Neuroprotective effects of Rhodiola rosea extracts against excitotoxicity and oxygen-glucose deprivation in hippocampal slice cultures

Gramsbergen, Jan Bert; Sindberg, Jeanne; Lundberg, Louise; El-Houri, Rime Bahij; Christensen, Kathrine Bisgaard; Grevsen, Kai; Christensen, Lars Porskjær; Zimmer, Jens

Publication date: 2012

Document version Final published version


Terms of use
This work is brought to you by the University of Southern Denmark through the SDU Research Portal. Unless otherwise specified it has been shared according to the terms for self-archiving. If no other license is stated, these terms apply:

- You may download this work for personal use only.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying this open access version

If you believe that this document breaches copyright please contact us providing details and we will investigate your claim. Please direct all enquiries to puresupport@bib.sdu.dk

Download date: 23. Aug. 2019
Neuroprotective effects of *Rhodiola rosea* extracts against excitotoxicity and oxygen-glucose deprivation in hippocampal slice cultures

J. B. Gramsbergen¹, J. Sindberg³, L. Lundberg², R. Bahij El-Houri⁴, K. B. Christensen², K. Greven², L. Porskjaer Christensen⁵, J. Zimmer¹

¹Neurobiology Research, Institute of Molecular Medicine, and ³Chem. Engineering, Biotech. Environ. Technol., Univ. Southern Denmark, Odense, Denmark; ²Dept. of Food Science, Aarhus Univ., Aarslev, Denmark

E-mail: jbgramsbergen@health.sdu.dk

Introduction

The medicinal plant *Rhodiola rosea* (rosenot, golden root) is known as a stimulant of mental and physical endurance, increasing resistance to chemical, biological, psychological and physical stressors (Panossian et al. 2010). Extracts of *R. rosea* roots contain flavonoids, phenolic acids, phenylethanol derivatives (e.g. salidroside) and phenylpropanoid glycosides (e.g. rosavin) (Ioset et al. 2011). Many of these compounds are considered potent antioxidants with putative neuroprotective potential (e.g. salidroside (5h)), but the significance of the various substances for the beneficial effects of Roseroot is still largely unknown. Here we tested the neuroprotective effects of crude methanolic extracts of *R. rosea* as well as chemical fractions and/or purified compounds (e.g. salidroside) against excitotoxicity and ischemia-like brain damage using organotypic hippocampal slice cultures.

Materials & Methods

Crude methanolic extracts of *R. rosea* roots and flowers (Clane S, Pharmaplet, Germany, grown for four years in our horticulture facilities), as well as chemical fractions of this extract (Table 1) were prepared and partly analysed by LC-MS. Hippocampal slice cultures derived from 8 days old rat pups were grown at 33°C in serum-optimum for 2-3 weeks before exposure to N-methyl-D-aspartate (NMDA, 10 µM, 24 or 48 h) or oxygen-glucose deprivation (OGD, 30 or 35 min) at 36°C (Norberg et al. 2005), with or without NMDA, Roseroot extract or single constituents (e.g. rosavin, salidroside) before (24 h), during (35 min) and/or immediately after the insult (for 48 h). NMDA, or OGD-induced neuronal cell death was quantified by propidium iodide uptake and immunohistochemical staining of MAP2 as a neuronal marker.

Results

Significant, dose-dependent protection against NMDA and OGD-induced CA1 pyramidal cell death was obtained by crude methanolic extracts of Roseroot (roots or flowers) using 250 µg/ml (33-50% protection) or 500 µg/ml (45-65% protection) (Figures 3, 4, 5). A number of chemical fractions of methanolic Roseroot extracts, as well as the purified constituents salidroside and rosavin were tested, but -- so far -- none of the tested fractions or single constituents showed protection against NMDA or OGD (Table 1).

Conclusion and perspectives

Methanolic extracts of *Rhodiola rosea* provide potent neuroprotection against excitotoxic (NMDA) or ischemic (OGD) cell death in hippocampal slice cultures. The active compounds are probably found in fractions A and/or H (Table 1), which will be further characterized by LC-MS and re-tested in slice cultures. We are currently analyzing micro array microRNA and gene analyses data of Roseroot treated cultures and performing Western blotting for selected proteins.

Acknowledgement

Supported by the Danish Strategic Research Council

References


