



# Ganoderma lucidum: A promising anti-inflammatory medicinal plant

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## ABSTRACT

Inflammation is a complex process and part of the host immune defense against invading micro-organism or trauma. Over production of some pro-inflammatory mediators can lead to chronic diseases of the inflammatory origin. Medicinal Plants which are used as anti-inflammatory agents, mainly act affecting various stages of the process of inflammation. In general they can inhibit formation of a wide of mediators such as cytokines by immune cells to prevent the inflammatory reaction cascade from starting. The use of most of the medicinal plants in treatment of chronic disease of the inflammatory origin is based on clinical and pharmacological trials. Meanwhile, the use of most of them is based on their longstanding traditional use in folk medicine. In this review, we report some of anti-inflammatory effects of *G. lucidum* as an ancient Chinese herbal medicine.

### Implication for health policy/practice/research/medical education:

*Ganoderma lucidum* seems to be useful as an anti-inflammatory medicinal plant. Therefore, more preclinical and clinical studies are recommended to elucidate its beneficial and risk effects in different conditions.

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## Introduction

Inflammation is an unpleasant process familiar to everyone. It occurs in response to a wide range of sunburn, wounds, trauma, infection and auto immune conditions. Inflammation is characterized by four physical clear signs of warmth, redness, pain and swelling (1-3). Indeed, an immunological mechanism which plays an important role in the pathogenesis of diseases of the inflammatory origin, is related to activation and interactions of different immune cells, resulting to over production of mediators (4). Therefore, the main goal in treatment with medicinal plant is looking for those of them with inhibitory effect on the production of pro-inflammatory mediators by immune cells.

Many plants have been known with inhibitory effects on

inflammation and anti-arthritis properties. In general, medicinal plants as whole reduces much of inflammation (5,6). *Ganoderma lucidum* (*G. lucidum*), a traditional Chinese medicinal herb, has been studied in many area during last two decades. Different compounds of *G. lucidum* extracts exert variable immunological effects. Selenium nano-particles decorated by sulfated *Ganoderma lucidum* polysaccharides has been shown to inhibit LPS-stimulated nitric oxide (NO) production by macrophages and down regulated mRNA gene expressions of pro-inflammatory cytokines including inducible NO synthase (iNOS), interleukin-1(IL-1) and TNF- $\alpha$  in a dose dependent manner. On the other hand, the anti-inflammatory cytokine IL-10 has been markedly increased under Selenium nano-particles treatment (7,8).

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In this regard some scientist believed that polysaccharides compounds of *G. lucidum* is responsible for anti-inflammatory and anti-tumor activities (9). There is also reports showing that polysaccharide from *G. lucidum* can increase the release of tumor necrosis factor and interferon (IFN) from macrophages and lymphocytes (10). Another compound named water-insoluble B 1,3 D-glucan extracted from the fruit body of *G. lucidum* has been shown to significantly down regulate the inducible nitric oxide synthetase and TNF- $\alpha$  mRNA gene expression (11). In addition to anti-inflammatory effects *G. lucidum*, there are some reports demonstrating its adjuvant effects. Chan *et al.* (12) reported that *G. lucidum* enhanced maturation of DC by upregulating CD40, CD80, and CD86 markers. Lin *et al.* (13), also showed that costimulatory molecules CD40, CD54, CD80, and CD86 of human dendritic cells increased in response to *G. lucidum*. In support of above mentioned adjuvant effect of *G. lucidum*, Ahmadi and Riazipour (14), demonstrated the up expression of CD40/CD86 on peripheral blood monocytes. In conclusion, *G. lucidum* seems to be useful as an anti-inflammatory medicinal plant. Therefore, more preclinical and clinical studies are recommended to more elucidate its beneficial and risk effects in different conditions.

#### Authors' contributions

All the authors wrote the manuscript equally.

#### Conflict of interests

The authors declared no competing interests.

#### Ethical considerations

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#### References

- Ikeda Y, Murakami A, Ohigashi H. Ursolic acid: an anti- and pro-inflammatory triterpenoid. *Mol Nutr Food Res* 2008;52:26–42.
- Choy EHS, Panayi GS. Cytokine Pathways and Joint inflammation in rheumatoid arthritis. *N Engl J Med* 2001;344(12):907-16.
- Guo LK, LUO SZ, Liao QH, Lai RG, Liu XL, Liu LJ, et al. Correlation study of auto-immune antibodies and rheumatoid arthritis patients of shen deficiency syndrome. *Zhongguo Zhong Xi Yi Jie He Za Zhi* 2013;33(5):619-22.
- Aries MF, Vaissiere C, Fabre B, Charveron M, Gall Y. Avena rhealba inhibits arachidonic acid cascade, CPLA2 and COX expression in human keratinocytes. Interest in cutaneous inflammatory disorders. *J Invest Dermatol* 2003; 121 JID abstract 0046.
- Skrovankova S, Misurcova L, Machu L. Antioxidant activity and protecting health effects of common medicinal plants. *Adv Food Nutr Res* 2012;67:75-139.
- Recio MC, Andujar I, Rios JL. Anti-inflammatory agents from plants: progress and potential. *Curr Med Chem* 2012;19(14):2088-103.
- Ding H, Zhou M, Zhang RP, Xu SL. Ganoderma lucidum extract protects dopaminergic neurons through inhibiting the production of inflammatory mediators by activated microglial. *Sheng Li Xue Bao* 2010;62(6):547-54.
- Wang J, Zhang Y, Yuan Y, Yue T. Immunomodulatory of Selenium nano-particles decorated by sulfated Ganoderma Lucidum polysaccharides. *Food Chem Toxicol* 2014;14:120-3.
- Joseph S, Sabulal B, George V, Antony KR, Janardhanan KK. Antitumor and anti-inflammatory activities of polysaccharides isolated from Ganoderma lucidum. *Acta Pharm* 2011; 61(3):335-42.
- Lee SS, Wei YH, Chen CF, Wang SY, Chen KY. Anti tumor effects of Ganoderma lucidum . *J Clin Med* 1995; 6:1-12.
- Wang J, Yuan Y, Yue T. Immunostimulatory activities of B-d-glucan from ganoderma lucidum. *Carbohydr Polym* 2014; 102: 47-54.
- Chan WK, Lam DT, Law HK, Wong WT, Koo MW, Lau AS, *et al.* Ganoderma lucidum mycelium and spore extracts as natural adjuvants for immunotherapy. *J Altern Complement Med* 2005;11:1047-57.
- Lin YL, Lee SS, Hou SM, Chiang BL. Polysaccharide purified from Ganoderma lucidum induces gene expression changes in human dendritic cells and promotes T helper 1 immune response in BALB/c Mice. *Mol Pharmacol* 2006;70:637–44.
- Ahmadi K, Riazipour M. Ganoderma lucidum induces the expression of CD40/CD86 on peripheral B blood monocytes. *Iran J Immunol* 2009; 6(2): 87-91.