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Screening of plant extracts for anti-inflammatory activity

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Introduction

In our search for natural products with anti-inflammatory activity, which are comparable to that of the polyphenol resveratrol, we investigated a large number of medicinal plant extracts for their anti-inflammatory activity. Among the tested extracts were the n-hexane, dichloromethane, ethyl acetate and methanol extracts produced by sequential extraction of aerial parts and roots of the medicinal plants, Rhodiola rosea, Achillea millefolium, Valeriana officinalis, and Platycodon grandifloras. Many of these extracts showed strong effect on interleukin-6 (IL-6) production in LPS-stimulated THP-1 macrophages. We found that all four extracts of roots of V. officinalis and P. grandifloras as well as the n-hexane, ethyl acetate, and methanol extracts of aerial parts of A. millefolium were able to inhibit production of IL-6 in LPS-stimulated THP-1 cells comparable to the anti-inflammatory control resveratrol (50 μM). Interestingly some extracts, among them methanol extracts of roots of R. rosea, showed an inflammatory effect.

Motivation

Our aim was to investigate new possibilities in treatment of obesity [1], which results in an inflammatory state in metabolic tissues. We tested resveratrol for anti-inflammatory activity by exploring its effect on production of interleukin-6, which is one of the major inflammatory mediators. We have found that resveratrol inhibits production of IL-6. Our motivation in this study was to find (using bioassay-guided search) other substances from natural products that have effect similar to resveratrol.

Materials and methods

Cultivation and harvesting of plant material

Sequential
Extraction

Screening

Liquid chromatography

Rhodiola rosea

Achillea millefolium

Valeriana officinalis

Platycodon grandifloras

n-hexane, dichloromethane, ethyl acetate and methanol extracts

Interleukin-6 production in LPS-stimulated THP-1 macrophages

Plant materials for this study were cultivated at Department of Food Science, Aarhus University, Aarslev, Denmark. Roots and aerial parts of Rhodiola Rosea were extracted fresh, whereas roots of Valeriana officinalis, Platycodon grandifloras were frozen (-25°C) directly after harvesting. All plant materials were ground before extraction using Knife Mill GRINDOMIX GM 300, Retsch, Germany and exposed to a four-step sequential extraction procedure with hexane, dichloromethane, ethyl acetate and methanol (HPLC-grade, Sigma-Aldrich, Germany). We used 5 ml of solvent for 1 g of plant material. Roots and aerial parts were soaked in each solvent for 24 h at 4°C in the dark. Extracts were filtered using filter paper with a pore size of 20–25 μm, and solvents were evaporated under vacuum at 32°C. Extracts were dissolved in Ethanol (96%) in concentration of 100 mg/ml.

Results

Many of the tested extracts showed inhibition of IL-6 in LPS-stimulated THP-1 cells comparable to resveratrol (RSV) in concentration of 50 μM. They were chosen for further separation and investigation. One of them, extract of Rhodiola rosea roots, was fractionated and tested. Most nonpolar fractions showed inhibition of IL-6, whereas more polar fractions showed inflammatory effects.

References: