



# *Cinnamomum zeylanicum* essential oil modulates an LPS-induced inflammatory response in vitro

Georgios Aindelis and Katerina Chlichlia\*

Department of Molecular Biology & Genetics, Democritus University of Thrace, Alexandroupolis, Greece

\* Email: achlichl@mbg.duth.gr

## Introduction

In recent years, there has been significant interest in the identification of plant-derived essential oils with health-promoting properties and potential as medicinal agents<sup>1</sup>. *Salvia officinalis* and *Cinnamomum zeylanicum* essential oils have been shown to exert a variety of health-beneficial effects<sup>2,3</sup>. *Cinnamomum* in particular has received attention as a biological agent with antiviral, antibacterial, antioxidant and immunomodulatory properties<sup>3,4,5</sup>.

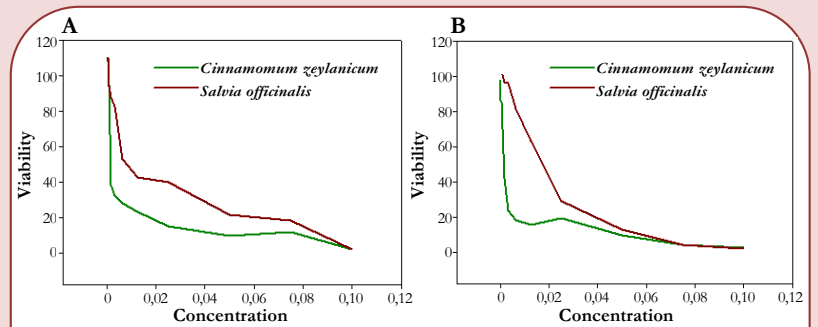
## Materials and Methods

Differentiated THP1 cells and RAW264.7 macrophages were treated with various concentrations of *Salvia officinalis* and *Cinnamomum zeylanicum* essential oil and the viability was measured with the SRB assay.

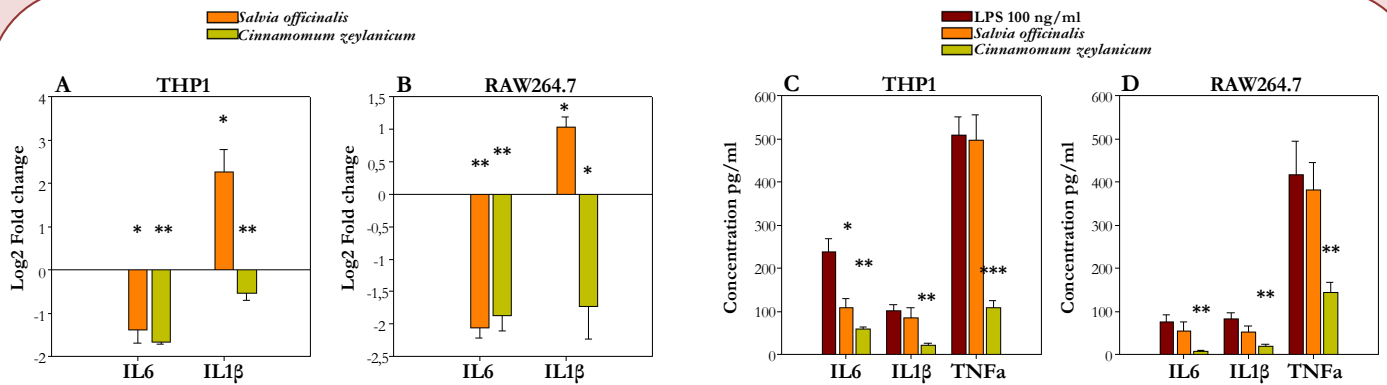
Differentiated THP1 cells were treated with 0.001% (v/v) of *Salvia officinalis* and 0.00075% (v/v) of *Cinnamomum zeylanicum* essential oil. Gene expression was examined with real-time PCR and cytokine secretion with ELISA

RAW264.7 macrophages were treated with 0.0001% (v/v) of *Salvia officinalis* and *Cinnamomum zeylanicum* essential oil. Gene expression was examined with real-time PCR and cytokine secretion with ELISA

## Results



**Figure 1:** Viability of differentiated THP1 (A) and RAW264.7 (B) cells treated with various concentrations of *Cinnamomum zeylanicum* and *Salvia officinalis* essential oils



**Figure 2:** Gene expression analysis with real-time PCR revealed a significant down-regulation of **IL6** and **IL1β** expression on both THP1 (A) and RAW264.7 (B) cells treated with *Cinnamomum zeylanicum* oil and stimulated with LPS (100 ng/ml). In addition, a notable decrease in **IL6**, **IL1β** and **TNFα** secretion was detected with ELISA in both cell lines (C, D) following treatment with *Cinnamomum zeylanicum* oil and stimulation with LPS (100 ng/ml).

## Conclusions

Our data suggest that *Cinnamomum zeylanicum* essential oil can modulate inflammatory reactions *in vitro*, in both human and mouse stimulated cells, as evident by the apparent down-regulation of key inflammatory effector molecules. Further investigation is warranted to clarify the mechanisms involved in this anti-inflammatory activity of *Cinnamomum zeylanicum* essential oil and if these observations persist in pre-clinical models.

The research project was supported by the Hellenic Foundation for Research and Innovation (H.F.R.I.) under the "1st Call for H.F.R.I. Research Projects to support Faculty members and Researchers and the procurement of high-cost research equipment" (Project Number: HFRI-FM17C3-2007).



## References

1. **Thirumurugan D, Cholarajan A, Raja S.S.S, Vijayakumar, R.** An Introductory Chapter: Secondary Metabolites. In *Secondary Metabolites—Sources and Applications*; IntelOpen Limited: London, UK, 2018.
2. **Velas D, Dimitropoulou E, Mitropoulou G, Kourkoulas Y, Ghaouris E.** Disinfection efficiencies of sage and spearmint essential oils against planktonic and biofilm *Staphylococcus aureus* cells in comparison with sodium hypochlorite. *Int J Food Microbiol.* 2017;257:19-25
3. **Kumar S, Kumari R, Mishra S.** Pharmacological properties and their medicinal uses of *Cinnamomum*: a review. *J Pharm Pharmacol.* 2019;71(12):1735-1761
4. **Mitropoulou G, Nikolaou A, Santarmaki V, Sgourou G, Kourkoulas Y.** Citrus medica and *Cinnamomum zeylanicum* Essential Oils as Potential Biopreservatives against Spoilage in Low-Alcohol Wine Products. *Foods.* 2020;9(5):577
5. **Vasconcelos N.G, Crodá J, Simionato S.** Antibacterial mechanisms of cinnamon and its constituents: A review. *Microb Pathog.* 2018;120:198-203