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Feasibility of Integrating Tripterygium wilfordii into Modern Cancer Therapy for Increased Efficacy and Minimal Toxicity

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Feasibility of Integrating *T. wilfordii* into Modern Cancer Therapy for Increased Efficacy and Minimal Toxicity

Ngoc Vo, Biomedical Engineering – Prof. Mary Boyes, VCU Honors College

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**Introduction**

- Diseases are becoming more resistance to the drugs that are used in the market today. Current solution to such problems is to develop strong and more powerful drugs to combat the disease.
- However, accompanying these powerful drugs are adverse side effects that is proportional to the effectiveness of the drug.
- According to the CDC, cancer is the second leading cause of death in the U.S, and the American Cancer Society reported that millions of new cancer cases are being diagnosed each year.
- Current cancer treatments are chemotherapy and ionizing radiation.
- Adverse effects are hair loss, extraneous damage to healthy cells, decreased immunity, etc.
- In order to find alternative treatment methods with less side effects, we turn to Eastern medicine.

**Table 1. Eastern Medicine vs. Western Medicine**

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- *Tripeterygium wilfordii*, an herbal medicine traditionally used to treat inflammation in China, contains compounds (tripotolide and celastrol) that prevent the growth of solid tumors, induce apoptosis, and prevent metastasis of developed tumors.
- Studies of tripotolide and celastrol on various cancer cells lines (in vitro and in vivo) have revealed some information about their mechanism (mode of action) and toxicity.

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**Findings**

**Therapeutic Effects of Tripotolide**
- Inhibits growth of 4 solid tumors (B16 mouse melanoma, MDA-435 human breast cancer, TSU bladder cancer, and MGC80-3 gastric cancer). Individual effects varies between cell lines, showing cell specificity (Yang et al.).
- Kiviharju et al. had similar results when studying tripotolide in prostatic epithelial tumors.
- Inhibit vessel formation by nearly 50% at 1.2 μM (He et al.).
- Yang et al. also found that after 3 days of treatment, there was a significant reduction in proteins and molecules for cell cycle progress. Kiviharju et al. found similar results in prostatic cancer cells. Tripotolide increased apoptosis rate slightly after 24h and significantly after 48h.

**Therapeutic Effects of Celastrol**
- Celastrol cause cell cycle arrest at low concentration and quickly induce apoptosis at higher concentrations above 800 nM (Peng et al.).
- Peng et al. also found that celastrol increased numbers of cell in G0/G1 starting at concentration of 400 nM.
- Celastrol inhibits VEGF in HUVECs cells at concentration of 1-2 μM (Pang et al.).

**Synergy**
- Other studies have also found that tripotolide and celastrol can potentiate the effects of current cancer treatment (chemotherapy and IR) at low dosages, thus lessening the adverse effects.

**Toxicity & Adverse Effects**
- Tripotolide causes “severe toxicities towards the gastrointestinal, renal, cardiac, hepatic, hematopoietic, and reproductive systems” (Liu et al.).
- No adverse reactions have been found to be associated with celastrol.

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**Conclusion**

- Potent drugs are being developed to combat diseases with growing resistance for current prescription, and adverse effects induced are proportional to strength of drug.
- The approach taken to rectify this problem is to look for alternative treatment methods in Eastern medicine. This study is conducted on *T. wilfordii* and its anti-cancer effects.
- The bioactive compounds within the plant roots have demonstrated strong anti-cancer effects, but they can induce detrimental side effects.
- Proposed solution is to use a crude extract of the roots as a treatment for cancer.
- If the results are undesirable, then research should be taken in the direction of producing combination drugs containing tripotolide and/or celastrol with selected non-bioactive compounds in the plant.

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**References**


