Hes·so
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Master of Science HES-SO in Life Sciences

Development of a cell-based bioassay for drug testing

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Cell culture

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DESCRIPTION

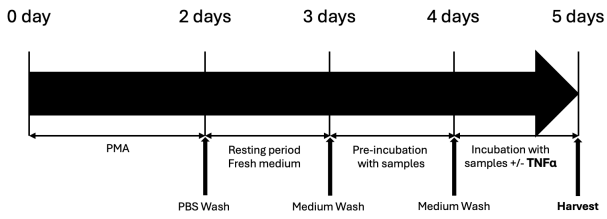
• Bioassays are essential tools for determining and estimating the biological activity, potency, stability, and safety of substances. Cell-based bioassays are particularly valuable for assessing the mode of action of active molecules and their effects on stimulating or inhibiting signalling pathways.

• Monocytes are key immune cells involved in inflammation, and the THP-1 cell line is widely used to model in vitro monocyte differentiation and polarization.

• Plants are a rich source of bioactive compounds, many of which have demonstrated immunomodulatory effects and are actively being investigated for their potential therapeutic applications.

• In this study, a cell-based bioassay was developed to test the immunomodulatory effects of plant-derived molecules, both in the presence and absence of inflammation induced in vitro by adding TNF-α. Substance X, a well-known molecule with anti-inflammatory and antioxidant properties, was selected as the control substance.

• The steps of the developed THP-1 cell-based Bioassay are summarized in the figure below:



Timeline of the developed THP-1 cell-based bioassay

Confidentiality Notice: Due to the confidential nature of this work, some of the results and conclusions cannot be disclosed in this poster.

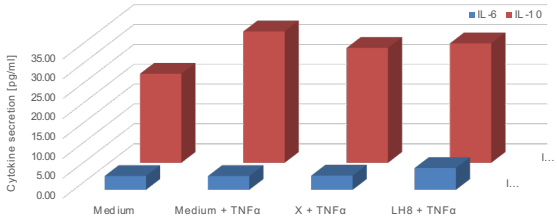
OBJECTIFS

The aim of this work is to study the immunomodulatory effects of plant-based molecules on THP-1-derived macrophages. This involves identifying the induced phenotype of the macrophages by assessing cytokine secretion and cell surface marker expression through flow cytometry. In addition to assessing the molecules anti-inflammatory effects, their capacity to present antioxidant properties by activating the NRF2 signaling pathway was also evaluated, with substance X, a well-studied molecule, used as a control to validate the observed effects.

RESULTS

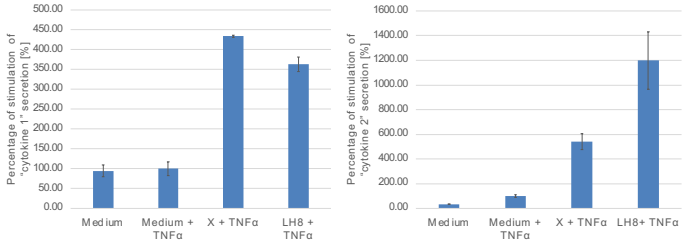
I. Measurement of Induced Cytokine Secretion

• Low levels of IL-6 and IL-10 were secreted with no statistically significant differences between the control group and the tested substances



Experiment 1a: Measurement of IL-6 and IL-10 levels in culture supernatant

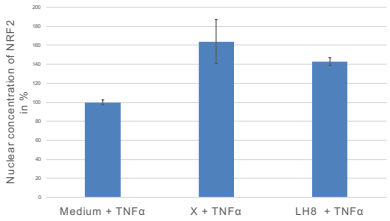
• In contrast to IL-6 and IL-10, the secretion of both cytokines “Cytokine 1” and “Cytokine 2” was significantly stimulated.



Experiment 1b: Cytokine 1 and Cytokine 2 secretion

II. Assessment of NRF2 Nuclear Translocation

• A statistically significant induction of NRF2 nuclear translocation induced in cultures treated with substance X and in cultures treated with the tested plant-derived product LH8.



Experiment 2: Nuclear concentration of NRF2

CONCLUSION

The objectives of this study were successfully achieved, demonstrating that the induced macrophage phenotype does not correspond to classical M1 or M2 profiles, but likely presents an intermediate phenotype.
Additionally, the comparable response observed in cells treated with substance X and LH-8 suggests that LH-8 may exhibit antioxidant properties, potentially mediated through NRF2 activation.

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