Rhodiola Rosea: The Influence of an Adaptogen on Cutaneous Cellular Metabolisms

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Abstract

The influence of an aqueous extract of *Rhodiola rosea* on various cutaneous targets will be described. It will be shown that application of quantities of the aqueous extract at levels of at least 1% can impart a profound hypothermic and hyperthermic protective effect on normal human keratinocytes (NHK) that are treated with the extract and then exposed to extraordinary temperature fluctuations. The effect of application of the extract on two types of dendritic cells will show that *Rhodiola rosea* can increase the ability of these cell types to consume oxygen compared to untreated controls. In fact, it will be further demonstrated that not only will *Rhodiola rosea* increase oxygen respiration in white adipocytes, but it also increases the rate of conversion of triglycerides into glycerol and free fatty acids, the initiation of a process called catabolism or fat burning. We propose that some of these cellular effects may explain why extracts of *Rhodiola rosea* can increase human endurance when taken orally.

Introduction

Rhodiola rosea is the name given to a plant that grows in rather harsh conditions in various mountainous climates, particularly in Tibet, Russia, China and India[1,2]. It has been described as an "adaptogen" for its ability to adapt to the harsh conditions under which it grows. The term "adaptogen" has been also used to describe the effects that extracts of this plant can have on the human body when it is ingested orally and the literature on its use in traditional medicines and in more modern nutritional supplements is plentiful[3-11]. Principal among the actives that can be isolated from *Rhodiola rosea* is a variety of phenylpropanoids, flavanoids and terpinoids that have been well characterized in the scientific literature[12]. *Rhodiola rosea* is unique among plants of the genus *Rhodiola* in that extracts of the species rosea contain specific vicianosides such as rosavin, rosin and rosarins. However few, if any, studies have strived to define which of the bioactive molecules from *Rhodiola rosea* specifically impart the "adaptogenic" effects. The use of extracts of *Rhodiola rosea* in topical applications has also been described[1-3,6,10,12].

In nutritional studies, one of the most powerful effects of extracts of *Rhodiola rosea* is in providing participants who ingest the extracts with improved or enhanced endurance both physically and mentally[1,2,8]. Again, the reasons for these effects have never been traced back to a single molecular entity as the extract is typically provided in such studies as either an aqueous or ethanolic extract containing multiple active components and, in fact, it may be multiple components that enhance these extracts with the benefits described.

In this paper, the influence of an aqueous extract of *Rhodiola rosea* on various cutaneous targets will be described. In particular, it will be shown that aqueous extraction can remove ingredients that can provide the extract with antioxidant activity comparable to vitamin C at similar concentrations. More interesting, it will be shown that application of quantities of the aqueous extract at levels of at least 1% can impart a profound hypothermic and hyperthermic protective effect on normal human keratinocytes (NHK) that are treated with the extract and then exposed to extraordinary temperature fluctuations. The effect of application of the extract on two types of dendritic cells, human dermal white adipocytes and dorsal root ganglion will show that *Rhodiola rosea* can increase the ability of these cell types to consume oxygen compared to untreated controls. In fact, it will be further demonstrated that not only will *Rhodiola rosea* increase oxygen respiration in white adipocytes but it also increases the rate of conversion of triglycerides into glycerol and free fatty acids, the initiation of a process called catabolism or fat burning. We propose that some of these cellular effects may explain why extracts of *Rhodiola rosea* can increase human endurance when taken orally.

Extraction Methods

The principal extraction process involved taking ground *Rhodiola rosea* root powder and extracting with water at 25°C. It was found