

***In vitro* evaluation of the effects of *Viscum album* homeopathic preparations on murine melanoma cells**

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ABSTRACT

Background: *Viscum album* extract (VA) is a complementary treatment in cancer, with *in vitro* and *in vivo* cytotoxic effects on several tumor types when applied in phytochemical doses. However, highly diluted ethanolic homeopathic preparations' effects and mechanisms need further study.

Aims: To assess the *in vitro* effects of highly diluted VA from the subspecies *V. album abietis* and *V. album album* at different potency levels in different dilution ratios on murine melanoma cells.

Methodology: The VA mother tinctures (MT) from *Abies alba* (MTA) and *Quercus robur* (MTQ) were prepared with summer and winter samples, harvested in Switzerland. They were submitted to homeopathic ethanolic maceration and a subsequent dynamization process. MTA, MTQ and the following respective potencies were tested in B16F10 murine cells: 3x, 12x, 30x, 6cH, 12cH, 200cH, 2LM, 3LM, and 5LM. Dynamized water, dynamized and non-dynamized ethanol, and carboplatin were used as control groups. The mitochondrial activity and cell viability analysis were performed at 1, 24, 48, and 72 hours by *in vitro* incubation. MTA and MTQ harvested in summer, as well as 12x, 200cH and 5LM potencies were also tested to cell apoptosis and necrosis markers, reactive oxygens species (ROS) production, inflammatory cytokines profile, cell morphology, and migratory capacity.

Results and discussion: MTA and MTQ induced a decrease in cell metabolism and higher cytotoxicity within 1 hour, with significant morphological changes and increased production of ROS and inflammatory cytokines. Both homeopathic dilutions 12x and 5LM showed an influence on cell metabolism, cell replication, and oxidative stress modulation with inflammatory cytokines, mitosis, and migration pattern changes. On the other hand, *Quercus robur* and *Abies alba* 200cH showed increased on cytotoxicity and ROS levels, respectively.

Conclusion: The *in vitro* effects of *Viscum album* homeopathic solutions in melanoma cells highlight the promising antitumoral potential and reinforce the need for further research to better understanding their mechanisms of action.

Keywords: Mistletoe, *Viscum album*, *Abies alba*, *Quercus robur*, high dilutions, antitumoral potential.