Introduction

Today’s lifestyles are replete with a variety of stress factors: UV radiation, pollution, sleep deprivation, poor diet, and emotional stress, to name but a few. These stresses affect a variety of essential biological and physiological processes. This includes the quality of our main protective barrier to the outside world, the skin, but also internal systems such as lipid metabolism.

Nature has evolved various mechanisms to deal with different types of environmental stress. Some of the most striking examples comes from organisms that exist in environmentally challenging conditions such as heat, cold, pressure, and even radiation. These organisms are commonly referred to as adaptogens.¹ A great example is Rhodiola rosea, a plant originating from the Arctic regions of Eastern Siberia and the Tibetan mountains, known for their hostile climates. It does so by producing a variety of bio-active and physico-chemically active compounds, including salidroside, terpenoids, tannins, flavonoids and sterols.² Preparations of this plant have been used in traditional medicine of several cultures in Asia and Europe. When extracts of Rhodiola rosea were incubated with primary visceral adipocytes, an increase in lipolysis was observed, resulting in decreased cellular triglyceride levels, compared with control cells.³

Triglycerides are broken down into glycerol and free fatty acids (Fig. 1). Measuring the level of glycerol released by adipocytes into culture media, serves as a measure of lipolysis.⁴

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Figure 1: Lipolysis process in adipocytes
To assess the effect of NAB® Rhodiola Extract on human adipocytes in culture, cells were incubated in the presence or absence of the extract for up to 24 hours, and the glycerol content in the culture media was quantified (Fig. 2). Caffeine was included in the assay, as it has been studied and used to increase metabolism and aid in weight loss, and is a widely used ingredient in anti-cellulite products. Samples were evaluated 1, 4, and 24 hours after addition of the extract or control compounds. Isoproterenol, which is included as a positive control, increases glycerol levels significantly after 4 and 24 hours incubation. The NAB® Rhodiola Extract, at 2%, also significantly increases glycerol levels by 28% after 4 hours and 21% after 24 hours, compared to baseline levels. Caffeine also appears to increase glycerol levels, but these increases were not significant versus control in this assay. The data presented clearly shows that the NAB® Rhodiola Extract is able to significantly increase lipolysis in cultured human adipocytes, as measured by glycerol release.

![Figure 2: Lipolysis assay in human adipocytes in vitro.](image)

A change in lipolysis level, may also be reflected in another parameter of cellular metabolism, oxygen consumption. The potential of NAB® Rhodiola Extract to affect cellular oxygen (O\(_2\)) consumption was measured in cultured human adipocytes. First, the baseline O\(_2\) level was established, then the test material was added to the cell culture and the O\(_2\) level was measured again. NAB® Rhodiola Extract significantly increased O\(_2\) consumption by 50% at 2% extract concentration, and by 134% at 3% extract concentration (Fig. 3). Isoproterenol (10 µM) slightly increased O\(_2\) consumption in these cells. No change in cell viability due to exposure to the test materials was observed.

![Figure 3: Oxygen consumption in cultured human adipocytes.](image)

These experiments indicate that NAB® Rhodiola Extract is able to affect two parameters of cellular metabolism in cultured human adipocytes in vitro:

- Increases lipolysis and lowers triglyceride content
- Increases cellular respiration
Technical Specifications

Regulatory Status

| INCI Name: | Water / Pentylene glycol / Rhodiola rosea root Extract |
| Preservative: | None added |
| Recommended Use Level: | 1-3% |
| Appearance: | Light-dark amber liquid |

References