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Comparison of the in vitro and in vivo toxic effects of thymoquinone using oral cancer HSC-3 and HSC-4 cell lines, oral fibroblasts, HACAT cell line, and Zebrafish embryos

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Abstract
The discovery and development of anticancer agents were made through long processes from screening new compounds in various cell lines, animal experimental studies, until clinical trials Majority of cancer chemotherapeutic agents have been initially screened in an in vitro cell-based system and then subsequently studied in an in vivo model using small animals destined for pharmacokinetic properties. Zebrafish (Danio rerio) has become one of the most popular animal model systems used for chemical toxicity tests and drug discovery. Thymoquinone (TQ) is the main constituent of black seed (Nigella sativa, spp) essential oil which shows anti-neoplastic activities in various tumor cells. However, to date, studies on the toxicity of TQ on normal cells or animal model are still insufficient. Here we report that TQ is selective toxic to different human cell lines and show negligible effect on the Zebrafish. The MTT assay demonstrated that TQ induced cytotoxicity on oral cancer cells (HSC-3 and HSC-4) but not on the normal cells (human oral fibroblast and HACAT cells). Moreover, no significant morphological change was observed in the Zebrafish model following TQ exposure at the concentration (0.003 mg/mL), similar to those in the cancer cells. The study suggests that TQ as a cancer chemotherapeutic candidate without apparent adverse effects.

Author Keywords
Chemotherapy, toxicity screening; Human cell lines; Nigella sativa; Thymoquinone; Zebrafish

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