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Medicinal Value of Turkey Tail Fungus *Trametes versicolor* (L.:Fr.) Pilát (Aphyllophoromycetideae)

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Trametes versicolor, formerly *Coriolus versicolor*, is a common fan-shaped polypore fungus of dead and dying trees throughout the world, which is an important part of forest ecology as a primary decomposer of hardwood. The fungus is characterized among the white-rot basidiomycetes. *T. versicolor* produces a laccase used to detoxify xenobiotics such as polychlorinated biphenyls, dyes, and a variety of synthetic polymers and as a pulp biobleach for making paper.

Turkey tail is arguably the best-researched medicinal mushroom, with a number of controlled clinical trials demonstrating increased long-term survivability in patients with gastrointestinal cancers, and to a lesser degree other cancers, with oral application of concentrated extracts of the fruit bodies and mycelium, particularly PSK and PSP. These commercially produced extracts are often prescribed along with chemotherapy for treating cancer in Japan and are paid for by national health care.

PSK and PSP have demonstrated a wide range of immunological effects *in vitro* and *in vivo,* particularly reticuloendothelial system activation, cytokine modulation (IFN-γ production, IL-2 production), enhancement of dendritic cell viability, T-cell maturation, natural killer cell activity, antibody production, and antitumor and anticancer effects. The extracts can inhibit carcinogenesis and tumor cell growth by activating cancer cell apoptosis.

Current clinical use in North America, Europe, and Asia of products containing turkey tail extracts and their use as health food supplements has rapidly increased in the last few years, with many types of products becoming available. They are often recommended as supportive treatment for their supposed immunorestorative effects in patients with chronic conditions such as various cancers and viral syndromes such as hepatitis C and for its hepatoprotective effects.

Since 1990, a number of controlled clinical trials have been performed in Japan with PSK as a supportive treatment in hospitals and clinics for treating patients with a variety of cancers, particularly colorectal and stomach cancer, but also breast and lung cancers. PSK is given orally, always along with various chemotherapeutic regimes. In several of these multicentric trials ($n = 103–462$), the 15-year survival rate was increased by 10–15%, and side effects of chemotherapy, such as nausea and anorexia, were reduced when PSK was given along with chemotherapy. Improvements in immune functions such as blood leukocyte and neutrophil counts, serum IgG and IgM, and body-mass index were seen in patients receiving turkey tail extracts with chemotherapy vs. chemotherapy alone.

Fundamental questions about the effectiveness of turkey tail extracts for life prolongation and mitigation of side effects from chemo- and radiotherapy in cancer patients, as well as its effectiveness as an immunorestorative and antiviral treatment in patients with chronic viral syndromes, remain to be fully answered. The dose, the solvents used for extraction, the source of starting material, the question of whether fruiting bodies or more easily

obtained mycelium cultures should be used, and the duration of treatment have only been partially clarified. Because ubiquitous cell wall components of fungi (including yeasts) and bacteria, (1→3)-β-D-glucans, are thought to be among the most important active constituents, a careful review of the large body of existing literature on the cellular mechanisms of effects on the immune system with oral exposure of these compounds has to be carefully considered.