

Combined Use of *Ganoderma lucidum* ReishiMax and Tea Polyphenols Tegreen Inhibits Tumor Growth Synergistically in Cancer-Bearing Mice

Yan Zhang, Li Zhang, Ningzhi Tan, Ying Qi, Ling Gao, Jia-Shi Zhu

Pharmanex Beijing Clinical Pharmacology Center, Beijing, China; Pharmanex Shanghai R&D Center, Shanghai, China; Pharmanex Research Institute, Provo, UT, USA



Abstract

Ganoderma lucidum (Reishi) and green tea are commonly used in China for cancer prevention and adjuvant therapy. A screening revealed superior anti-malignancy activities of ReishiMax (RM) among commercial Reishi products (JACM 9:491, 2003). Synergy of RM and Tegreen (TG; containing >98% tea polyphenols) was found in anti-cancer in human breast and prostate cancer cells (Int'l J Oncol 30:963, 2007). Further screening showed that fucose-containing polysaccharides are highly enriched in RM (0.34%), the class of polysaccharides demonstrating high immune enhancing activities (Bioorg Med Chem 10:1050, 2002). They are much less (0.04-0.20%) in other Reishi products. In addition to the survival studies in cancer mice (FASEB J 21:A1100, 2007), we tested synergy of RM and TG in inhibiting tumor growth in sarcoma-bearing mice. After 28-day treatment, RM+TG significantly decreased tumor weight by 45% in S180-innucleated mice, compared to controls (p<0.05). The data further confirmed the previous finding of synergy of RM and TG in anti-malignancy, indicating their therapeutic values in cancer prevention and adjuvant treatment.

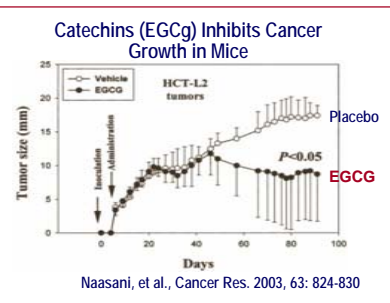
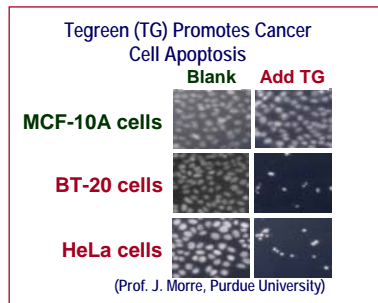
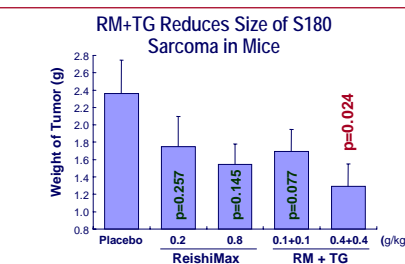
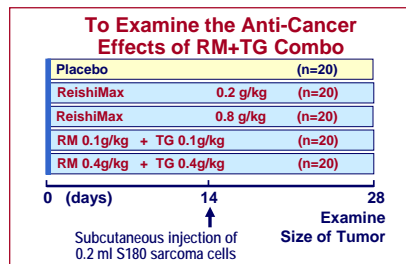
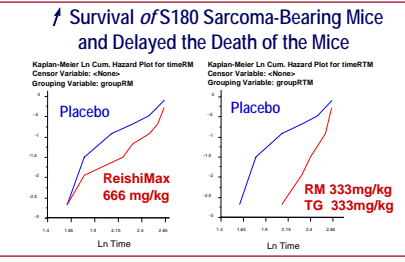
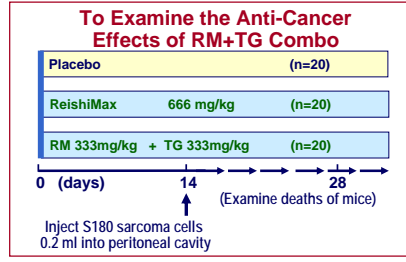
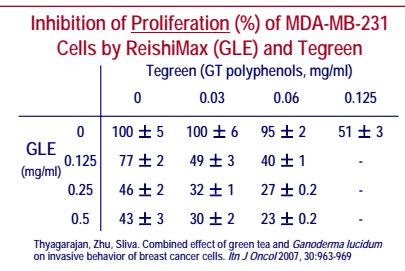
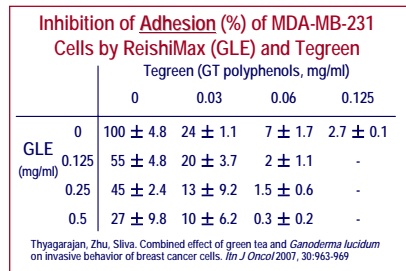
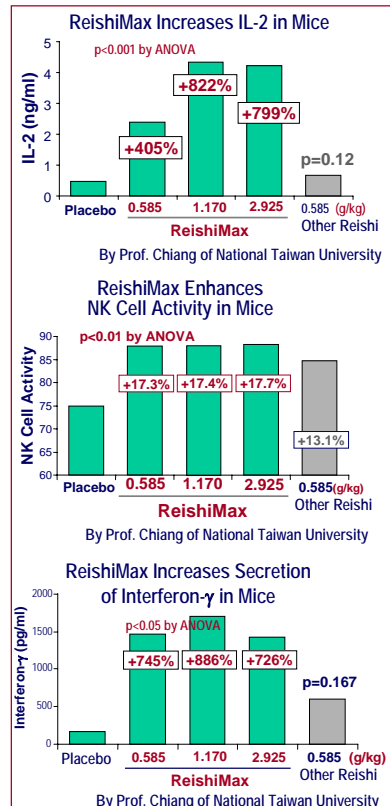
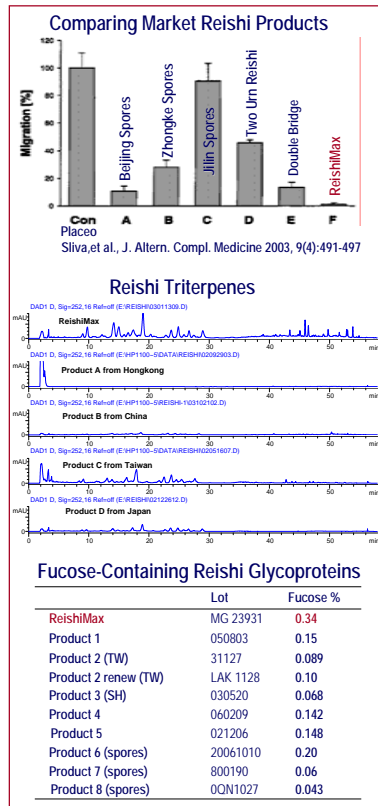
Scientific Background

◆ *Ganoderma lucidum* (GL) and Green Tea are precious medicinal herbs and have broad nutritional and health benefits. They have been used in china for >2000 years, including for anti-cancer adjuvant treatment.

◆ ReishiMax (RM), an extract of GL, contains high concentrations of active chemicals: triterpenes (Ma et al. *J Nat Prod* 2002, 65:72) and Fucose-containing glycoproteins (Wang et al. *Bioorg Med Chem* 2002, 10:1057).

◆ Tegreen (TG) contains >98% tea polyphenols, ~70% tea catechins, the major anti-cancer chemicals (Cooper and Morre 2005, 11:521).

◆ Synergy of RM and TG in anti-cancer was shown *in vitro* (Thyagarajan, Zhu, Sliva *Int'l J Oncol* 2007, 30:963).



Summary and Conclusions

◆ ReishiMax maintains the healthy immune functions:

- ↑ the activity of macrophages
- ↑ proliferation of B cells, and T cells
- ↑ T cell functions (↑Th1, ↓Th2)
- ↑ the NK cell functions
- ↑ secretion of Interferon-γ

◆ Tegreen keeps the normal cell health:

- ↑ Apoptosis of mutant cells
- ↑ Angiogenesis

◆ Synergy of ReishiMax and Tegreen in anti-cancer *in vitro*

- ↓ Cancer cell proliferation
- ↓ Cancer cell invasive behaviors
- ↓ Cancer cell migration
- ↓ Angiogenesis

◆ Synergy of ReishiMax and Tegreen in anti-malignancy *in vivo*

- ↑ Survival time
- ↓ Cancer death risks