suggesting its potential in immunotherapy (Mori *et al*., 1987) [29]. Chemotherapy-induced myelosuppression in mice could be ameliorated by PSK, especially when administered alongside granulocyte colony-stimulating factor (G-CSF), granulocyte/macrophage colony-stimulating factor (GM-CSF), or IL-3 (Kohgo *et al*., 1994) [19].

c) Antioxidant activity

Oxidative stress occurs when the generation of reactive oxygen species exceeds the capacity of biological antioxidant systems. Excessive oxidative stress has been associated with cellular damage and several pathological processes. Natural antioxidants are crucial for mitigating oxidative stress and is linked to a lower risk of related disorders (Mazumder *et al*., 2021; Sarkar *et al*., 2022; Uttara *et al*., 2009) [27, 36, 43]. Antioxidative properties confer a protective impact on organs, especially in contexts involving oxidative stress (Mazumder *et al*., 2022) [24]. Extracts of *T. versicolor* have demonstrated antioxidant activity in various laboratory assays (Angelova *et al*., 2022) [3]. Phenolic constituents and other extractable compounds may contribute to these effects. The extract of *T. versicolor* and its hydrolysate demonstrated nearly 100% ABTS•$^{+}$ and DPPH• radical scavenging activity with a low half maximal inhibitory concentration (Michalak *et al*., 2023) [25].

d) Antimicrobial activity

Certain extracts and metabolites derived from *T. versicolor* have been investigated for antibacterial and antifungal properties. The extract and hydrolysate of *T. versicolor* showed antibacterial effects on the growth of the cultures of *Staphylococcus aureus*, *Staphylococcus epidermidis*, *Escherichia coli*, *Pseudomonas aeruginosa* and *Salmonella Typhimurium* (Michalak *et al*., 2023) [26]. Matijasevic *et al*. (2016) [22] reported that methanol extracts of *T. versicolor* has antibacterial efficacy against *Staphylococcus epidermidis*, *Shigella sonnei*, *Yersinia enterocolitica*, and *Salmonella enteritidis*. The chloroform extract shown notable antibacterial efficacy against *S. aureus* and *E. faecalis*, whereas the ethanol extract exhibited superior effectiveness against *P. aeruginosa*, *E. coli*, *B. subtilis*, and *Candida albicans* (Gebreyohannes *et al*., 2019; Mustafin *et al*., 2022; Nguyen *et al*., 2023; Ulusoy *et al*., 2016; İnci *et al*., 2022) [12, 30, 31, 42, 15]. The optimum levels of triterpenes, sugars, and polyphenols were found in *T. versicolor* mycelial extracts, which exhibited significant activity against *Candida krusei* and *Candida parapsilosis* (Knezevic *et al*., 2018) [18]. Tochikura *et al*., (1989) [40] reported that PSK exhibits extensive antiviral properties, obstructing HIV reverse transcriptase, lymphocyte adhesion, and intercellular transmission of human immunodeficiency virus type 1 (HIV-1), HIV-2, and human T-lymphotropic virus type 1 (HTLV-1).

e) Anti-inflammatory activity

Inflammation is a complex biological response involving immune cells, cytokines and other signalling molecules. Research on *T. versicolor* has investigated whether its constituents can influence inflammatory pathways. Some experimental findings suggest that selected extracts may alter the production or activity of inflammatory mediators. These effects may overlap with the mushroom's broader immunomodulatory properties. Nevertheless, immune modulation and anti-inflammatory action are not interchangeable. A compound may suppress certain inflammatory signals while stimulating other immune responses. The direction and magnitude of the effect depend on the biological context. There is currently insufficient clinical evidence to recommend *T. versicolor* as a treatment for specific inflammatory diseases.

f) Hepatoprotective and metabolic potential

The possible hepatoprotective and metabolic effects of *T. versicolor* have been explored in preclinical research. Studies of mushroom extracts and their constituents have investigated biological pathways associated with liver injury, glucose regulation and lipid metabolism. PSK demonstrates liver-protective benefits and possible cancer-preventive attributes against hepatic malignancies (Huang *et al*., 2015) [13]. Research indicates that PSP decreases serum concentrations of ALT and AST while enhancing the negative conversion rates of HBVDNA, HBeAg, and HBsAg. Consequently, the amalgamation of PSP with additional hepatoprotective medications and multivitamins yields superior therapeutic outcomes compared to any monotherapy (Zhang *et al*. 1994; Chan *et al*., 2009) [48, 6].

g) Cardiovascular complications protecting properties

T. versicolour exhibits significant beneficial impacts in addressing cardiovascular issues. Macrofungi possess a substantial historical account of being employed as a nutraceutical to address the imbalance of fat metabolism

associated with cardiovascular diseases (D'Amico *et al*., 2021) [8]. In a study, the functions of extracellular polysaccharide (EPTV) and intracellular polysaccharide (IPTV) from *T. versicolour* were documented in mice with hyperlipidaemia produced by a high-fat diet (Huang *et al*., 2020) [14]. The study further highlighted that administration of *T. versicolour* heteropolysaccharides (TVH) significantly normalised increased concentrations of low-density lipoprotein, triglycerides, and total cholesterol (TC), particularly at moderate and high dosages. Wang *et al*. (2019) reported that aqueous extracts of *T. versicolor* inhibited diabetic-induced cardiomyopathy (DCM) induced by cardiac fibrosis.

h) Protection against neuro-degenerative disorders

Neurodegenerative diseases, such as Alzheimer's disease, Parkinson's disease, Huntington's disease, and amyotrophic lateral sclerosis, are marked by the gradual decline of neurones, cognitive deficits, and movement impairments. The aetiology encompasses interrelated processes including oxidative stress, persistent neuroinflammation, mitochondrial impairment, atypical protein accumulation, and neuronal cell death. In recent years, therapeutic fungi have garnered significant scientific interest due to their many bioactive compounds and their neuroprotective effects. *C. versicolour* exhibited significant antioxidant efficacy against neurodegenerative mechanisms triggered by chronic traumatic brain injury in experimental mice models (D'Amico *et al*., 2021) [8]. Experimental studies on *T. versicolor* biomass have examined its capacity to modulate redox-sensitive cellular pathways linked to inflammation and neuronal stress (Trovato Salinaro *et al*., 2018) [41]. These results indicate that its neuroprotective capabilities may partially entail the control of inflammatory responses, however specific pathways necessitate additional verification.

i) Protection of gut health

The fibrous material in T. *versicolour*, constitutes an indigestible segment of plant nutrition that facilitates digestion for health maintenance (Pallav *et al*., 2014) [32]. Polysaccharides that are not fully digested in the upper gastrointestinal tract may interact with intestinal microorganisms. This has generated interest in the potential prebiotic effects of medicinal mushrooms. Research on *T. versicolor* has considered the possibility that its polysaccharides influence microbial composition, microbial metabolism and interactions between the gut and immune system. The administration of *T. versicolor* extracts positively influences the gut microflora (Saleh *et al*., 2017) [35]. Yu *et al*. (2013) [47] discovered that *T. versicolor* extract therapy altered gut microbiota by enhancing the abundance of *Bifidobacterium* and *Lactobacillus* while diminishing detrimental bacteria such as *Clostridium* and *Staphylococcus*. These beneficial bacteria alleviated gastrointestinal issues such as diarrhoea, decreased cholesterol levels, diminished risks of specific cancers, bolstered the immune system, and enhanced digestion.

j) Wound healing

By enabling the exchange of moisture and oxygen, chitosan/PVA nano-fibers derived from *Trametes versicolor*, which were produced through electrospinning, facilitated wound healing (Yasrebi *et al*., 2021) [46]. This, in turn, facilitated fibroblast adhesion and proliferation.

Safety and Limitations

Currently, almost thirteen varieties of *T. versicolor*-derived medications and one health product based on *T. versicolor* are utilised in various commercial and clinical applications (Elkhateeb *et al*., 2020) [10]. The safety of *T. versicolor* products depends on the preparation, dose, product quality and individual characteristics of the user. The clinical history of standardized PSK does not establish the safety of every mushroom supplement. Potential concerns include gastrointestinal disturbances, allergic reactions, variation in active-constituent concentrations and contamination or misidentification of fungal material. Interactions with medicines, particularly immunosuppressive agents and cancer treatments, require professional assessment. Individuals receiving cancer therapy or managing chronic medical conditions should consult a qualified healthcare professional before using mushroom-derived supplements.

Conclusion

Trametes versicolour is an important mushroom characterised by a variety of bioactive compounds and potential therapeutic benefits. It serves as a significant focus for medical mycology, pharmacology, and drug development studies. The polysaccharide formulations, especially PSK and PSP, have garnered significant interest due to their immunomodulatory properties and possible anticancer implications. Among its suggested uses, supplementary cancer therapy constitutes the most advanced domain of investigation, especially for standardised PSK formulations. The antioxidant, antibacterial, anti-inflammatory, hepatoprotective, metabolic, and prebiotic properties present more avenues for research, however the supporting evidence for these uses is largely experimental. The future clinical significance will rely on demonstrating consistent efficacy and safety for particular formulations instead of supposing that all mushroom-derived medicines possess identical therapeutic properties.

Reference

1. Ajibola OO, Nolasco-Hipolito C, Carvajal-Zarrabal O, Shanti F, Salleh SF, *et al*. Raymond Thomas, Turkey tail mushroom (*Trametes versicolor*): an edible macrofungi with immense medicinal properties. Current Opinion in Food Science. 2024;58:101191. doi:10.1016/j.cofs.2024.101191.
2. Akagi J, Baba H. PSK may suppress CD57(+) T cells to improve survival of advanced gastric cancer patients. International Journal of Clinical Oncology. 2010;15:145–152.

3. Angelova G, Brazkova M, Mihaylova D, Slavov A, *et al*. Bioactivity of biomass and crude exopolysaccharides obtained by controlled submerged cultivation of medicinal mushroom *Trametes versicolor*. Journal of Fungi. 2022;8(7):738.
4. Benson KF, Stamets P, Davis R, Nally R, Taylor A, Slater S, *et al*. The mycelium of the *Trametes versicolor* (Turkey tail) mushroom and its fermented substrate each show potent and complementary immune activating properties in vitro. BMC Complementary and Alternative Medicine. 2019;19(1):342. doi:10.1186/s12906-019-2681-7.
5. Blagodatski A, Yatsunskaya M, Mikhailova V, Tiasto V, Kagansky A, Katanaev VL. Medicinal mushrooms as an attractive new source of natural compounds for future cancer therapy. Oncotarget. 2018;9(49):29259–29274.
6. Chan GCF, Chan WK, Sze DMY. The effects of β-glucan on human immune and cancer cells. Journal of Hematology and Oncology. 2009;2:25.
7. Chay WY, Tham CK, Toh HC, Lim HY, Tan CK, Lim C, *et al*. Coriolus versicolor (Yunzhi) use as therapy in advanced hepatocellular carcinoma patients with poor liver function or who are unfit for standard therapy. The Journal of Alternative and Complementary Medicine. 2017;23(8):648–652.
8. D'Amico R, Trovato Salinaro A, Fusco R, Cordaro M, *et al*. Hericium erinaceus and Coriolus versicolor modulate molecular and biochemical changes after traumatic brain injury. Antioxidants. 2021;10(6):898.
9. Darshan K, Sagar SP, Vajramma B, Shreedevasena S, Ashajyothi M, Asaiya AJ, *et al*. Medicinal potential of Turkey tail mushroom (*Trametes versicolor*): a comprehensive review. South African Journal of Botany. 2024;172:254–266. doi:10.1016/j.sajb.2024.07.013.
10. Elkhateeb WA, Elnahas MO, Thomas PW, Daba GM. *Trametes versicolor* and Dictyophora indusiata champions of medicinal mushrooms. Pharmaceutical Research. 2020;4(1):000192.
11. Fritz H, Kennedy DA, Ishii M, Fergusson D, Fernandes R, Cooley K, *et al*. Polysaccharide K and Coriolus versicolor extracts for lung cancer. Integrative Cancer Therapies. 2015;14(3):201–211.
12. Gebreyohannes G, Nyerere A, Bii C, Berhe Sbhatu D. Determination of antimicrobial activity of extracts of indigenous wild mushrooms against pathogenic organisms. Evidence-Based Complementary and Alternative Medicine. 2019;2019(1):6212673.
13. Huang Y, Wang Y, Li X, Chen Z, Li X, Wang H, *et al*. Molecular mechanism of ER stress-induced gene expression of tumor necrosis factor-related apoptosis-inducing ligand (TRAIL) in macrophages. FEBS Journal. 2015;282(12):2361–2378.
14. Huang Z, Zhang M, Wang Y, Zhang S, Jiang X. Extracellular and intracellular polysaccharide extracts of *Trametes versicolor* improve lipid profiles via serum regulation of lipid-regulating enzymes in hyperlipidemic mice. Current Microbiology. 2020;77(11):3526–3537.
15. İnci Ş, Akyuz M, Kırbag S. Antioxidant and antimicrobial effects of *Trametes versicolor* (L.) Lloyd extracts in different solvents. Turkish Journal of Science and Technology. 2022;17(2):261–265.
16. Jensen GS, Hart AN. Immunomodulation by SanPharma fungal metabolic products. Journal of Alternative and Complementary Medicine. 2006;12(4):409–416.
17. Jhan MH, Yeh CH, Tsai CC, Kao CT, Chang CK, Hsieh CW. Enhancing the antioxidant ability of *Trametes versicolor* polysaccharopeptides by an enzymatic hydrolysis process. Molecules. 2016;21(9):1215. doi:10.3390/molecules21091215.
18. Knezević A, Stajić M, Sofrenić I, Stanojković T, Milovanović I, Tešević V, *et al*. Antioxidative, antifungal, cytotoxic and antineurodegenerative activity of selected Trametes species from Serbia. PLOS ONE. 2018;13(8):e0203064.
19. Kohgo Y, Hirayama Y, Sakamaki S, Matsunaga T, Ohi S, Kuga T, *et al*. Improved recovery of myelosuppression following chemotherapy in mice by combined administration of PSK and various cytokines. Acta Haematologica. 1994;92(3):130–135.
20. Lowenthal R, Taylor M, Gidden JA, Heflin B, Lay JO Jr, Avaritt N, *et al*. The mycelium of the *Trametes versicolor* synn. Coriolus versicolor (Turkey tail mushroom) exhibit antimelanoma activity in vitro. Biomedicine & Pharmacotherapy. 2023;161:114424. doi:10.1016/j.biopha.2023.114424.
21. Lu H, Yang Y, Gad E, Inatsuka C, Wenner CA, Disis ML, *et al*. TLR2 agonist PSK activates human NK cells and enhances the antitumor effect of HER2-targeted monoclonal antibody therapy. Clinical Cancer Research. 2011;17(21):6742–6753.
22. Matijasevic D, Panti M, Raskovic B, Pavlovic V, Duvnjak D, Sknepnek A, *et al*. The antibacterial activity of Coriolus versicolor methanol extract and its effect on ultrastructural changes of Staphylococcus aureus and Salmonella enteritidis. Frontiers in Microbiology. 2016;7:1226. doi:10.3389/fmicb.2016.01226.
23. Mazumder M, Sarkar AK. Mushrooms as a source of enzyme inhibitor. In: Goyal MR, Malik JA, editors. Enzyme Inactivation in Food Processing: Technologies, Materials and Applications. Apple Academic Press, 2023, 339–360.
24. Mazumder M, Roy S, Sarkar AK. Pharmacological and therapeutic value of bamboo mushroom Phallus indusiatus (Agaricomycetes). Italian Journal of Mycology. 2022;51:47–57.
25. Michalak K, Winiarczyk S, Adaszek Ł, Kosikowska U, Andrzejczuk S, Garbacz K, *et al*. Antioxidant and antimicrobial properties of an extract rich in proteins obtained from *Trametes versicolor*. Journal of Veterinary Research. 2023;67(2):209–218. doi:10.2478/jvetres-2023-0036.
26. Michalak K, Winiarczyk S, Adaszek Ł, Kosikowska U, Andrzejczuk S, *et al*. Antioxidant and antimicrobial

properties of an extract rich in proteins obtained from *Trametes versicolor*. Journal of Veterinary Research. 2023;67(2):209–218. doi:10.2478/jvetres-2023-0036.
27. Mazumder M, Sen S, Sarkar AK. Organoprotective role and therapeutic implication of Psidium guajava L. and its bio-active compounds. In: Nutrition and Public Health. A1 Publisher, Kolkata, 2021, 77–116.
28. Mili S, Rami N. Bioactive chattels and health benefit applications of *Trametes versicolor*. Asian Journal of Biological and Life Sciences. 2022;11(1):29–33.
29. Mori H, Mihara M, Teshima K, Uesugi U, Xu Q, Sakamoto O, *et al*. Effect of immunostimulants and antitumor agents on tumor necrosis factor (TNF) production. International Journal of Immunopharmacology. 1987;9:881–892. doi:10.1016/0192-0561(87)90004-X.
30. Mustafin K, Bisko N, Blieva R, Al-Maali G, Krupodorova T, *et al*. Antioxidant and antimicrobial potential of Ganoderma lucidum and *Trametes versicolor*. Turkish Journal of Biochemistry. 2022;47(4):483–489.
31. Nguyen HTK, Lee J, Park Y, Park HJ, Ahn SK, Kim JK, *et al*. Comparative analysis of anticancer and antibacterial activities among seven Trametes species. Mycobiology. 2023;51:256–263. doi:10.1080/12298093.2023.2247.
32. Pallav K, Dowd SE, Villafuerte J, Yang X, Kabbani T, Hansen J, *et al*. Effects of polysaccharopeptide from *Trametes versicolor* and amoxicillin on the gut microbiome of healthy volunteers: a randomized clinical trial. Gut Microbes. 2014;5(4):458–467. doi:10.4161/gmic.29558.
33. Rosendahl AH, Sun C, Wu D, Andersson R. Polysaccharide-K (PSK) increases p21WAF/Cip1 and promotes apoptosis in pancreatic cancer cells. Pancreatology. 2012;12(6):467–474.
34. Saldanha A, Añibarro-Ortega M, Laronha H, *et al*. Sustainable ex-situ cultivation of *Trametes versicolor* (L.) Lloyd using forest biomass: impacts on nutritional, chemical, and bioactive profiles compared to wild populations. Biomass Conversion and Biorefinery. 2026;16:213. doi:10.1007/s13399-026-07140-8.
35. Saleh MH, Rashedi I, Keating A. Immunomodulatory properties of Coriolus versicolor: the role of polysaccharopeptide. Frontiers in Immunology. 2017;6:8.
36. Sarkar AK, Oraon S, Mondal S, Sadhukhan S. Ethno-pharmacological and industrial attributes on the underutilized Arenga species in India. Journal of Food Biochemistry. 2022;46(12):e14441.
37. Sarkar AK, Mazumder M. Potential therapeutics of cultivated and wild mushrooms against diabetes. In: Goyal MR, Malik JA, Kumari A, editors. The Functional Foods. Apple Academic Press, 2024, 151-186.
38. Sharma HN, Catrett J, Nwokeocha OD, Boersma M, Miller ME, Napier A, *et al*. Anti-Toxoplasma gondii activity of *Trametes versicolor* (Turkey tail) mushroom extract. Scientific Reports. 2023;13:8667. doi:10.1038/s41598-023-35676-6.
39. Stamets P. *Trametes versicolor* (Turkey tail mushrooms) and the treatment of breast cancer. Global Advances in Health and Medicine. 2012;1(5):20.
40. Tochikura TS, Nakashima H, Yamamoto N. Antiviral agents with activity against human retroviruses. Journal of Acquired Immune Deficiency Syndromes. 1989;2(5):441–447.
41. Trovato Salinaro A, Pennisi M, Di Paola R, Scuto M, *et al*. Neuroinflammation and neurohormesis in the pathogenesis of Alzheimer's disease and Alzheimer-linked pathologies: modulation by nutritional mushrooms. Immunity & Ageing. 2018;15:8. doi:10.1186/s12979-017-0108-1.
42. Ulusoy M, Çelebier İ, Yıldız SS, Keskin N, Özgör E. Investigation of antimicrobial activity of different *Trametes versicolor* extracts on some clinical isolates. Hacettepe Journal of Biology and Chemistry. 2016;44(3):267–272.
43. Uttara B, Singh AV, Zamboni P, Mahajan RT. Oxidative stress and neurodegenerative diseases: a review of upstream and downstream antioxidant therapeutic options. Current Neuropharmacology. 2009;7:65–74.
44. Wang Y, Li H, Li Y, Zhao Y, Xiong F, *et al*. Coriolus versicolor alleviates diabetic cardiomyopathy by inhibiting cardiac fibrosis and NLRP3 inflammasome activation. Phytotherapy Research. 2019;33(10):2737–2748.
45. Yang L, Zhang LM. Chemical structural and chain conformational characterization of some bioactive polysaccharides isolated from natural sources. Carbohydrate Polymers. 2009;76(3):349–361.
46. Yasrebi N, Zarmi AH, Larypoor M, Zeynali M, Ebrahimi-Hosseinzadeh B, Mokhtari-Hosseini ZB, *et al*. In vivo and in vitro evaluation of the wound healing properties of chitosan extracted from *Trametes versicolor*. Journal of Polymer Research. 2021;28(10):399.
47. Yu ZT, Liu B, Mukherjee P, Newburg DS. *Trametes versicolor* extract modifies human fecal microbiota composition in vitro. Plant Foods for Human Nutrition. 2013;68(2):107–112.
48. Zhang W, Xing L, Wang Y, Wang Y. Clinical observation on Oriental Coriolus versicolor in the treatment of viral hepatitis. Shanghai Journal of Traditional Chinese Medicine. 1994;9:35–36.
49. Zhang H, Morisaki T, Matsunaga H, Sato N, Uchiyama A, Hashizume K, *et al*. Protein-bound polysaccharide PSK inhibits tumor invasiveness by down-regulation of TGF-β1 and MMPs. Clinical and Experimental Metastasis. 2000;18(4):345–351.