

# NAB<sup>®</sup> Rhodiola Extract

## Your Partner in the Fight Against Urban Stress



### Key Product Attributes

- Adaptogenic plant extract that helps protect skin against the stresses of modern urban life
- Enhances the resistance of skin cells to UV-radiation, reactive oxygen species, and pollution
- Protects key skin components against the harmful effects of free radicals

## Introduction

Modern life comes with a variety of stress factors: UV radiation, pollution, sleep deprivation, poor diet, and emotional stress, to name but a few. What all these factors have in common is that they, through different physical, chemical and biological mechanisms, can lead to the formation of reactive oxygen species (ROS).<sup>1,2</sup> These ROS can damage proteins and lipids and have been implicated in several diseases as well as the general process of aging.<sup>2</sup>

As our first layer of protection against the environment our skin is particularly sensitive to this process of oxidative stress. Our skin is constantly under attack from the outside, but also from toxins generated within, often, as the result of unhealthy lifestyles. Making matters worse, the skin's natural defenses, such as antioxidant production and cell damage repair processes, decline as we get older, further accelerating the aging of the skin.<sup>2</sup>

What our skin needs to mitigate the visible effects of aging due to the stresses of modern life is protection against both the causes and effects of oxidative stress. This is exactly what NAB® Rhodiola Extract offers.

## NAB® Rhodiola Extract

NAB® Rhodiola Extract is an extract from the root *Rhodiola rosea*, which originates from the Arctic regions of Eastern Siberia and the Tibetan mountains. Studies demonstrated that *Rhodiola* is an adaptogenic plant, which means it has developed natural defense mechanisms, such as increased production of powerful antioxidants, against the harmful effects of extreme environmental conditions.<sup>3</sup>

Data shows that NAB® Rhodiola Extract enhances the skin's resistance to stress and thus promotes skin cell vitality.

Specifically, NAB® Rhodiola Extract:

- Boosts the activity of endogenous antioxidants in skin cells
- Protects the skin against harmful effects of UV radiation
- Helps protect skin lipids against oxidative stress
- Helps protect against degradation of squalene on skin exposed to environmental pollutants
- Reduces the expression of inflammatory cytokines
- Can help protect skin against exposure to extreme temperatures

## In Vitro — Auto Climate Control for the Skin

Human cells can only survive within a narrow range of temperatures, with 37°C representing an optimal temperature. Deviations from this temperature can induce the expression of specialized proteins which help the cells to survive.<sup>4</sup>

To evaluate the ability of NAB® Rhodiola to protect against thermal stress, a method using cultured human keratinocytes exposed to hot or cold temperatures was performed.

### Keratinocyte Viability with Thermal Stress

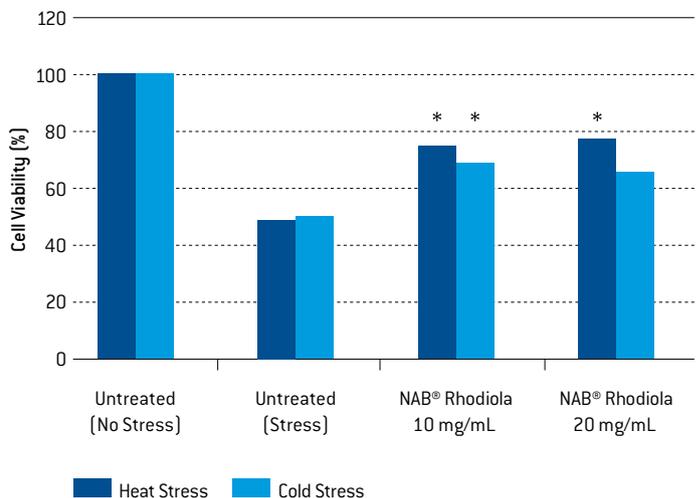


Figure 1 shows that keratinocytes treated with 1% of NAB® Rhodiola Extract provides a protective effect against both hot (15-20 minutes of hyperthermia @ 48°C) and cold (15-17 hours of hypothermia @ 4°C) thermal stress as indicated by the increase in viability of the cells. NAB® Rhodiola Extract 2% provides a protective effect against hot stress. \*Denotes (p < 0.05) difference from the Untreated (with stress) sample.

## Inflammaging

Recent scientific studies have provided new insights into the important role of low-grade inflammation in skin aging. Specifically, pro-inflammatory cytokines, such as Interleukin-8 (IL-8) and Interleukin-6 (IL-6) can cause skin damage by activating dermal fibroblasts to secrete Matrix metalloproteinases (MMPs). These MMPs are well known for their role in photo-aging, through their ability to degrade extra cellular matrix (ECM) proteins such as collagens and elastin, which can ultimately lead to the formation of wrinkles.<sup>5,6</sup>

## Results

*In vitro* data presented in Fig. 2 demonstrate the effect of NAB® Rhodiola on reducing the expression of inflammatory cytokines in human keratinocytes challenged with Phorbol Myristate Acetate (PMA), a well known activator of inflammation.

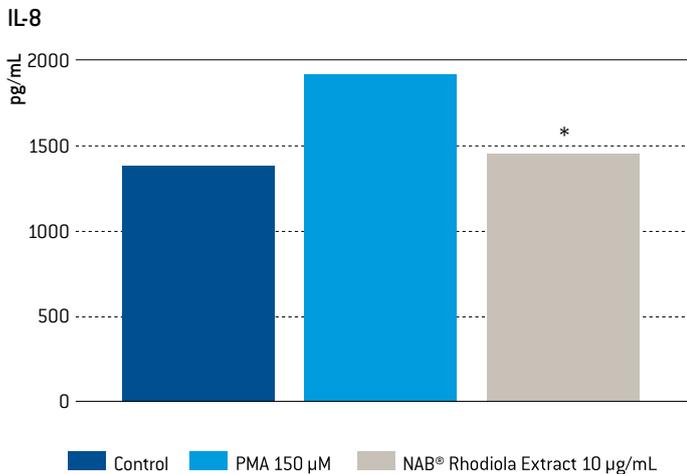
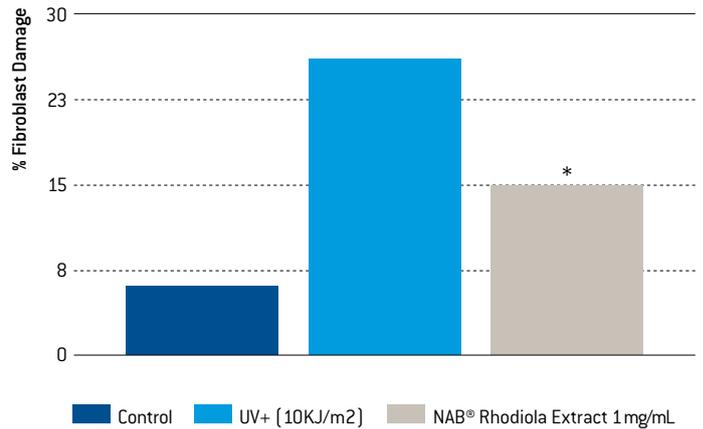
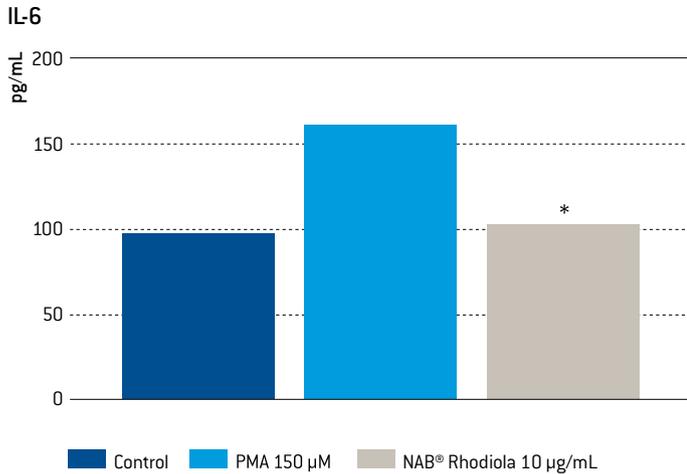


Figure 3: Relative amount of DNA damage in normal human skin fibroblasts as determined through a Comet assay.<sup>8</sup> Shown are amount of DNA damage in culture medium (left), in medium irradiated with 10 kJ/m<sup>2</sup> UV (center), and medium with 1mg/mL NAB® Rhodiola Extract irradiated with same UV dose (right). The asterisk indicates that NAB® Rhodiola Extract significantly minimizes UV induced DNA damage relative to untreated control (P<0.05). The images show the raw data on which the quantitative data is based. Damaged DNA fragments are separated through electrophoresis and visualized using a fluorescent stain resulting in the appearance of a "Comet tail."

Figure 2: Expression of IL-6 (top) and IL-8 (bottom) in normal human keratinocytes in culture medium (control), medium with 150 µM PMA, and medium with 10 µg/mL NAB® Rhodiola Extract and PMA. The asterisk indicates NAB® Rhodiola Extract significantly reduces the increased expression of both IL-6 and IL-8 induced by PMA (P<0.05)

## Protecting Human Fibroblasts from UV radiation

It is well documented that UV radiation can accelerate skin aging by either directly damaging DNA or through the generation of reactive oxygen species (ROS).<sup>7</sup>

### Results

Figure 3 shows that NAB® Rhodiola Extract significantly minimizes UV induced DNA damage in human fibroblasts *in vitro* relative to untreated control.

## Antioxidant activity (Glutathione)

A critical antioxidant that is naturally produced in the skin is Glutathione. Glutathione is a tripeptide that is normally found in its reduced form (GSH) but is sensitive to ROS itself leading to its inactive oxidized form (GSSG). The ratio of GSH to GSSG is therefore a marker of oxidative stress and is known to decrease with age.<sup>9</sup>

### Results

Figure 4 shows the effect of NAB® Rhodiola Extract on the GSH levels in human Keratinocytes (HaCaT) *in vitro* under UV stress. The results show that NAB® Rhodiola Extract significantly outperforms both control and Resveratrol (positive control) in maintaining GSH levels.

## Results

Table 2 shows that NAB® Rhodiola Extract helps to inhibit the degradation of squalene, in the presence of artificial pollution.

Sample	% Squalene degradation
Squalene (unexposed)	0
Squalene (exposed)	98
Squalene + NAB Rhodiola Extract (exposed)	95

Table 2: Squalene degradation percentages after exposition to artificial pollution (gasoline motor and ozone generator); and with NAB® Rhodiola .ANOVA, p<0.05

## Technical Specifications

INCI Name	Water/Pentylene glycol/Rhodiola rosea root Extract
No preservative added	
Recommended Use Level	1-3%
Appearance	light-dark amber liquid

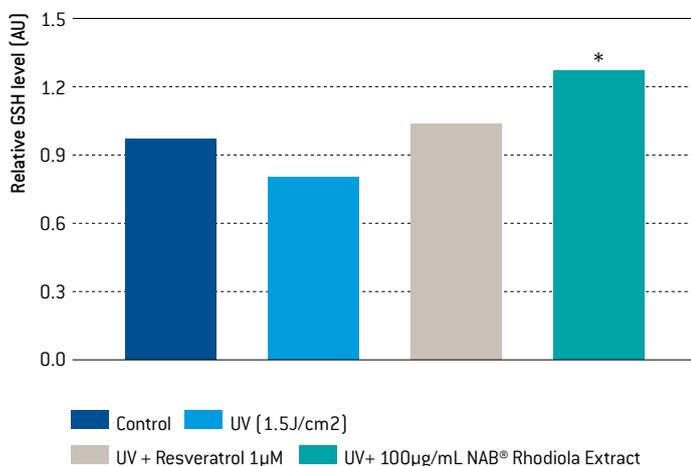


Figure 4: GSH levels in normal human skin keratinocytes in culture medium, medium irradiated with UV 1.5J/cm2, medium with 1µM Resveratrol irradiated with same UV dose, and medium with NAB® Rhodiola Extract irradiated with same UV dose.

## Lipid Peroxidation

Just like proteins, skin lipids are also sensitive to the harmful effects of ROS. Specifically, lipid peroxidation has been established as a marker of cellular injury caused by oxidative stress.<sup>10</sup>

## Results

The effect of NAB® Rhodiola Extract on lipid peroxidation was determined in a lipid bilayer system by monitoring the presence of Malondialdehyde, one of the end products of lipid peroxidation. Results are listed in Table 1, showing that NAB® Rhodiola Extract significantly inhibits lipid peroxidation relative to control and outperforms the positive control (Quercetin).

Group	% lipid peroxidation
Buffer (control)	100
Quercetin 40µg/mL (positive control)	18
NAB® Rhodiola Extract 100 mg/mL	6

Table 1: Lipid peroxidation determined through photometry assessment of Malondialdehyde levels. Each result is the average of three separate evaluations.

## Anti-pollution

Squalene, a major component of sebum, is highly prone to photo-oxidation and as such is a reliable oxidative stress marker.<sup>11</sup> In vivo studies have shown that those living in polluted areas tend to have decreased levels of squalene on the skin.<sup>12</sup>

The anti-pollution benefits of NAB® Rhodiola Extract were evaluated by monitoring the degradation of squalene in the presence of artificially generated pollution from a gasoline motor and ozone generator.

## References

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