

## The relationship between *Ganoderma lucidum* and long-term use in diabetes -review

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**ABSTRACT:** This report evaluates the therapeutic potential and safety of Ganoderma lucidum (Lingzhi) in managing Type 2 Diabetes Mellitus (T2DM). The primary bioactive components, polysaccharides (GLP), demonstrate hypoglycemic effects by enhancing antioxidant enzyme activity and modulating apoptosis-related proteins (eg, bcl-2) to protect pancreatic beta-cells. Clinical studies indicate that 12 weeks of supplementation with Lingzhi extracts significantly reduces hemoglobin A1c (HbA1c) and fasting blood glucose levels.

From a safety perspective, Lingzhi is traditionally classified as a non-toxic "superior herb" with benefits in preventing cardiovascular complications. While generally well-tolerated, some users may experience temporary "healing reactions" or potential anticoagulation effects during long-term use. Experts emphasize that Lingzhi should serve as a complementary

therapy and must not replace conventional pharmacological treatments.

The relationship between *Ganoderma lucidum* and diabetes is mainly reflected in the effects of its active ingredients (especially polysaccharides) on lowering blood sugar, regulating insulin secretion, and protecting the pancreas.

Analysis of the relationship between *Ganoderma lucidum* and diabetes

### **1. Hypoglycemic active ingredients and mechanisms**

Polysaccharides in *Ganoderma lucidum* have been shown to have significant hypoglycemic pharmacological effects. Specifically, Ganoderan A, B, and C, purified from hot water extracts of *Ganoderma lucidum* fruiting bodies, have been shown to significantly reduce blood glucose levels in mice in animal experiments [1, 2]. In addition, *Ganoderma lucidum* polysaccharides (GLP) can also enhance the activity of antioxidant enzymes in the pancreas by regulating the expression of bcl-2 protein and the bax/bcl-2 ratio, which are related to apoptosis, thereby reducing oxidative damage to the pancreas and inhibiting pancreatic cell apoptosis, thus protecting pancreatic function [3, 4].

### **2. Clinical research evidence**

Clinical trials have provided substantial evidence for patients with type 2 diabetes. A study of 71 subjects showed that after 12 weeks of continuous use of *Ganoderma lucidum* polysaccharide extract products (such as Ganopoly), the average glycosylated hemoglobin (HbA1c) of the patients decreased significantly from 8.4% to 7.6% [4, 5]. In addition, the patients' fasting blood glucose, 2-hour postprandial blood glucose and insulin levels all showed consistent improvement [5]. As early as the 1970s, clinical reports in mainland China also pointed out that *Ganoderma lucidum* preparations have good efficacy for diabetes [6].

### **3. Traditional Pharmacology and Modern Applications**

In traditional literature, Shennong's Classic of Materia Medica and Compendium of Materia Medica list *Ganoderma lucidum* as a "superior medicine". It is sweet, warm and non-toxic, and suitable for long-term use to regulate physiological functions [8].

Modern research on drug use indicates that wild *Ganoderma lucidum* (red *Ganoderma* or purple *Ganoderma*) can assist in the treatment of diabetes and has the function of lowering cholesterol and triglycerides, which helps prevent cardiovascular complications related to diabetes [7].

Analysis of the effects of long-term *Ganoderma lucidum* use on patients with type 2 diabetes.

## **1. Safety and long-term toxicity assessment**

In traditional and modern scientific assessments, *Ganoderma lucidum* is generally regarded as a highly safe medicinal material. According to the *Shennong Materia Medica*, *Ganoderma lucidum* is listed as a "superior" herb, which is sweet, warm and non-toxic, and it is emphasized that "it does not harm people when taken in large quantities or for a long time" and has the effect of nourishing vital energy and prolonging life [8]. Modern toxicological studies also support this view. Tests on *Ganoderma lucidum* spores show that they are not mutagenic; in a 28-day feeding experiment on rats, no obvious abnormalities were found in the biochemical indicators and organ pathological examinations of the tested animals [6, 9].

Clinical studies on patients with type 2 diabetes have shown that after taking Ganopoly extract (such as Ganopoly) for 12 weeks, in addition to the improvement of blood glucose levels, the subjects showed good tolerability and safety [4, 5].

## **2. The protective mechanism of *Ganoderma lucidum* on the pancreas**

The specific mechanism by which *Ganoderma lucidum* protects the pancreas from oxidative damage is mainly achieved through its polysaccharides (GLP):

- Enhance the antioxidant system: increase the activity of antioxidant enzymes in the pancreas and scavenge free radicals [3, 4].
- Inhibit apoptosis: Protect pancreatic cells from programmed cell death by increasing the expression of bcl-2 protein and adjusting the bax/bcl-2 ratio.
- Reduce lipid peroxidation: alleviate the damage to cell membranes caused by oxidative stress [3, 4].

### 3. Possible reactions and side effects

Although *Ganoderma lucidum* has a high safety profile, the following reactions may still occur during long-term use:

- Herxheimer reaction (healing reaction): Some patients may experience temporary diarrhea, dry mouth, flatulence or urticaria in the early stage [10].
- General effects and coagulation risks: According to information collected from Japanese studies, long-term use may lead to loss of appetite, or nosebleeds, bloody stools and other phenomena that affect coagulation function [11].
- Drug interactions: *Ganoderma lucidum* has immunomodulatory functions and may interact with immunosuppressants or biological agents, thereby affecting drug efficacy.

### 4. Expert Recommendations and Verification of Anti-Aging Efforts

Experts emphasize that *Ganoderma lucidum* should be used as an "adjunctive therapy" and diabetic patients should not stop taking Western medicine treatment without authorization (An Qinzhi, 2016). In terms of delaying aging, although human trials have confirmed that taking *Ganoderma lucidum* can enhance total antioxidant capacity and improve liver function (GPT/GOT), the main basis for Taiwan's "delaying aging" certification is still animal experimental data, labeled as "helping to increase the survival rate of aging mice" [12, 13].

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