

A comparison of the gene expression profiles and pathway network analyses after treatment of Prostate cancer cell lines with different *Ganoderma lucidum* based extracts.

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ABSTRACT

Background: *Ganoderma lucidum* is a type of fungus commonly consumed in Asia for the promotion of health and longevity. The observed biological activity of *G. lucidum* includes anti-cancer and anti-inflammatory effects which may be useful in the treatment and prevention of cancer and other chronic diseases. *G. lucidum* grows under conditions which range from tropical to temperate and has a different physiology depending on the geographical region in which it is grown. For this reason, the health benefits may vary depending on the form of *G. lucidum* and the environmental conditions to which it was exposed. This led us to investigate the effect of wildy grown *G. lucidum*, from the Himalayan region versus other commercially available *G. lucidum* products, on two human cancer cell lines.

Methods: Extraction of the bioactive components found in *G. lucidum* is essential, as the fungus is tough and indigestible. Four different Ganoderma extracts were prepared. Thereafter, the extracts were tested on two human prostate cancer cell lines, and the IC₅₀s were determined. This was followed by the use of Affymetrix GeneChip® PrimeView™ Human Gene Expression Arrays to identify the changes in gene expression due to the treatment of prostate cancer cell lines (PC3 and DU145) with Ganoderma extracts. Several key genes identified with Affymetrix analysis were validated using RT-PCR.

Results and Discussion: We found that all the Ganoderma extracts showed growth inhibition in the cancer cell lines tested. Using Affymetrix microarray analysis, we identified four main biologically active pathways: cell cycle control/apoptosis, cell-cell adhesion, DNA repair, and inflammatory /immune response, where activity was influenced

by the Ganoderma extracts used. Using RT-PCR, we tested ten genes associated with all four pathways. The RT-PCR results supported our findings in the Affymetrix analysis, i.e. that *G. lucidum* extracts have an anti-inflammatory and cell cycle effect and therefore may have long term health benefits. These effects were specific to the extract tested.

Key Words: *Ganoderma lucidum*, PC3, DU145, gene expression, Affymetrix, pathways, RT-PCR