Cognitive Vitality Reports® are reports written by neuroscientists at the Alzheimer's Drug Discovery Foundation (ADDF). These scientific reports include analysis of drugs, drugs-in-development, drug targets, supplements, nutraceuticals, food/drink, non-pharmacologic interventions, and risk factors. Neuroscientists evaluate the potential benefit (or harm) for brain health, as well as for age-related health concerns that can affect brain health (e.g., cardiovascular diseases, cancers, diabetes/metabolic syndrome). In addition, these reports include evaluation of safety data, from clinical trials if available, and from preclinical models.

Turkey Tail Mushrooms

Evidence Summary

Compounds in turkey tail mushrooms have immunomodulatory and antioxidant properties, but the properties may vary with the preparation. They have a strong safety record, but efficacy may depend on host factors.

Neuroprotective Benefit: Compounds in turkey tail mushrooms have antioxidant properties, which may be neuroprotective.

Aging and related health concerns: Polysaccharides in turkey tail mushrooms have immunomodulatory properties and have successfully been used as anti-cancer treatment adjuncts in Asia.

Safety: Turkey tail mushroom products have safely been used as part of traditional medicine in East Asia and were shown to mitigate chemotherapy-related side effects in RCTs. The effects may vary in different preparations.

Availability: OTC, Rx (in Japan)	**Dose**: PSK (Krestin) 3 g/day (1 g TID in oral capsules) used in cancer in Japan.
Half-life: N/A	**BBB**: Compounds in *T. versicolor* have variable degrees of penetrance
Clinical trials: Tested in numerous clinical trials as an adjunct cancer therapy, for which it is approved in Japan. Best efficacy is seen for PSK in gastrointestinal cancers.	**Observational studies**: There is a case report of a woman achieving remission from metastatic breast cancer after using turkey tail mushroom supplements as an adjunct to chemotherapy.

What is it?

Turkey tail mushrooms (*Trametes versicolor* or *Coriolus versicolor*), also known as kawaratake mushrooms in Japan, and as Yunzhi in traditional Chinese medicine, were named for their concentric rings of brown and tan which confers a resemblance to tail feathers [5]. It is a type of white rot fungus found primarily on dead logs, and is very common in the forests of North America, Europe, and Asia. In order to decompose the wood, or substrate upon which it grows, the fungal mycelium secretes a variety of compounds into its substrate, altering its chemical composition [6]. Many of the chemicals produced by the fungus, as well as those transformed through the process of fermentation, have been found to have medicinal properties. Turkey tail mushrooms are considered medicinal mushrooms, and these medicinal products typically include parts of the mushroom (mycelium and fruiting bodies) as well as the fermented substrate. In some cases, these involve the use of a crude powder, while others involve extraction of bioactive compounds. Therefore, the medicinal properties of a given *Trametes versicolor* derived product depend on the parts of the fungus used, the type of fermentation substrate, and the process of extraction or preparation.

Turkey tail mushrooms have long been used as part of traditional medicine in China and Japan, where they are primarily consumed in the form of tea. More recently, some of the bioactive compounds have been identified and used for medicinal purposes in a purified form [5]. The protein bound polysaccharide mixture of beta glucans, polysaccharide-K (PSK) has predominantly been used in Japan. Beta glucans are abundant in the cell walls of fungi. PSK is a protein polysaccharide containing a beta (1,4) glucan main chain as well as beta (1, 3) and beta (1, 6)-linked side chains. Polysaccharopeptide (PSP) has predominantly been used in China. PSK and PSP are similar, but derived from different strains of *Trametes versicolor* (CM-101 and COV-1, respectively) and differ in sugar composition, with PSK containing fucose, and PSP containing rhamnose and arabinose [3]. PSK and PSP have

immunomodulatory properties stemming from the effects of the beta-glucans on immune cells. They may also have anti-cancer activity, and have been used clinically as adjuncts in cancer treatment [5]. PSK is approved, under the trade name Krestin produced by Kureha Corporation, as an adjunct for cancer therapy in Japan. They are considered prebiotics, with the capacity to modulate the microbiome [7], but it is not clear what role the microbiome plays in the efficacy of PSK/PSP.

Neuroprotective Benefit: Compounds in turkey tail mushrooms have antioxidant properties, which may be neuroprotective.

Types of evidence:

- 1 clinical trial for Meniere's disease (n=40)
- Several laboratory studies

Human research to suggest prevention of dementia, prevention of decline, or improved cognitive function: None

Human research to suggest benefits to patients with dementia: None

Mechanisms of action for neuroprotection identified from laboratory and clinical research:

Cellular stress response/antioxidant activity: POTENTIAL BENEFIT

Fermented *Trametes versicolor* contains a variety of compounds with antioxidant activity [8; 9; 10]. *Trametes versicolor* can also induce vitagenes, which are involved in cellular stress responses and redox homeostasis. *Trametes versicolor* powder (200 mg/kg) was able to induce the vitagene lipoxin A4 (LXA4) in the brain, particularly in the cortex and hippocampus, in rats [11]. In an Alzheimer's disease (AD) mouse model ($AlCl_3$ + D-galactose), *Trametes versicolor* polysaccharide (90 mg/kg/day), Gingko flavonoid, or the combination (37.5 mg/kg GF and 45 mg/kg TVP) improved performance on the Y maze and step-through tests, enhanced antioxidant enzymes (SOD, CAT), reduced pathological hyperchromatic nuclei in the brain, and reduced the expression of pro-inflammatory mediators (TNFα, IL-6, IL-1β) [12].

A biomass preparation of *Trametes versicolor*, at a dose of three 500 mg tablets every 12 hours, had antioxidant properties when tested in a clinical trial for patients with Meniere's disease (n=40), a neurological condition involving vertigo and hearing loss [1]. Treatment reduced markers of oxidative stress, including carbonyls, 4-hydroxynonenal (HNE), luminescence, and F2-isoprostanes in blood cells, toward control levels. The polysaccharide treatment also increased the plasma ratio of reduced

glutathione (GSH) to oxidized glutathione (GSSG), and led to the induction of vitagenes, including HO-1, Hsp70, Trx, sirtuin-1, in the patients' blood cells. The patients also reported a significant improvement in tinnitus, which may be related to the reduction in oxidative stress.

APOE4 interactions: Unknown

Aging and related health concerns: Polysaccharides in turkey tail mushrooms have immunomodulatory properties, and have successfully been used as anti-cancer treatment adjuncts in Asia.

Types of evidence:

- 3 meta-analyses (n=23 RCTs, n=3 CTs) or systematic reviews (n=28 studies)
- 1 retrospective survey (n=963 patients)
- 8 clinical trials not in systematic reviews
- 1 case study
- Numerous laboratory studies

Longevity: *T. VERSICOLOR* EXTRACT PROLONGED LIFESPAN IN FEMALE FLIES

In Oregon K stock Drosophila melanogaster, an extract of *Trametes versicolor* polysaccharides comprised of 67.53% beta-D-glucose, 12.49% D-mannose, 11.49% L-abequose, 8.21% D-galactose, and trace L-acofriose influenced reproduction and longevity [13]. At a dose of 0.5% to 3%, the extract increased the number of flies in first filial generation. At a dose of 2 to 3%, the extract prolonged the mean lifespan, the maximal lifespan, and median lethal time of female flies, but not male flies.

Cancer

Compounds derived from turkey tail mushrooms, namely polysaccharide-K (PSK) and polysaccharopeptide (PSP) in Japan and China, respectively, have been **used as an adjunct to cancer therapy for their immunomodulatory properties** [5]. PSK (Krestin) is approved for cancer treatment in Japan. Krestin is a propriety pharmaceutical grade formulation developed by Kureha. Preclinical studies suggest that *Trametes versicolor* extracts have some intrinsic anti-cancer properties as well. The benefits in clinical studies appear to be modest, and may depend on the primary anti-cancer agent used as well as the stage of disease. The effects appear to be related to immune status, as patients with anergic immune systems are less likely to experience the immunostimulatory effects of PSK. PSK and PSP are considered prebiotics with the ability to modulate the microbiome. It is not clear what role microbiome

modulation plays in its therapeutic responses, and whether individuals in different parts of the world with different microbiomes would benefit to a similar degree as those in Asia, where the vast majority of the clinical studies have been conducted.

Gastric cancer: PSK AS AN ADJUNCT ASSOCIATED WITH ENHANCED SURVIVAL AT SPECIFIC STAGES

PSK has been most extensively tested in the context of gastrointestinal cancers. A meta-analysis of 23 RCTs (n=10,684 patients), found that the inclusion of PSK in the treatment intervention was associated with increased overall survival up to five years (Odds ratio OR: 1.37, 95% Confidence Interval (CI) 1.22 to 1.68), and increased disease-free survival up to seven years (OR: 1.66, 95% CI 1.11 to 2.48) [14]. The survival benefits were driven by the combination of PSK with chemotherapy. Other analyses have failed to find significant survival advantages for the use of adjunctive PSK [15], which may stem from differences in the type of chemotherapeutic used, as PSK may synergize with some more than others. Additionally, outcomes vary based on the stage of disease. For gastric cancer, Stage 3 appears to be most responsive to PSK's anti-tumorigenic immunostimulatory properties. It may also depend on the overall inflammatory environment of the tumor. In a separate RCT testing chemotherapy plus PSK (3 g/day) in patients with stages II and III gastric cancer undergoing curative gastrectomy (n=918), the inclusion of PSK was associated with improved survival, but the effect was stage dependent and immune status dependent [4]. Consistent with other studies, PSK was most effective at mid-stage disease (Stage 3A and 3B), in this case by prolonging survival (54.8% vs 45.5%, P = 0.031), but not at early (Stage 2) or late (Stage 3C) disease. The survival effect was also dependent on the ability of PSK to potentiate the immune system, particularly natural killer (NK) and NK-T cells, as those positive for PD-L1, a marker of immune cell exhaustion, were not responsive to PSK. It is unclear whether the efficacy of PSK would be enhanced if used in combination with checkpoint inhibitors, such as PD-1/PD-L1 inhibitors.

Lung cancer: PSK AS AN ADJUNCT ASSOCIATED WITH IMMUNE ENHANCEMENT

The findings of a systematic review of 28 studies, including 17 preclinical, 6 RCTs, and 5 non-randomized clinical trials, suggest that *Trametes versicolor*, particularly PSK, exerts beneficial immunomodulatory effects in the context of lung cancer [3]. In the RCTs, which primarily used PSK at a dose of 3 g/day, PSK treatment was associated with improvements in immune and hematological function, including shortened chemotherapy-induced bone marrow suppression, as well as increased white blood cell counts, hemoglobin, platelets, neutrophils, IgG and IgM antibodies, NK cell activity, and CD4+ T cell counts. PSK was also associated with a reduction in tumor-related symptoms, and greater effectiveness ratings relative to chemotherapy alone, though most studies failed to show a significant effect on overall survival. The effectiveness may be stage related, and PSK appears to be more effective in Stage 3 than in

Stage 4 lung cancer. Improvements in 1-, 2-, 5- year, and median survival were seen with adjunct PSK treatment in some of the non-randomized controlled trials. Preclinical studies attribute the anti-tumor activity of PSK and PSP to the potentiation of tumor immune surveillance, as well as anti-proliferation and anti-metastatic effects.

Breast cancer: *T. VERSICOLOR* ASSOCIATED WITH IMMUNE ENHANCEMENT

A preparation of *Trametes versicolor* was tested in a Phase 1 dose-escalation trial in the US in women with breast cancer (n=11), up to 9 g of *Trametes versicolor* per day for 6 weeks following radiotherapy (NCT00680667) [2]. There were trends in increased lymphocyte counts at 6 and 9 g/day, and increased functional activity for NK cells at 6 g/day. There were also dose-related increases in CD8+ T cells and CD19+ B cells, suggestive of an immunostimulatory effect.

In a case report, an 87-year-old woman with metastatic HER2-neu positive breast cancer took turkey tail mushroom capsules at a dose of 4 g twice per day while undergoing chemotherapy with Taxol and Herceptin [16; 17; 18]. Three and a half years later the patient was still active and disease-free, but continued maintenance therapy with Herceptin as well as the turkey tail mushroom supplementation. The patient reported the absence of prominent chemotherapy-related side effects while on this regimen. It is unclear whether the addition of the turkey tail mushroom capsules had an immunomodulatory effect which boosted the efficacy of the chemotherapy in this patient.

In preclinical models, an aqueous extract of *Trametes versicolor* (1 g/kg) decreased tumor weight by 36% and lung metastasis by 70% in a mouse model of metastatic breast cancer [19]. The treatment had an immunostimulatory effect by potentiating anti-tumorigenic pro-inflammatory immune cells, while having an anti-migratory effect on the tumor cells. *Trametes versicolor* was part of a blend of medicinal mushrooms called Breast Defend™ (100 mg/kg), which also reduced breast to lung tumor metastasis in a metastatic breast cancer mouse model [20]. These studies suggest that *Trametes versicolor* may act as an immunostimulatory adjunct in the context of metastatic breast cancer, but it has not yet been established whether there is preferential synergism in combination with particular chemotherapeutics, or in the context of specific disease variants.

Colorectal cancer: PSK ASSOCIATED WITH MARGINAL, INCONSISTENT BENEFIT

A meta-analysis of three clinical trials (n=1,094 patients) testing adjunct PSK therapy in the context of curatively resected colorectal cancer suggests that the addition of PSK can modestly reduce disease reoccurrence and improve survival relative to chemotherapy alone [21]. The overall survival risk ratio was 0.71 (95% CI 0.55 to 0.90; P=0.006), while the disease-free survival risk ratio was 0.72 (95% CI: 0.58

to 0.90; P=0.003). The five-year survival rate was 79%, compared to 72.2% for chemotherapy alone, while the disease-free survival rate was 72.2%, compared to 65.9% for chemotherapy alone. In these studies, the chemotherapy generally involved the induction with mitomycin C plus long-term administration of oral fluorinated pyrimidines.

More recent Phase 3 trials not included in this meta-analysis tested the combination of PSK with the oral fluorinated pyrimidine tegafur-uracil. In patients (n=106) with curatively resected Stage 2 rectal cancer, tegafur/uracil in combination with PSK (3 g/day) for 1 year after surgery had no significant effect on overall 3- and 5- year survival compared to surgery alone (100% vs 100% and 97.9% vs 93.4%, respectively) [22]. However, there was a trend toward worse 3- and 5-year disease-free survival (76% vs 84% and 65.1% vs 77.2%, respectively). A separate Phase 3 trial (n=357) testing tegafur/uracil plus PSK in Stage 2B and Stage 3 colorectal cancer found that this combination was less effective than tegafur/uracil plus leucovorin in terms of 3-year disease free survival (72.1% vs 82.3%) and overall survival (90.7% vs 95.4%) [23]. These studies suggest that the ability of PSK to potentiate anti-cancer responses is marginal in the context of colorectal cancer, at least in combination with currently tested therapies, such that it is unlikely to exert clinically meaningful effects in most cases.

Immunosenescence: *T. VERSICOLOR* ASSOCIATED WITH IMMUNE ENHANCEMENT (Preclinical)

Turkey tail mushrooms are primarily known for their ability to modulate immune system function. The effects may be context dependent, as *Trametes versicolor* derived compounds tend to stimulate anti-tumor immune responses in the context of cancer, but exert anti-inflammatory effects in preclinical models of inflammatory disease. Differences may also be related to the relative abundance of different compounds in different preparations/extractions. Turkey tail mushrooms may be able to boost innate and adaptive immune responses in the context of aging. Old mice (23 months old) fed a diet supplemented with polysaccharopeptide (PSP) containing extract of *Trametes versicolor* (1%) for 1 month showed evidence of a modest immunoenhancement effect [24]. These mice showed a significantly higher delayed-type hypersensitivity response, which is an immune reaction that develops in response to a foreign antigen. Notably, similar immunoenhancement was not seen in young (5-month-old) mice. In cell culture, polysaccharide purified from *Trametes versicolor* (CV-S2-Fr.I) stimulated lysosomal activity in primary mouse macrophages by 250%, which was higher than a comparable concentration of LPS [25]. Extracts of *Trametes versicolor* also led to the induction of CD69 on lymphocytes and monocytes in human peripheral blood mononuclear cells (PBMCs) [6].

The immunomodulatory effects may involve modulation of the gut microbiome, which is known to influence host immune responses. In an RCT (NCT01414010), healthy volunteers (n=24) fed PSP from

Trametes versicolor (1200 mg, 3 times/day) for two weeks showed consistent changes in microbiome composition, though the particular species affected were influenced by the baseline microbiota composition of the host [7]. Certain taxa were also preferentially affected at different ages.

Diabetes/metabolic syndrome: *T. VERSICOLOR* IMPROVES GLUCOSE TOLERANCE (Preclinical)

In preclinical models, *Trametes versicolor*-derived compounds improved glucose tolerance and mitigated diabetes-related pathologies. In the high-fat diet plus streptozotocin model of diabetes, male rats treated with extracellular polysaccharopeptide (ePSP) derived from the LH-1 strain of *Trametes versicolor* (0.1 g/kg oral) showed a decrease in post-prandial blood glucose levels, insulin resistance, serum triglycerides, and oxidative stress markers [26; 27]. A reduction in blood glucose levels and insulin resistance was also seen in the same model using an aqueous extract of *Trametes versicolor* (100 mg/kg) [28]. These effects were associated with increased expression of the glucose transporter 4 (GLUT4) in skeletal muscle, via modulation of p38 MAPK signaling. This preparation (25 mg/kg) also alleviated aspects of diabetic cardiomyopathy, including cardiac fibrosis and cardiac inflammation in this model [29]. The cardioprotective effects were attributed to the inhibition of TGF-β1/Smad signaling and the NLRP3 inflammasome. In high-fat diet induced hyperlipidemia, male mice fed polysaccharide extracts of *Trametes versicolor* (100-200 mg/kg) had reduced levels of serum lipids [30]. Both intracellular and extracellular polysaccharide extracts reduced serum total cholesterol, LDL-c, and triglyceride levels, which was associated with an increase in the activity of serum lipoprotein lipase.

Colitis: *T. VERSICOLOR* IS IMMUNOMODULATORY (Preclinical)

Compounds derived from turkey tail mushrooms were found to alleviate symptoms of colitis through modulation of the immune system. In the dextran sulfate sodium (DSS)-induced model of colitis, male mice treated with an ethanol extract of *Trametes versicolor* (70 mg/kg oral) for four weeks had reduced levels of IgE, as well as the pro-inflammatory mediators TNFα, IL-1β, and IL-6 [31]. A compound called YZP, a 12-kDa non-glycosylated protein purified from the fruiting body of *Trametes versicolor* promoted the differentiation of anti-inflammatory regulatory B cells in mice [32]. These YZP-induced B cells increased anti-inflammatory IL-10 and decreased production of pro-inflammatory cytokines in the intestine in a colitis mouse model.

Pain: *T. VERISCOLOR* REDUCES PAIN (Preclinical)

Compounds from turkey tail mushrooms have been shown to have analgesic effects in rodent models. Male rats fed *Trametes versicolor* mycelium powder (500 mg/kg) had reduced pain behavioral responses and plasma COX-2 and prostaglandin E2 levels following a formalin-induced pain test, with similar

efficacy to aspirin [33]. The antinociceptive activity may be related to the high percentage (11.92%) of oleanolic acid in the mushroom powder. Polysaccharopeptide (PSP) from *Trametes versicolor* (200 ug/kg intrathecally) reduced morphine-induced hyperalgesia and pain in male rats. The effect involved PSP's induction of cannabinoid type 2 receptor (CB2), which in turn leads to the upregulation of β-endorphin and decrease in prostaglandin E2, and IL-1 [34].

Osteoporosis: *T. VERSICOLOR* REDUCES BONE LOSS (Preclinical)

In a rat model of diabetes-related osteoporosis, oral treatment with the extracellular polysaccharopeptide (ePSP) from the LH-1 strain of *Trametes versicolor* (100 mg/kg 28 days) resulted in thicker, less porous bones [27]. The bones of the treated rats also showed increased maximal load and stiffness to levels comparable to control non-diabetic rats. Turkey tail mushrooms may also reduce bone loss during the course of metastatic cancer. In a mouse model of metastatic breast cancer, treatment with *Trametes versicolor* aqueous extract (1 g/kg oral) for four weeks reduced bone loss, with these mice showing 10.3% higher bone volume relative to their untreated counterparts [19]. The protective effect against bone loss may stem from the inhibition of excessive bone reabsorption. In MC3T3-E1 mouse osteoblast-like cell line, water extracts from *Trametes versicolor* inhibited the activity of bone absorbing osteoclasts [35].

Safety: Turkey tail mushroom products have safely been used as part of traditional medicine in East Asia, and were shown to mitigate chemotherapy-related side effects in RCTs. The effects may vary in different preparations.

Types of evidence:

- 2 meta-analyses or systematic reviews
- 5 clinical trials not in systematic reviews
- 1 case report
- Numerous laboratory studies

Turkey tail mushroom products are associated with a strong safety profile. In clinical trials, *Trametes versicolor* preparations or derived polysaccharides were well-tolerated, and side effects were attributed to co-administered chemotherapeutic agents [5]. PSK has safely been used as an adjunct in cancer treatment in thousands of patients since the mid-1970s. A meta-analysis of 23 RCTs involving polysaccharide K (PSK) found that the use of PSK was safe based on moderate to high quality evidence [14]. Furthermore, when used in combination with anti-cancer chemotherapeutic agents, PSK did not

augment side effects, but rather, in many cases mitigated them. In particular, PSK was found to reduce the incidence of chemotherapy-related nausea and vomiting (OR: 0.53, 95% CI 0.31 to 0.91) and leukopenia (OR: 0.60, 95% CI 0.43 to 0.83) [14]. Additional studies not included in this analysis also reported that *Trametes versicolor* products/preparations, including PSK, mitigated side-effects of anti-cancer therapies, leading to improvements in patient quality of life [3; 23; 36]. Preclinical studies also found no evidence of adverse events in terms of changes to body weight, hematological parameters, or organ toxicities [20; 24; 37].

The beta glucans in PSK/PSP/*Trametes versicolor* preparations have been shown to modulate the gut microbiome [7], which may underlie the reports from some patients regarding changes to bowel movement regularity and stool coloration (Drugs.com).

Drug interactions: Interactions with turkey tail mushroom products have not been reported, however, clinical evidence supports its immunostimulatory properties, including the ability to reduce chemotherapy-related immunosuppression [3]. While this appears to be beneficial in the context of cancer, it could potentially negatively interact in patients taking/requiring immunosuppressive agents for other conditions [14].

Sources and dosing:

Polysaccharide-K is available as a pharmaceutical grade prescription product called Krestin by Kureha Corporation in Japan, where it is an approved agent for use in cancer treatment [5]. It is typically dosed at 3 g/day in the form of oral capsules taken 3X per day (1 g TID) (Drugs.com). In China, the use of polysaccharopeptide (PSP) is more common, where it is an approved category II drug product, with recommended dosing at 3.24 g /day (1.08 g TID), in the form of oral capsules (Drugs.com). In a clinical trial for breast cancer, *Trametes versicolor* capsules were well-tolerated up to 9 g/day [2]. *Trametes versicolor* biomass preparations and extracts are available as OTC products. The fruiting bodies of turkey tail mushrooms are edible, and *Trametes versicolor* is commonly consumed in the form of tea, which can be considered a type of aqueous extract [5]. Of note, the medicinal glycoproteins are known to be found in the mycelium of the fungus, so it is important to note what part of the fungus is used in any OTC products.

While glycoproteins (including PSK and PSP) are the best characterized medicinal components, *Trametes versicolor* preparations contain a variety of compounds which may have medicinal properties, such as antioxidants. The particular composition of medicinal compounds will vary across preparations depending on which parts of the fungus are included, the nature of the fermentation substrate, and

method of extraction/purification [6]. While the anti-cancer/immunostimulatory properties are attributed to the known glycoproteins, such as PSK and PSP, the compounds responsible for many of the other properties identified in preclinical studies have not been well-characterized. These effects may require a mixture of compounds, and efficacy is likely to be dependent on the source and preparation method. Further work is necessary to determine the optimal preparation for non-cancer conditions.

The 87-year-old woman who used turkey tail mushrooms as an adjunct to chemotherapy and recovered from metastatic breast cancer used Host Defense turkey tail mushroom supplements [18]. She used a dose of 4 g 2X per day. The clinical trial showing modulation of the gut microbiome in healthy volunteers used *T. versicolor* I'm- Yunity ®, which is enriched for PSP, and currently marketed in the US for veterinary use, at a dose of 1200 mg 3X/day [7]. In the clinical trial for Meniere's disease, a biomass preparation of *C. versicolor* from Mycology Research Laboratories was used at a dose of 3 tablets of 500 mg every 12 hours [1].

Research underway:

There are ongoing clinical trials for the use of *Trametes versicolor* as an immune booster for COVID-19 (NCT04667247), and as part of a multi-mushroom supplement for IBD (NCT04329481).

Search terms:

Pubmed, Google: Turkey tail, *Trametes versicolor*, *Coriolus versicolor*, PSK, PSP

- Alzheimer's disease, neurodegeneration, aging, cancer, diabetes, immunity, clinical trials, safety, meta-analysis

Websites visited for Turkey Tail Mushrooms:

- Clinicaltrials.gov
- Examine.com
- Drugs.com
- DrugBank.ca
- MSKCC.org

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