A237 Evaluation of toxic and protective effects of an essential oil of *Salvia officinalis* L. on liver cells

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The widespread use of sage (*Salvia officinalis* L.) in herbal teas and as a food condiment requires that studies of their biological effects are conducted in order to prevent ill effects on human health. It is known that the essential oil (EO) of this plant is neurotoxic, but in higher concentrations than those used in the applications referred above.

In this study we have isolated and characterized the EO of *S. officinalis* and studied its toxic/protective effects in rat hepatocytes isolated by collagenase perfusion. The aims were to determine: 1. whether the use of the *S. officinalis* EO for human consumption has any adverse effects to the liver in the concentration range likely to be ingested; 2. verify the often attributed antioxidant effects (protective) on liver cells challenged with an oxidant agent (*tert*-butyl hydroperoxide *t*-BHP) and compare it to the effects of the reference antioxidant quercetin.

The EO was obtained by hydrodistillation of fresh aerial parts of sage plants harvested in April 2002 in Arouca experimental farms in northern Portugal and then analyzed by GC and GC-MS. We obtained a total yield of 12.07 mg of EO per g of plant dry weight and more than 50 compounds were identified. The major representative compounds were α-thujone (17.36 %), α-humulene (13.25 %), 1,8-cineole (12.73 %), β-caryophyllene (8,50 %) and borneol (8.29 %). To study EO toxic/protective effects in rat hepatocytes, we measured the cell viability (LDH leakage), lipid peroxidation and glutathione status in experiments undertaken with cells (suspensions of 1×10^6 viable cells per millilitre) exposed to EO alone (toxicity of the EO; *t*-BHP as a positive control); and with cells exposed to EO and an oxidative compound (*t*-BHP) together (in EO protection evaluation; quercetin as a positive control) for 30 min. Our results show that the EO is not toxic when present at a concentration below 0.2%; only at 2 µl EO/ml cell suspension occurred a significant LDH leakage and GSH decrease indicating cell damage. The EO toxicity may be due to GSH depletion or to a solvent effect on the membrane. In the range of concentrations tested the EO did not show protective effects.

A238 Enhanced permeability of animal skin models using total saponins of *Acanthophyllum squarrosum*

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There have been many efforts to enhance systemic absorption of drugs. The current work provides information on the induction of membrane permeability by total saponin of *Acanthophyllum squarrosum Boiss.* root (ATS).

A. squarrosum roots were collected, dried, powdered and defatted using petroleum ether in a Soxhlet apparatus. The powder was further extracted with methanol. The concentrated methanol extract was partitioned between water and n-butanol. n-Butanol fraction was concentrated and redissolved in methanol and precipitated with diethyl ether. The precipitate was collected as crude saponin (1). A Franz diffusion cell was used to study drug transport through the snake and rat skin. Skin specimens were placed between two glass chambers and fastened using polymer washers and stainless steel clips. Two hydrophillic drug molecules, gentamicin sulfate (GS) and 5(6)-carboxyfluoresceine (CF) were used as drug models; and absorption enhancers were ATS and Quillaja total saponin (QTS). The intensity of fluorescence emitted by CF in samples was determined using fluorimeter at 588 nm. GS assay was performed using an agar diffusion method discussed by Philips *et* al. (2). Surface tension changes and hemolytic activities of both TS and QTS were also determined.

The results showed that both crude saponins can enhance transdermal absorption of GS and CF. The results also indicated that their maximum enhancing effect is below the enhancer critical micelle concentration (cmc), while maximum hemolytic activity was observed at concentrations above the relevant cmc.

References: 1. Lacaille-Dubois, M.A. et al. (1993). Phytochemistry, 34: 489-495. **2.** Philips M. et al., (1974). J. Clin. Path., 27: 447-451.