

DOSSIER · SUBSTANCE

Medicinal Mushrooms (Reishi, Chaga, Cordyceps)

Medicinal mushrooms primarily include Reishi (*Ganoderma lucidum*), Chaga (*Inonotus obliquus*), and Cordyceps. The database records clinical studies in humans—a basis that is still emerging compared to laboratory research but growing. The most notable finding: a significant proportion of controlled trials assess **safety and immunomodulatory effects**, while applications such as oncology or fatigue are often only represented in observational studies or reviews.

882

STUDIES IN
TOTAL

130

IN HUMANS

41

OF WHICH
CONTROLLED

36

IN ANIMALS

183

IN THE LAB

Figures from the IHR study database · Last updated 2026-10-15

How to Read This Dossier

ESTABLISHED

measured in humans, with a comparison group

PLAUSIBLE

supported by mechanism, animal studies or observation

HYPOTHESIS

a likely connection that still needs to be tested

Medicinal mushrooms (Reishi, Chaga, Cordyceps) at a glance

ORIGIN:

Medicinal mushrooms such as Reishi (*Ganoderma lucidum*), Chaga (*Inonotus obliquus*), and Cordyceps are fungal species used in medicine, whose extracts or powders have been traditionally employed in Asian medicine. They contain bioactive compounds such as polysaccharides (e.g., beta-glucans), triterpenes, and sterols, which have demonstrated immunomodulatory, antioxidant, or antitumour effects in preclinical studies. Preparations range from teas to standardised capsules, with aqueous extracts enriching polysaccharides and alcoholic extracts enriching triterpenes.

STUDY LANDSCAPE:

882 evaluated publications · 41 controlled human studies · 89 observational studies · 97 review articles · 36 animal studies · 139 cell culture studies

STRONGEST EVIDENCE:

- **Safety and tolerability:** Controlled studies confirm the good tolerability of *Ganoderma lucidum* (Reishi) at dosages up to 6 mg/day over 12 weeks, with no severe adverse events or changes in laboratory values (e.g., PSA, testosterone). Mild side effects such as nausea or diarrhoea were reported.
- **Immune system:** Randomised studies show significant increases in lymphocyte populations (CD3+, CD4+, CD8+) with *Ganoderma lucidum* extracts, particularly β-glucans, suggesting an immunostimulatory effect. However, the clinical relevance remains unclear.
- **Oncology:** (supportive) Systematic reviews find insufficient evidence for a direct antitumour effect of *Ganoderma lucidum*, but indicate improved quality of life and cellular immune responses in cancer patients, particularly in combination with chemotherapy.
- **Inflammatory processes:** Pilot studies on *Ganoderma lucidum* in rheumatoid arthritis show limited efficacy (e.g., pain reduction), but no significant changes in immunological parameters such as cytokines or CD4+/CD8+ ratio.
- **Oxidative stress** Preclinical data from animal and cell culture studies suggest antioxidant effects of *Ganoderma lucidum* polysaccharides via the Nrf2/ARE signalling pathway. These findings are not yet confirmed in humans, and clinical studies with clear markers (e.g., MDA) are still pending.

LIMITATIONS:

- The methodological quality of clinical studies is heterogeneous: small sample sizes, lack of blinding, and varying extract forms complicate comparisons. Many studies originate from Asia, which may introduce cultural influences on results.
- Oncological studies typically examine adjuvant effects in combination with chemotherapy, not standalone effects. Observational studies show associations (e.g., immune markers) but do not establish causality.
- Data on long-term effects, specific conditions (e.g., diabetes, cardiovascular diseases), or microbiome changes are sparse or entirely absent.

CLASSIFICATION:

Medicinal mushrooms such as Reishi, Chaga, and Cordyceps show primarily immunomodulatory effects and good tolerability in clinical studies. Evidence for direct antitumour, anti-inflammatory, or metabolic effects is limited and methodologically heterogeneous.

1. What Medicinal Mushrooms Are and How They Are Studied

Medicinal mushrooms refer to fungal species used in medicine, whose extracts or powders have been traditionally employed in Asian medicine. Reishi, Chaga, and Cordyceps are among the most extensively researched species. They contain bioactive compounds such as **polysaccharides** (e.g., beta-glucans), **triterpenes**, and **sterols**, which exhibit immunomodulatory, antioxidant, or antitumour effects in cell cultures and animal models. The mushrooms are typically used as dried fruiting bodies, extracts, or standardised preparations, with applications ranging from tea infusions to high-dose capsules.

Critical for research is the **diversity of preparations**: aqueous extracts primarily contain polysaccharides, while alcoholic extracts enrich triterpenes. The bioavailability of these compounds varies widely, complicating comparisons between studies. Additionally, **combinations of multiple mushroom species** or additives such as vitamins are often investigated, which limits the attribution of specific effects to individual mushrooms. The majority of controlled studies use standardised extracts, whereas observational studies frequently rely on traditional preparations.

2. What the Studies Show in Detail

The key human studies and most important reviews—by application area, including population, duration, preparation, measured outcomes, and results, as reported in the original publications. Numbers are included only where the study provides them.

Distribution of controlled human studies by application area—the numbers are not additive, as a single study may be assigned to multiple areas:

APPLICATION AREA	CONTROLLED STUDIES
Safety and tolerability	23
Immune system	18
Oncology	16
Fatigue and stress	12
Metabolism	11
Inflammatory processes	10

APPLICATION AREA	CONTROLLED STUDIES
Cardiovascular system	7
Oxidative stress	7

Oncology

In a randomised, placebo-controlled, double-blind study (n=37) involving patients with advanced adenocarcinoma (gastric, lung, liver, breast, and colorectal cancer), the combination of *Antrodia cinnamomea* (AC) with chemotherapy was investigated. Participants received 20 ml of AC extract or placebo twice daily for 30 days alongside standard chemotherapy. The primary endpoint was 6-month overall survival (OS), with secondary endpoints including disease control rate (DCR), quality of life (QoL), and adverse events. Median OS was 5.4 months in the AC group versus 5.0 months in the placebo group (p=0.340), with a DCR of 41.2% vs. 55% (p=0.33). The study showed no significant differences but indicated a trend towards fewer progression-related deaths in the AC group (33.3% vs. 66.7%). Limitations included the small sample size and heterogeneity of tumour entities ²⁷.

Measured outcomes included the Clinical Global Impression (CGI) scale and visual analogue scales for fatigue and well-being in patients with neurasthenia. After 8 weeks, the Ganopoly group showed a significant reduction in CGI severity scores (15.5% vs. 4.9% in the placebo group) and fatigue scores (28.3% vs. 20.1%). Well-being scores improved by 38.7% (vs. 29.7% with placebo). The study provides evidence for symptom relief in neurasthenia but does not demonstrate clinical efficacy in oncology ¹⁰.

A systematic review (2016) evaluated randomised controlled trials (RCTs) on various medicinal mushrooms, including *Ganoderma lucidum*, in cancer patients. Primary endpoints were long-term survival, tumour response, immune functions, and quality of life. For the *Ganoderma lucidum* subset, the review found no sufficient clinical evidence for a direct antitumour effect. Two RCTs and one non-randomised study reported improved cellular immune responses and mitogenic reactivity in cancer patients. One study showed an improvement in quality of life in 65% of lung cancer patients. The authors emphasise that medicinal mushrooms, including *Ganoderma lucidum*, are currently classified as supportive measures rather than direct therapies.

HYPOTHESIS The preclinical data on cytotoxic and anti-angiogenic effects of *Ganoderma lucidum* suggest that other fungal derivatives or bioactive compounds may utilise similar mechanisms. However, clinical studies demonstrating direct applicability to oncological patients are lacking. The observed immunomodulatory effects may act synergistically with conventional therapies but require further validation.

Large-scale, homogeneous RCTs with clearly defined oncological endpoints (e.g., progression-free survival, response rates) and standardised fungal extracts are lacking.

Inflammatory Processes

A double-blind, randomised, placebo-controlled pilot study (n=65) investigated the effect of *Ganoderma lucidum* (4 g/day) in combination with San Miao San (2.4 g/day) in patients with active rheumatoid arthritis (RA) over 24 weeks. The primary endpoint was achieving an ACR20 response. Secondary endpoints included changes in ACR components, cytokines, and oxidative stress markers. No significant difference in ACR20 response was observed between the verum (42.4%) and placebo (9.1%) groups (p>0.05). Significant improvements were seen only in pain and patient global assessment. Immunological parameters (e.g., CD4+/CD8+ ratio, IL-18, IFN-γ-inducible proteins) remained unchanged, providing no evidence of immunomodulation in this study ⁵.

In a randomised, double-blind, placebo-controlled study (n=18), the effect of *Ganoderma lucidum* (1.44 g/day over 4 weeks) on biomarkers of oxidative stress, inflammation, and hepatotoxicity was examined in healthy adults. No significant changes were observed in antioxidant status, lipid profile, or inflammatory markers. Only a slight tendency towards lower lipid levels and an increase in urinary antioxidant capacity were noted. The study provides no evidence for an anti-inflammatory effect in healthy subjects ².

A systematic review (2023) analysed clinical studies on various medicinal fungi, including *Reishi*, *Chaga*, *Cordyceps*, and others, in cancer therapy. Of 39 included studies, 14 reported improvements in quality of life or symptom burden, and 11 reported positive immunological effects (e.g., increased NK cell activity). Two studies on *Trametes robiniophila* (Huaier granules) showed improved survival in hepatocellular and breast carcinoma. However, most of the included studies had small sample sizes and were not randomised. The data suggest potential for inflammation modulation across multiple fungi but without a clear dose-response relationship ¹⁵.

HYPOTHESIS The observed effects on quality of life and immune parameters may be attributable to indirect anti-inflammatory action via fungal polysaccharides.

RCTs with clear inflammatory endpoints (e.g., CRP, cytokines) in defined inflammatory diseases and standardised extracts are lacking.

Oxidative Stress

The study demonstrates an antioxidant and hepatoprotective effect but without clinical endpoints ⁴.

In a randomised, double-blind, placebo-controlled study (n=26) involving patients with borderline hypertension or hyperlipidaemia, *Ganoderma lucidum* (1.44 g/day over 12 weeks) was investigated. Primary endpoints were blood pressure, lipid profile, and antioxidant capacity. No significant changes in blood pressure or BMI were observed. However, triglycerides decreased and HDL cholesterol increased in the initial treatment phase (carry-over effects prevented complete evaluation). Antioxidant capacity in plasma remained unchanged, though uric acid concentration rose. The study suggests a moderate lipid-lowering effect but without clear antioxidant effects ⁸.

A review (2021) summarised the antioxidant mechanisms of *Ganoderma lucidum* polysaccharides (GLP). GLP act via activation of the Nrf2/ARE signalling pathway, inhibition of reactive oxygen species (ROS), and modulation of antioxidant enzymes (e.g., SOD, catalase). Preclinical studies in animal and cell models showed a reduction in oxidative stress in models of cardiomyopathy and neurodegeneration. These findings are preclinical; clinical data on these effects in humans are largely lacking ³⁶.

HYPOTHESIS The antioxidant effects of *Ganoderma lucidum* may be due to direct radical scavenging or induction of endogenous protective mechanisms (e.g., Nrf2).

Clinical studies with clear oxidative stress markers (e.g., MDA, carbonyls) in defined patient groups (e.g., diabetes, cardiovascular diseases) are lacking.

Gut and Microbiome

A narrative review (2020) summarised the role of several medicinal fungi—including *Agaricus sylvaticus*, *Agaricus blazei murill*, *Antrodia cinnamomea*, *Coriolus versicolor*, and *Ganoderma lucidum*—in integrative oncology. Clinical studies on these fungi showed improvements in quality of life and reduction of side effects from conventional therapies for some of the included species. The data suggest potential for microbiome modulation across medicinal mushrooms but without direct evidence for *Ganoderma lucidum* specifically ⁶.

HYPOTHESIS The observed effects on quality of life and immune functions may be attributable to indirect influence on the microbiome via fungal polysaccharides.

Clinical studies with direct microbiome analyses (e.g., 16S rRNA sequencing) and standardised fungal extracts are lacking.

Metabolism

A randomised, placebo-controlled study (n=24) investigated the effect of a pre-workout supplement containing *Cordyceps sinensis* (including 18 g powder with 40 kcal, for 3 weeks) on aerobic and anaerobic performance in moderately trained subjects. The verum group showed no significant changes in VO₂max, training volume, or body composition compared to placebo. The study provides no evidence for a metabolic effect of *Cordyceps sinensis*.

A Cochrane Review (2015) evaluated the effect of *Ganoderma lucidum* on cardiovascular risk factors (blood glucose, blood pressure, lipid profile). Despite preclinical evidence of lipid-lowering and blood glucose-lowering effects, the review found no sufficient clinical evidence. The included studies had methodological shortcomings (e.g., small sample sizes, lack of randomisation). The authors conclude that *Ganoderma lucidum* cannot currently be recommended for the treatment of metabolic diseases ¹⁴.

HYPOTHESIS The preclinical data on *Ganoderma lucidum* and *Cordyceps* suggest that fungal extracts may influence glucose and lipid metabolism.

RCTs with standardised extracts and clear metabolic endpoints (e.g., HbA1c, insulin resistance) in defined patient groups (e.g., diabetes, metabolic syndrome) are lacking.

Immune System

A double-blind, randomised, placebo-controlled study (n=16) investigated the safety and tolerability of *Ganoderma lucidum* (2 g/day for 10 days) in healthy volunteers. Primary endpoints were laboratory parameters (full blood count, liver and kidney function tests) and immunological markers (CD4, CD8, CD19, CD56). No adverse events or changes in laboratory values were observed. CD56 cell counts increased during administration but returned to baseline 10 days after discontinuation. Due to the small sample size and high variability, this increase was not significant. The study demonstrates the safety of *Ganoderma lucidum* but without clear immunomodulatory effects ¹².

Primary endpoints were the number of circulating CD8+ T cells and natural killer (NK) cells. The verum group showed significantly higher absolute lymphocyte counts (CD3+, CD4+, CD8+) compared with placebo. The intervention was safe and well tolerated. The study provides a preclinical indication of an immunostimulatory effect of *Ganoderma lucidum* β-glucans, though without clear clinical relevance ¹⁶.

HYPOTHESIS The observed effects on lymphocyte populations may be attributable to activation of the innate immune system by fungal polysaccharides.

Clinical studies with clear immunological endpoints (e.g., cytokine profiles, vaccine responses) in immunosuppressed patients are lacking.

Safety and Tolerability

A randomised, double-blind, placebo-controlled study (n=88) investigated the safety and efficacy of an ethanolic *Ganoderma lucidum* extract (6 mg/day for 12 weeks) in men with lower urinary tract symptoms (LUTS). The primary endpoint was the change in the International Prostate Symptom Score (IPSS). The verum group showed a significant improvement in IPSS (−2.1 points vs. placebo, p<0.0001). No serious adverse events occurred, and laboratory values (PSA, testosterone) remained unchanged. The study demonstrates the safety and tolerability of *Ganoderma lucidum* but without clear dose-dependent effects ¹³.

A systematic review (2021) summarised the toxicological data on *Ganoderma lucidum*. Clinical studies predominantly reported mild adverse events (e.g., nausea, diarrhoea, muscle pain). No severe side effects were observed. Preclinical studies showed no genotoxic or hepatotoxic effects. The data suggest a favourable safety profile, though long-term studies are lacking ³³.

HYPOTHESIS The good tolerability of *Ganoderma lucidum* suggests that other fungal extracts might exhibit similar safety profiles. However, direct comparative studies are required, particularly regarding long-term safety.

Long-term studies on the safety of fungal extracts with chronic administration and in defined patient groups are lacking.

Viral Infections

A review (2021) summarised the antiviral effects of *Cordyceps militaris*. Cordycepin, a bioactive metabolite, demonstrated antiviral activity against SARS-CoV-2, influenza, and HIV in preclinical studies. Mechanisms include inhibition of viral RNA synthesis and modulation of immune parameters. However, clinical data are entirely lacking, and antiviral efficacy in humans has not been investigated ³⁴.

A review (2020) on *Ganoderma lucidum* reported antiviral effects in preclinical models (e.g., against herpesviruses, influenza). Mechanisms of action include inhibition of viral replication and stimulation of interferon production. No clinical studies on antiviral efficacy in humans are available, so these findings remain preclinical ³⁵.

HYPOTHESIS The preclinical data on antiviral effects of *Cordyceps* and *Ganoderma* suggest that fungal extracts or bioactive compounds might utilise similar mechanisms. However, clinical studies on efficacy in viral infections are lacking.

Clinical studies on the antiviral efficacy of fungal extracts in defined viral infections (e.g., influenza, COVID-19) are lacking.

Overall Picture

The available studies on medicinal mushrooms—including *Ganoderma lucidum*, *Cordyceps* spp., *Antrodia cinnamomea*, and others—present a heterogeneous picture across the field. In oncology, data suggest immunomodulatory and quality-of-life-improving effects for these mushrooms, though without clear evidence of direct antitumour activity for *Reishi*, *Chaga*, or *Cordyceps*. In inflammation and oxidative stress, moderate antioxidant and anti-inflammatory effects are observed across various fungal extracts, though clinical relevance for *Reishi*, *Chaga*, or *Cordyceps* remains inconsistent. The safety and tolerability of these extracts are well documented, though long-term data are lacking.

Across all areas, it is notable that most studies have small sample sizes, short intervention durations, and lack standardisation of extracts. **Plausible:** Preclinical data suggest that fungal polysaccharides and other bioactive components might utilise mechanisms such as immunomodulation and antioxidation, though clinical studies are required for validation.

Methodology of the evidence base

The included controlled human studies comprise a broad spectrum of designs: randomised controlled trials (RCTs, n=12), placebo-controlled double-blind studies (n=8), and other controlled designs. Intervention durations ranged from 10 days to 6 months, with most studies lasting 4–12 weeks. Primary endpoints frequently included immunological parameters (e.g., lymphocyte populations, cytokines), quality of life (QoL), or clinical scores (e.g., IPSS, ACR20). Secondary endpoints included oxidative stress markers (e.g., TEAC, TBARS), metabolic parameters (e.g., blood glucose, lipids), and adverse events. Systematic shortcomings include the lack of standardisation of fungal extracts (e.g., polysaccharide content) and the absence of studies in patients with defined conditions. Furthermore, long-term studies and direct comparisons with established therapies are lacking.

Medicinal mushrooms in oncology: What the studies actually support

Most oncological studies on medicinal mushrooms are **REVIEWS OR CELL CULTURE STUDIES** describing antitumour mechanisms—such as activation of immune cells or inhibition of tumour cell growth in vitro. The few controlled human studies typically examine **adjuvant effects** in combination with chemotherapy, not standalone effects. Even the most frequently cited work on reishi (2005) is a **narrative review** that summarises existing evidence but provides no new clinical data. The methodologically more robust studies often show **no significant effects** on tumour size or survival time, but merely improvements in quality of life or immunological parameters.

A central issue is the **LACK OF STANDARDISATION**: oncological studies use different extracts, dosages, and mushroom species, making comparisons impossible. Moreover, many studies are **not blinded** or have small sample sizes, limiting their validity. The frequently cited work on *Antrodia cinnamomea* (2016) is a **pilot study** with only a few participants and combines the mushroom with chemotherapy—a design that does not allow conclusions about its standalone effect. The current evidence base **does not justify a recommendation** for medicinal mushrooms as a cancer therapy, but only as a supportive measure under medical supervision.

3. How Robust the Research Is

The evaluated studies are predominantly **basic research** and cell culture studies, with controlled human studies representing a smaller but relevant subset of the total evidence base. Clinical applications focus on **safety**, the **immune system**, and **oncology**. Other key areas include fatigue, metabolism, and inflammation. The most frequently cited controlled studies primarily examine reishi (*Ganoderma lucidum*), while chaga and cordyceps are less commonly investigated in clinical settings. Reviews dominate citation frequency, indicating strong theoretical interest but limited clinical evidence for these specific mushrooms.

The **methodological quality** of clinical studies is heterogeneous: many are small, unblinded, or use different extract forms, complicating comparisons. Most controlled studies originate from Asia, where medicinal mushrooms are traditionally used—cultural differences in application and expectations may influence results. Oncological studies often examine **adjuvant effects** in combination with chemotherapy, not standalone effects. Observational studies frequently show **associations** (e.g., between mushroom consumption and immune markers) but do not establish causality. The evidence base on long-term effects or specific diseases remains still emerging.

4. Common Claims — and What the Data Show

STATEMENT	EVIDENCE
	Controlled studies demonstrate changes in immune markers (e.g., NK cells, cytokines), but no clinically relevant strengthening of the immune system. Most data are from cell culture and animal studies.
	Cell culture and animal studies demonstrate antioxidant effects; however, in humans, only short-term changes in markers (e.g., MDA, SOD) have been observed.

STATEMENT	EVIDENCE
Medicinal mushrooms have been investigated for improving cognitive performance; the results are inconsistent	Few controlled studies examine cognitive effects, most with small sample sizes and short intervention periods. The results are not consistent and do not permit
Medicinal mushrooms have been studied for lowering blood sugar; the results are inconsistent	Metabolic studies indicate slightly improved glucose levels in controlled settings, but no clinically relevant effect. The data are still emerging and methodologic

5. Profile: Molecule and Charge

Medicinal mushrooms (Reishi, Chaga, Cordyceps) are not a single molecule but a **mixture** — there is no molecular formula and no fixed molecular mass. What can be described are functional groups, charge behaviour, and redox properties; these are the focus of the next section.

6. Charge, Electrons, Radicals

In humans, an increased capacity to bind free radicals in serum was measured after physical exertion, suggesting antioxidant effects. DPPH radical scavenging activity in serum increased after three months of mushroom supplement intake ²³. Additionally, a protective function against oxidative stress in athletes was documented ²³. In human tissue, extracts from *Inonotus obliquus* demonstrated radical scavenging ability at concentrations as low as 5 µg/ml ²⁵. Polysaccharides from mushrooms reduced reactive oxygen species (ROS) and malondialdehyde (MDA) in skin fibroblasts ²⁶ and activated the Keap1-Nrf2/ARE signalling pathway, which is involved in the regulation of oxidative processes ²⁶.

In silico studies calculated binding energies of -5.948 to -6.291 kcal/mol for certain mushroom metabolites such as ganodermanontriol or ganoderic acid C2, suggesting potential interactions with proteases ²². In cell cultures, a mushroom extract selectively induced oxidative DNA damage in colorectal cancer cells, while protecting non-malignant cells from ROS accumulation ²⁴. Whether these effects are due to direct electron transfer or cation exchange has not yet been directly measured in humans.

7. Interactions with Other Substances

Substances with which this compound has been **jointly** investigated or discussed in human studies and review articles — combinations, comparisons, or shared mechanisms of action. The number indicates studies in which both appear.

SUBSTANCE	SHARED STUDIES	OF WHICH CONTROLLED IN HUMANS
Adaptogens	148	30
Chronic inflammation	88	11
Beta-glucans	47	12
Hericium (Lion's Mane)	30	0
Stress, cortisol, and inflammation	27	7
Gut microbiome	25	3
Turmeric and curcumin	14	1
Green tea and EGCG	6	1
Therapeutic fasting and intermittent fasting	5	4
Dietary fibre and psyllium husk	5	0

Fungal polysaccharides and other bioactive compounds from medicinal mushrooms may interact with medications, particularly when used concurrently with chemotherapeutic agents. In a controlled human study, *Antrodia cinnamomea* was combined with chemotherapy without demonstrating a significant improvement in outcomes for advanced cancer. However, a trend towards lower mortality and longer median overall survival (OS) was observed in the combination group, suggesting possible synergistic effects ²⁷. Systematic reviews of *Ganoderma lucidum* (Lingzhi) and *Coriolus versicolor* (Yunzhi) describe their frequent combination with cytotoxic cancer drugs in Asian countries. These reviews highlight potential interactions via enzymes such as cytochrome P450 (CYP) and drug transporters, which could influence pharmacokinetics ^{28 31}.

Laboratory and animal studies indicate that **bioactive compounds** derived from *Ganoderma lucidum* may enhance the effects of cyclophosphamide, such as in inhibiting breast cancer metastases. At high concentrations, no significant toxicities were observed ^{30 30}. Isolated observations suggest synergistic effects with conventional antibiotics, though this requires further clinical investigation ²⁹. The identification of active components such as ganoderic acid H underscores the potential for targeted interactions, including the modulation of interferon- α ³².

8. Overdose, Tolerability, and Limits

Limited data from controlled human studies are available on overdose, toxicity, and upper limits of medicinal mushrooms (including Reishi). In one study, participants received 2 grams of Reishi extract twice daily for 10 days without severe adverse effects or signs of liver or kidney toxicity ¹². Another investigation involving 4 weeks of Reishi intake (dose unspecified) showed no significant changes in liver or kidney function markers ². In a study with cancer patients, Reishi extract (dose not specified) did not result in abnormal elevations of serum creatinine or liver enzymes ¹⁶. Adverse effects were described as mild to moderate (grade ≤ 2), including nausea, vomiting, diarrhoea, and muscle pain ¹⁵. A study involving a Reishi and privet formula in lung cancer patients undergoing chemotherapy (n=82) found no differences in the frequency of adverse events between the verum and placebo groups ^{17 17}.

Contraindications cannot be explicitly derived from the available studies. In patients with rheumatoid arthritis, 8 episodes of mild adverse effects occurred with Reishi (dose unspecified), compared with 14 in the placebo group ⁵. In cancer patients (n=37), no severe adverse events were documented, though without detailed dosage information ²⁷. No animal or tissue studies on toxicity or contraindications are included in the available evidence. Further research on long-term use and dose-response relationships would be necessary.

9. The Most Robust Studies

Ranked by evidential strength, not by prominence. The full evaluation includes significantly more studies; only the most reliable are listed here.

Controlled Human Studies

- ¹ Anticancer effects of *Ganoderma lucidum*: a review of scientific evidence (2005)
- ² *Ganoderma lucidum* ("Lingzhi"), a Chinese medicinal mushroom: biomarker responses in a controlled human supplementation study (2004)
- ³ *Ganoderma lucidum* (Reishi mushroom) for cancer treatment (2016)
- ⁴ Triterpenoids and polysaccharide peptides-enriched *Ganoderma lucidum*: a randomised, double-blind placebo-controlled crossover study of its antioxidant effects (2017)
- ⁵ Safety and efficacy of *Ganoderma lucidum* (lingzhi) and San Miao San supplementation in patients with rheumatoid arthritis: a double-blind, randomised, placebo-controlled trial (2007)
- ⁶ Significance of Medicinal Mushrooms in Integrative Oncology: A Narrative Review (2020)
- ⁷ β -glucans from *Grifola frondosa* and *Ganoderma lucidum* in breast cancer: an example of complementary and integrative medicine (2018)
- ⁸ Study of potential cardioprotective effects of *Ganoderma lucidum* (Lingzhi): results of a controlled human intervention trial (2012)
- ⁹ *Ganoderma lucidum* (Reishi mushroom) for cancer treatment (2012)
- The effects of a pre-workout supplement containing caffeine, creatine, and amino acids during three weeks of high-intensity exercise on aerobic and anaerobic performance (2010)
- ¹⁰ A randomised, double-blind and placebo-controlled study of a *Ganoderma lucidum* polysaccharide extract in neurasthenia (2005)
- ¹¹ *Ganoderma lucidum* ('Lingzhi'); acute and short-term biomarker response to supplementation (2004)
- ¹² Safety and tolerability of *Ganoderma lucidum* in healthy subjects: a double-blind randomised placebo-controlled trial (2007)
- A preliminary randomised controlled study of short-term *Antrodia cinnamomea* treatment combined with chemotherapy for patients with advanced cancer (2016)
- ¹³ Randomised clinical trial of an ethanol extract of *Ganoderma lucidum* in men with lower urinary tract symptoms (2008)
- ¹⁴ *Ganoderma lucidum* mushroom for the treatment of cardiovascular risk factors (2015)
- ¹⁵ Medicinal Mushroom Supplements in Cancer: A Systematic Review of Clinical Studies (2023)
- ¹⁶ Randomised Clinical Trial for the Evaluation of Immune Modulation by Yogurt Enriched with β -Glucans from Lingzhi or Reishi Medicinal Mushroom, *Ganoderma lucidum* (2018)
- ¹⁷ Preliminary Efficacy and Safety of Reishi & Privet Formula on Quality of Life Among Non-Small Cell Lung Cancer Patients Undergoing Chemotherapy: A Randomised Clinical Trial (2020)
- ¹⁸ Control of Oral Human Papillomavirus (HPV) by Medicinal Mushrooms, *Trametes versicolor* and *Ganoderma lucidum*: A Preliminary Clinical Trial (2014)
- ¹⁹ Effect of an Extract of *Ganoderma lucidum* in Men with Lower Urinary Tract Symptoms: A Double-Blind, Placebo-Controlled Randomised and Dose-Ranging Study (2008)

- ²⁰ The Nutritional Significance of *Ganoderma lucidum* on Human Health: A GRADE-Assessed Systematic Review and Meta-Analysis of Clinical Studies (2025)
- *Agaricus blazei* Murrill and Inflammatory Mediators in Elderly Women: A Randomised Clinical Trial (2012)
- ²¹ Spore Powder of *Ganoderma lucidum* for Alzheimer's Disease: A Protocol for Systematic Review (2019)

10. Summary

Clinical research on medicinal mushrooms focuses on safety, immunomodulatory effects, and supportive applications in oncology. Controlled studies confirm the good tolerability of *Ganoderma lucidum* (Reishi) and demonstrate significant increases in lymphocyte populations, suggesting an immunostimulatory effect. In oncology, there is evidence of improved quality of life and immune responses in cancer patients, though no sufficient proof of a direct antitumour effect exists. Studies on inflammatory processes or oxidative stress are limited and often show no significant effects on clinical endpoints. The evidence base regarding metabolism or the microbiome is inadequate, and many studies exhibit methodological shortcomings that limit their validity.

HYPOTHESIS The preclinical effects observed with medicinal mushrooms, particularly *Ganoderma lucidum*, suggest that fungal polysaccharides and triterpenoids may utilise similar immunomodulatory or antioxidant mechanisms. The activation of the Nrf2/ARE signalling pathway or stimulation of NK cells by fungal polysaccharides could also be relevant for other bioactive compounds in medicinal mushrooms. In oncology, medicinal mushrooms may act synergistically with conventional therapies by enhancing immune responses or reducing side effects. However, direct comparative studies are lacking to substantiate the transferability of these effects to other fungal derivatives. The observed improvements in quality of life may stem from indirect effects such as anti-inflammatory activity or microbiome modulation, which would also be plausible for other fungal bioactive compounds.

To clarify the clinical relevance of medicinal mushrooms, large-scale, homogeneous randomised controlled trials (RCTs) with clearly defined endpoints are required. In oncology, studies should examine progression-free survival, response rates, and immunological parameters using standardised extracts. For inflammatory diseases, RCTs with clear inflammatory markers (e.g., CRP, cytokines) and defined patient groups (e.g., rheumatoid arthritis) are necessary. Studies on oxidative stress should measure markers such as MDA or carbonyls in specific conditions (e.g., diabetes, cardiovascular diseases). Long-term studies with standardised preparations and clear safety profiles are essential to justify their use in clinical practice.

11. Unresolved Questions

- **Long-term safety:** It remains unclear whether regular intake over several years is safe. Existing safety studies have short durations.
- **Interactions:** Potential interactions with immunosuppressants or chemotherapeutic agents have not been systematically investigated.
- **Standardisation:** The lack of uniform extraction methods complicates the comparability of studies and their applicability in practice.

12. Further Paths

Topics, mechanisms and chains in which this substance appears — for those who want to look beyond the substance.

- Interaction network

Frequently Asked Questions

Can medicinal mushrooms be used during chemotherapy?

Controlled studies typically examine medicinal mushrooms as **adjuvant therapy** in combination with chemotherapy. These occasionally demonstrate **improvements in quality of life** or immune parameters, but no direct effects on tumour growth or survival time. The evidence base is limited, and potential **interactions** (e.g., with immunomodulators) are insufficiently studied. Any use should only occur under medical supervision.

Which extract form is best studied?

Most controlled studies use **standardised extracts** of Reishi (*Ganoderma lucidum*), particularly aqueous or alcoholic extracts with defined polysaccharide or triterpene content. Traditional preparations (e.g., teas) are less frequently studied and more variable in composition. Chaga and Cordyceps are far less represented in clinical trials.

Are there differences between the mushroom species?

Reishi is the most extensively studied, with a focus on **immunomodulation and oncology**. Cordyceps is primarily examined in studies on **fatigue and metabolism**, whereas Chaga is almost exclusively investigated in **cell culture or animal studies**. Direct comparisons between species are lacking, and most studies investigate only one type—combinations are scarcely researched.

Sources

- 1 Anticancer effects of *Ganoderma lucidum*: a review of scientific evidence
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