

LONGEVITY & PROTECTIVE BEAUTY



Glorydermal® Bloxydur

Blocks Oxidative Stress Durably





Introduction

Oxidative stress means stress for the skin. **Free radicals** play a central role in this context.

Free radicals are produced naturally in our body in numerous metabolic processes, but also through environmental influences such as UV radiation, pollution or cigarette smoke. Psychological stress, lack of sleep or an unhealthy diet or lifestyle also favour the formation of free radicals.

They are therefore **invisible companions in our daily life**.



Free radicals are **highly reactive species** (e.g. Reactive Oxygen Species (ROS)) that can severely **damage cell components** such as lipids, proteins, amino acids and also our DNA. When our skin is exposed to an **excess** of free radicals that cannot be neutralised in the body's natural physiological balance, we speak of **oxidative stress**.

The result: premature skin ageing, wrinkles and photoageing, but also irregularities, dry or inflamed areas.



Relaxation for the skin

In order to counteract premature skin ageing and the negative consequences of free radicals, it is important that **free radicals in excess** are **sustainably neutralised** and the skin is thus **permanently rebalanced**.

Ideally, the free radicals should be **neutralised** for a **long time** and thus **continuously** before they can have an effect on the skin.





Active Description – Enzymes and Enzyme-like Actives



Free radicals are very well-known natural influences of **ancient origin**.

Since the beginning of life, organisms are depended on using effective **protective mechanisms** to counteract these influences to survive.

Enzymes play an essential role in these processes. They **enhance and accelerate** many biochemical reactions and they have **important functions in the metabolism of organisms**.

They are **not used up** over many reaction cycles and therefore they offer a **long-term powerful efficacy**.

Enzymes could be called the “conductors of life”.



Active Description – Enzymes and Longevity



Enzymes could be called the “conductors of life”.



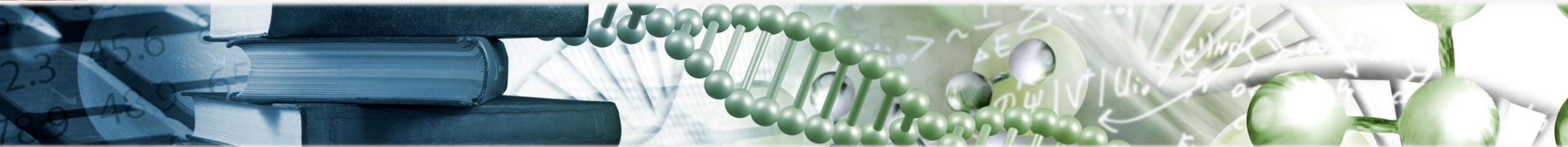
Enzymes are directly linked to longevity!

Enzymes are key regulating elements in the body. Active ingredients with **enzymes** or **enzymatic activity** thus **contribute to longevity at a crucial point**.

As **protection against oxidative processes** play a significant role in **preventing premature skin ageing**, the enzymatic component of Glorydermal® Bloxydur **ideally matches the concept of longevity**.



Active Description – Learning from Nature



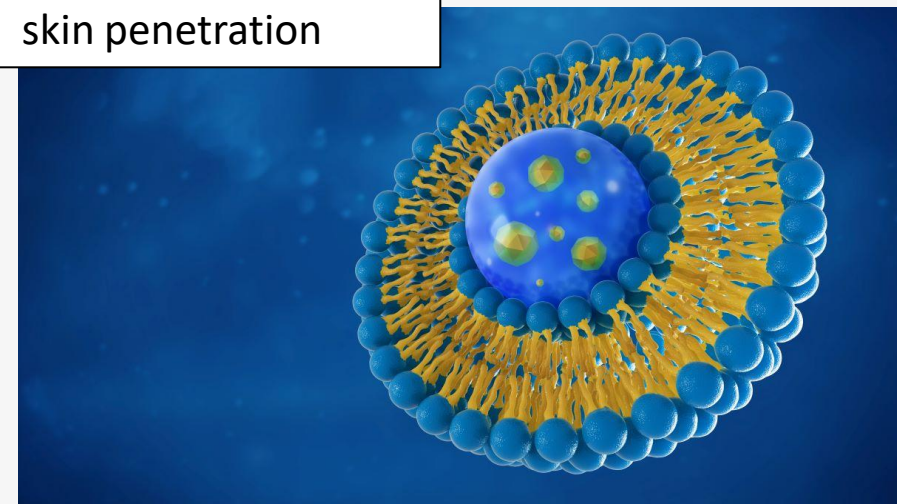
Antioxidant enzyme

**Neutralisation of
free radicals**

Iron peptide

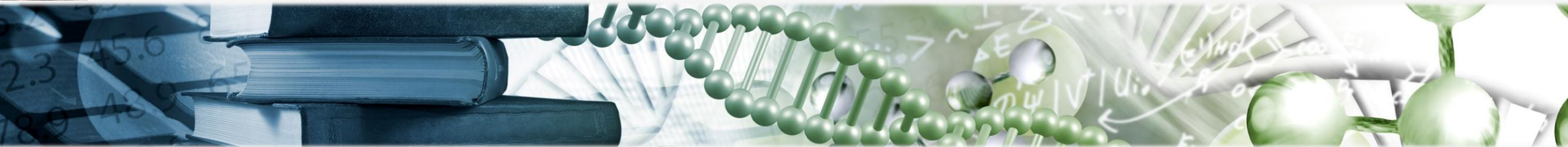


**Encapsulated in liposomes
for improved
skin penetration**

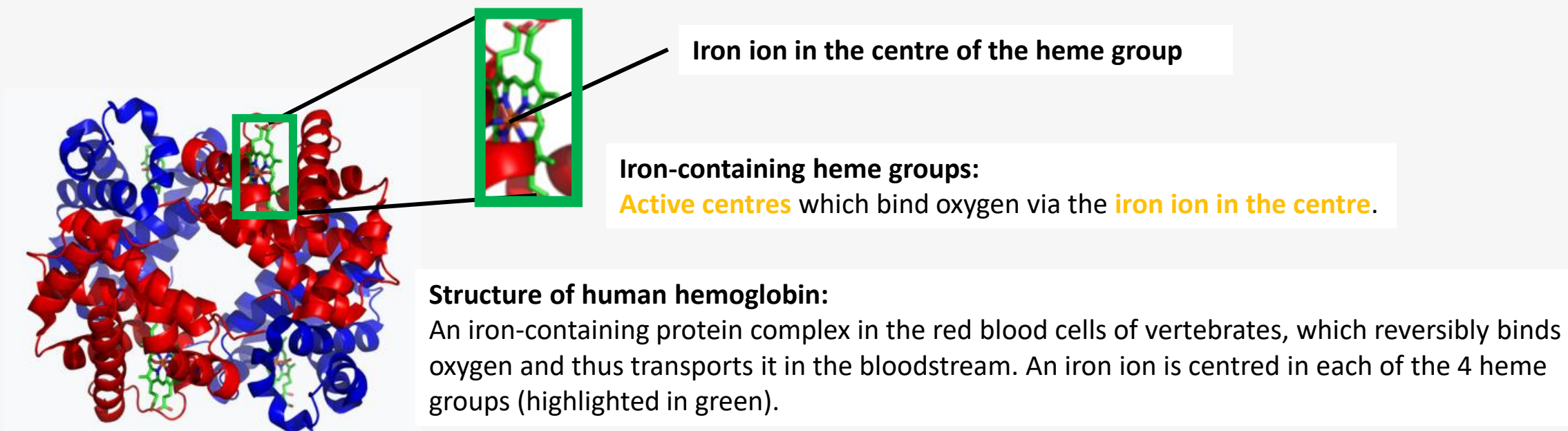




Active Description – Learning from Nature



The **iron peptide** in Glorydermal® Bloxydur has a similar structure to the **active centres of hemoglobin**

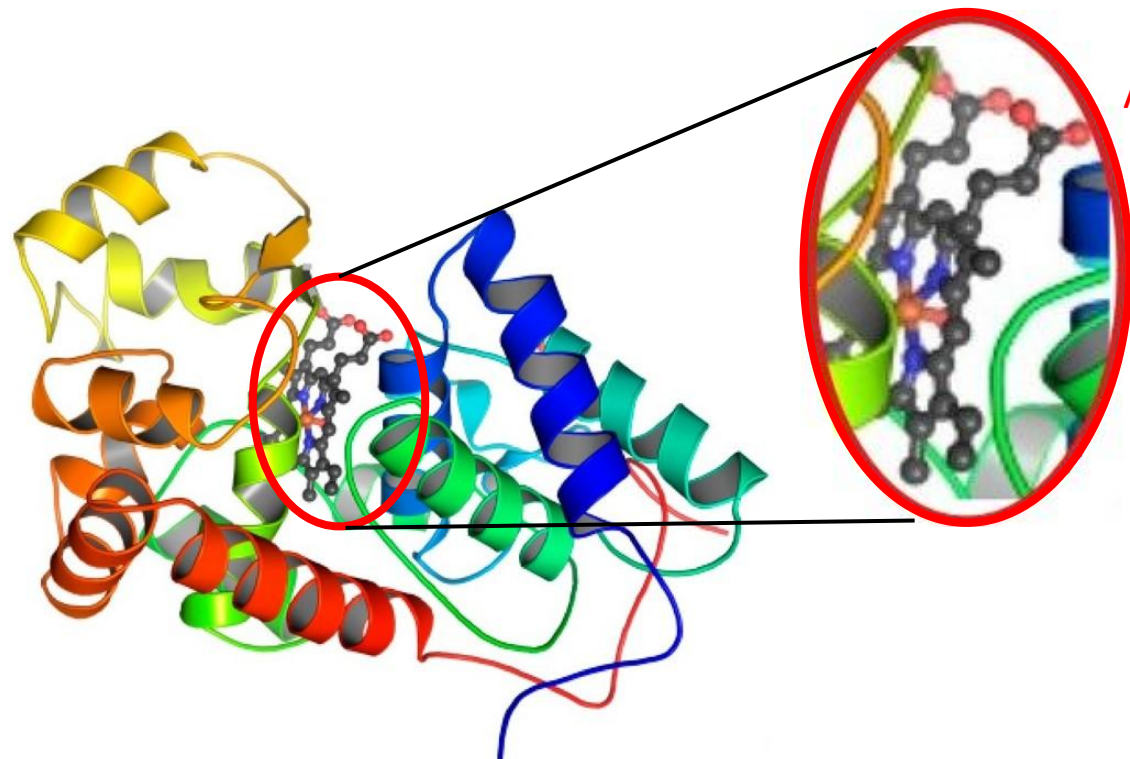


Source: <https://en.wikipedia.org/wiki/Hemoglobin>



Active Description – Learning from Nature

The iron peptide in Glorydermal® Bloxydur is **the first and, to date, only synthetic peroxidase-like active** for use in cosmetics.



Active centre of the horseradish peroxidase with iron core

The iron peptide in Glorydermal® Bloxydur **mimics the active centre** of the peroxidase.

Focus on active core of the enzyme allows **better skin penetration properties** (size!) and **high efficacy**.

Synthetic pathway offers **highly standardised quality and quantity**, which is not possible by common enzyme extractions from natural sources.

3D Structure of Horseradish Peroxidase

(Danielson, A. et al. Investigating the Mechanism of Horseradish Peroxidase as a RAFT-Initiase. *Polymers* **10**, 741 (2018).)

Peroxidases are enzymes that catalyse the reduction of peroxides (usually hydrogen peroxide).



Active Description – Antioxidant Enzyme



Antioxidant enzyme (iron peptide):

Reactive Oxygen Species (**ROS**), which include free radicals, are **continuously neutralised**.

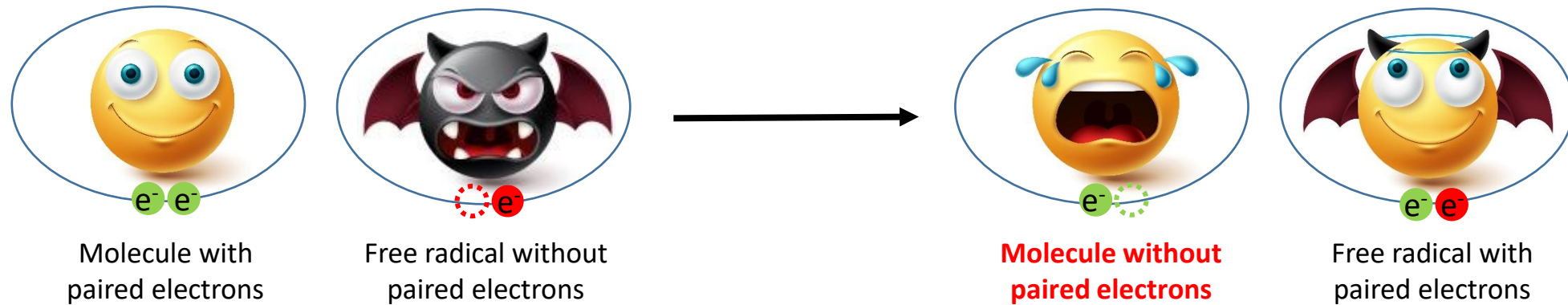
This long-term antioxidant acts like an enzyme. It is **not used up** and **regenerates itself**.

➡ **Long-term radical protection**



Free Radicals – **Action**, Neutralisation, Long-term Radical Protection

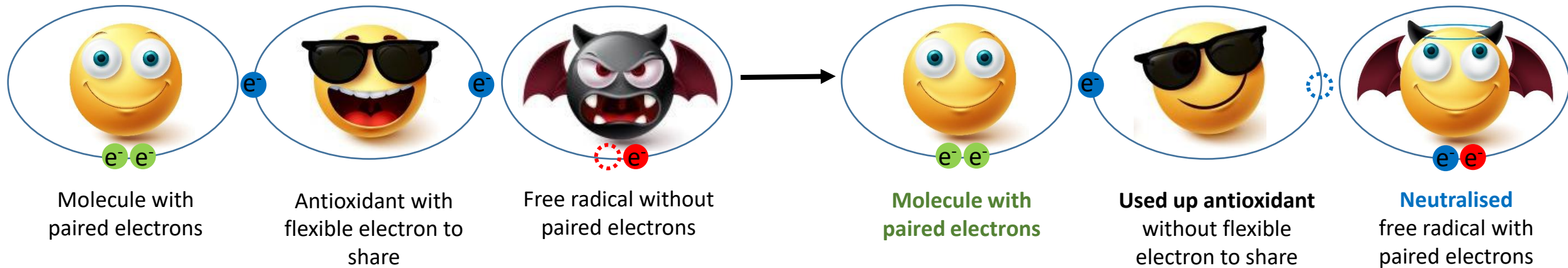
Action of free radicals **without** antioxidants





Free Radicals – Action, **Neutralisation**, Long-term Radical Protection

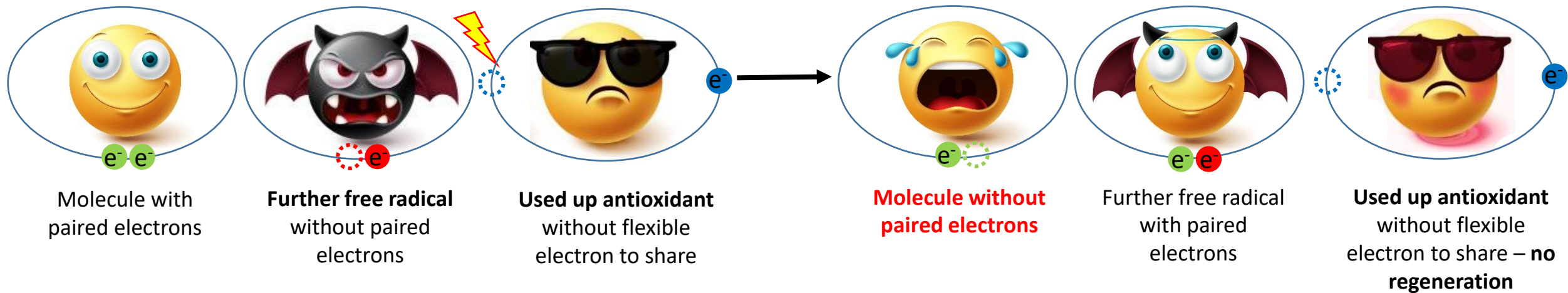
Neutralisation of free radicals **with common antioxidants**





Free Radicals – Action, Neutralisation, Long-term Radical Protection

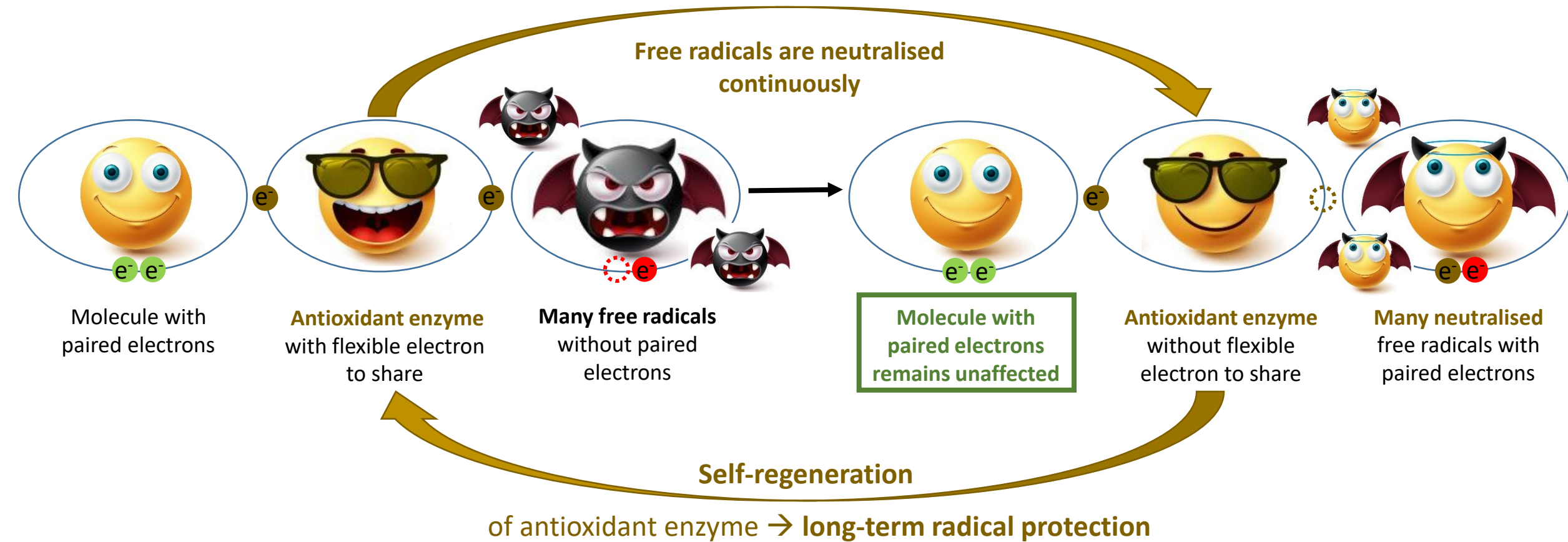
Limits of neutralisation of free radicals with common antioxidants





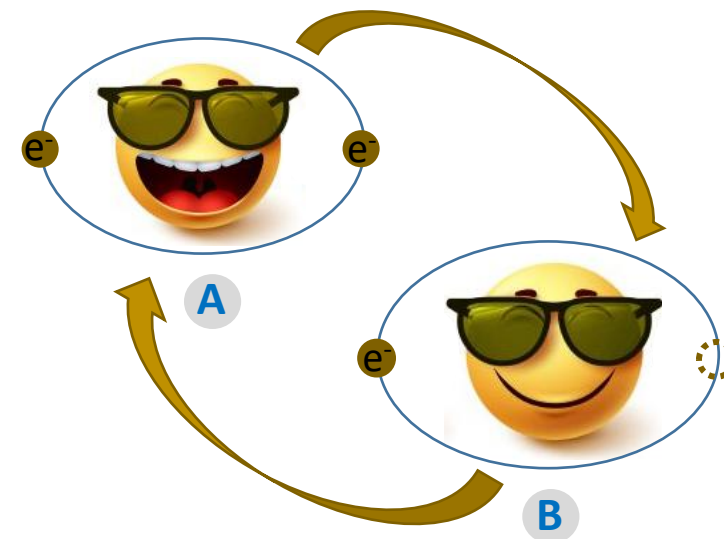
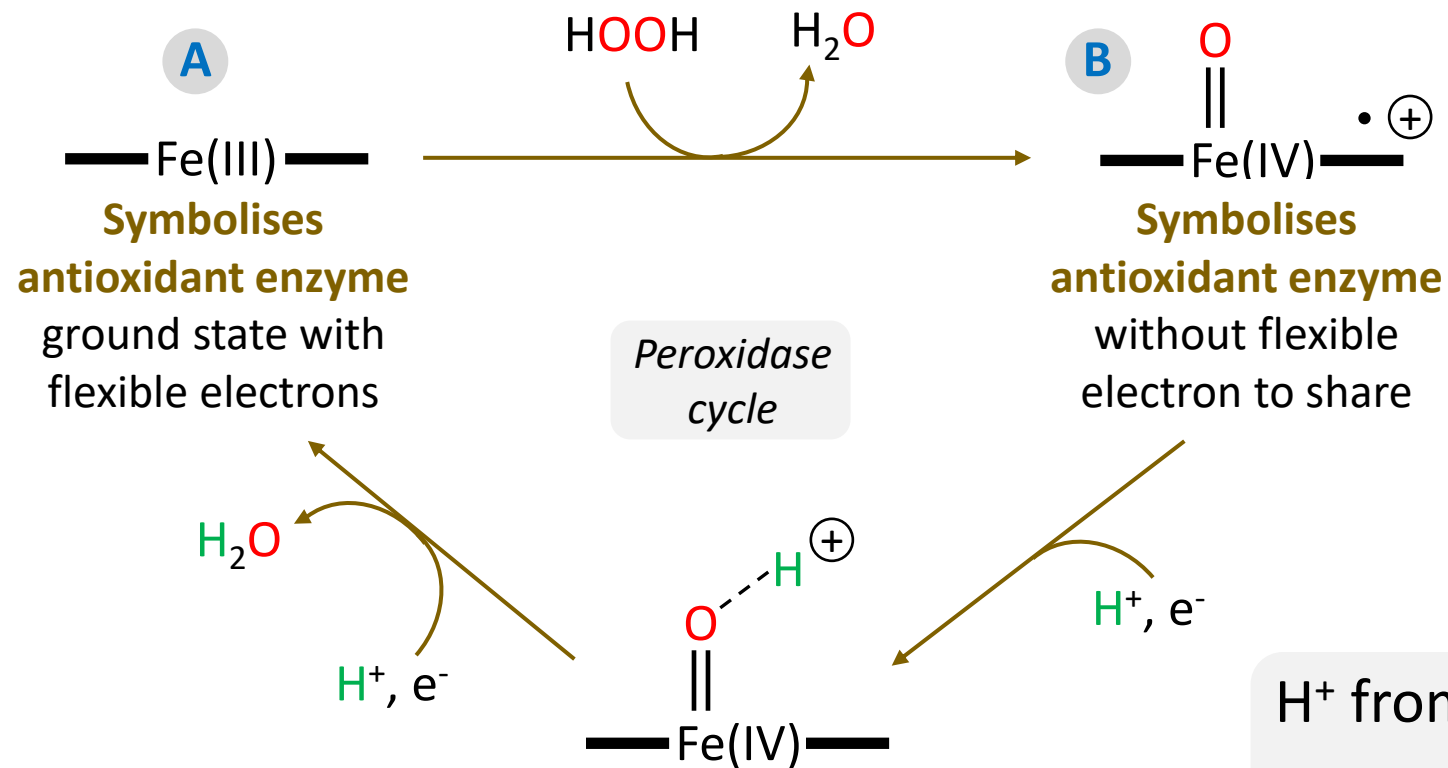
Free Radicals – Action, Neutralisation, **Long-term Radical Protection**

Neutralisation of free radicals **with antioxidant enzyme in Glorydermal® Bloxydur**





Self-regeneration of the Antioxidant Enzyme



H⁺ from autoprotolysis of water:



Adapted from the peroxidase cycle of horseradish peroxidase (Berglund, G., Carlsson, G., Smith, A. *et al.* The catalytic pathway of horseradish peroxidase at high resolution. *Nature* **417**, 463–468 (2002).)



Stability of the Oxidation State Fe(IV)



How stable is Fe(IV)?

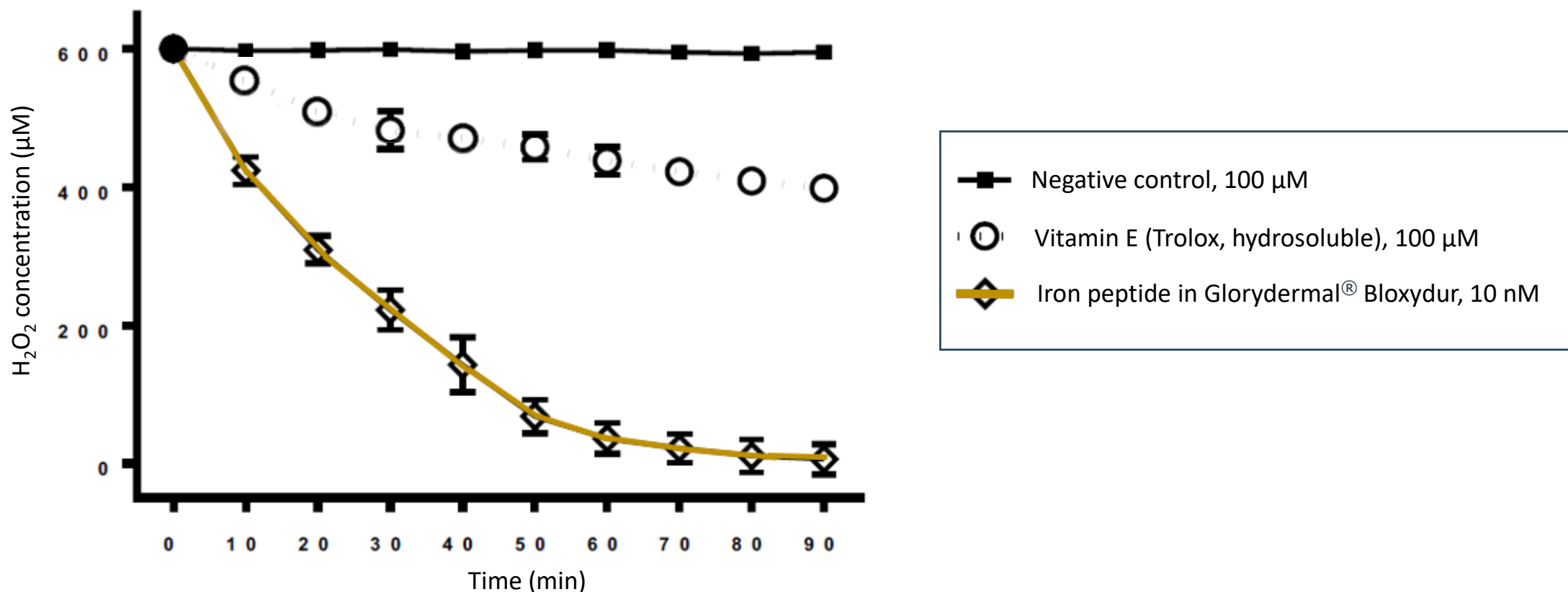
Fe(IV) is a **very rarely** occurring oxidation state. This is due to its **generally low stability**.

Under certain conditions, however, this oxidation state can be **stabilised** and even be **impressively visible** to the naked eye: **Amethyst**

Amethyst consists of the mineral quartz. Its **violet colour** is caused by **iron impurities in the oxidation state Fe(IV)**.



Antioxidant Assay – Antioxidant Enzyme and Non-Enzymatic Antioxidant



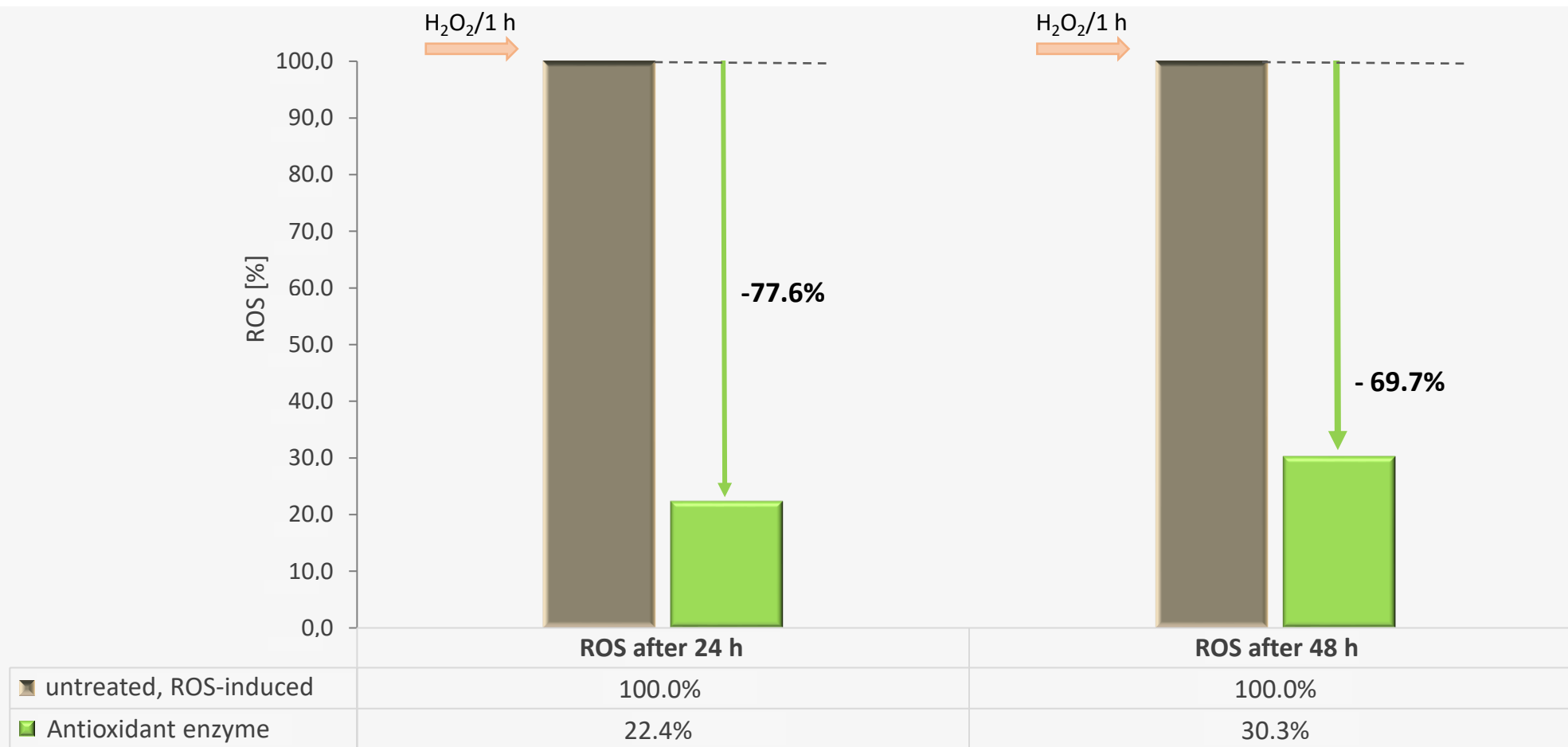
The rate of H_2O_2 breakdown for the **iron peptide** (antioxidant enzyme) is **significantly superior over time** than the one for **vitamin E** (non-enzymatic antioxidant), although its concentration is **10,000-times less** than the concentration of vitamin E.

→ **Proof of the enzymatic activity** of the iron peptide (one molecule can breakdown several H_2O_2 molecules), which enables long-term radical protection.

Assay design: Xylenol orange assay (A560) (Gay & Gebicki, 2000) to measure the H_2O_2 breakdown of antioxidant components over time.



Efficacy Study – Long-term Radical Protection

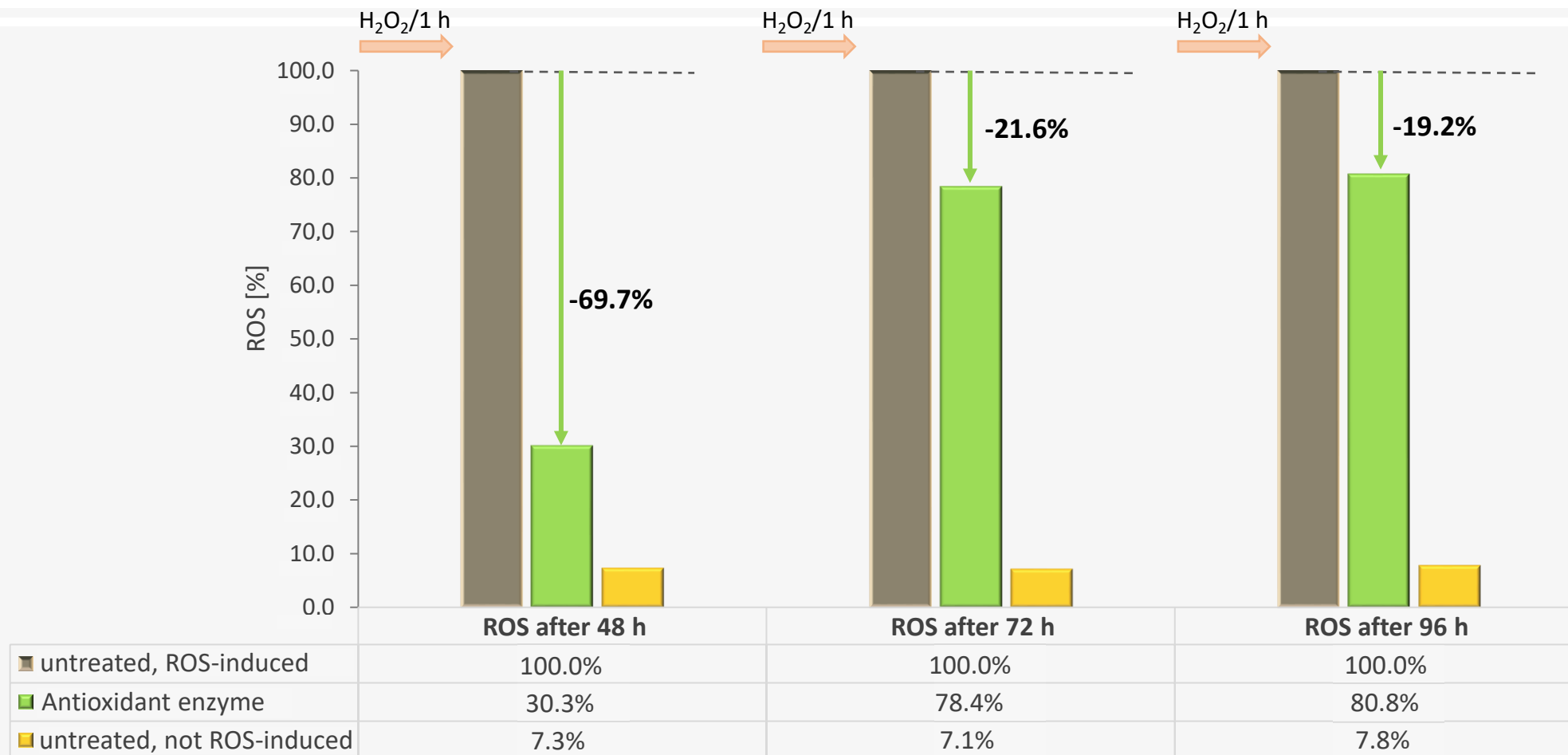


The antioxidant enzyme regenerates itself and provides long-lasting protection against free radicals.

Study design: Human keratinocytes, used formulation: aqueous solution of active ingredient with 0.3% antioxidant enzyme mixture according to Glorydermal® Bloxydur. ROS were induced by H₂O₂ treatment (treatment duration: 1 h). Untreated, ROS-induced = positive control (normalised to 100%, maximum stress). Results in relation to positive control (p<0.0001).



Efficacy Study – Long-term Radical Protection



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In vivo Study – Antioxidant Protection Upon Oxidative Challenges

Biozoom® Skin Autofluorescence (Skin AF)



biozoom Services GmbH

Biozoom® measures **carotenoids** present in the skin by means of fluorescence techniques.

In use double blind, randomised, placebo-controlled
Hemiface application before exposure to oxidative challenges
Placebo cream vs verum cream (with 0.3% Glorydermal® Bloxydur)
5 women (aged 25-32 years)
Exposure time of the different oxidative challenges: 15 min
Measurements at T0 and T1 (T0+15 min)
3 measurements in different areas/cheek for placebo and verum

Different oxidative challenges:

Ozone
(representing urban pollution)

UVA
(380 nm)

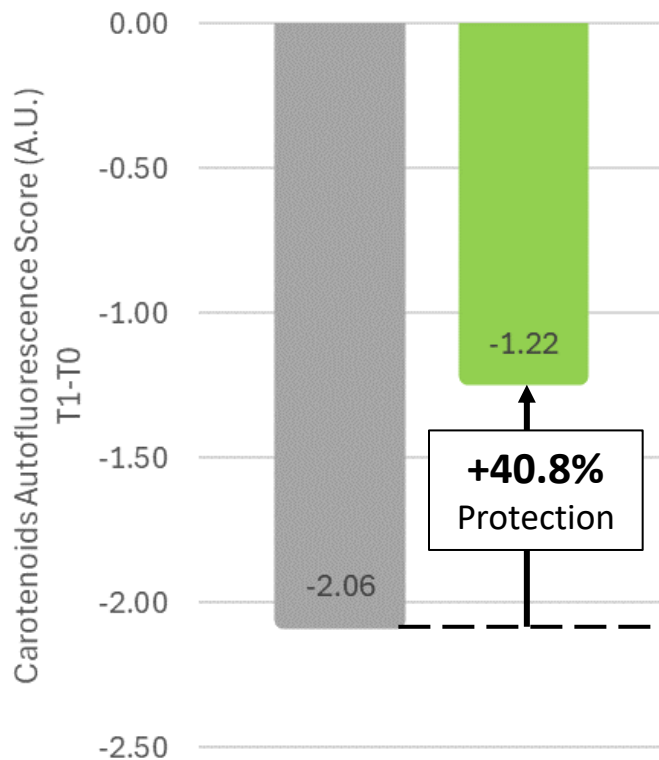
HEV/Blue Light
(380-445 nm)



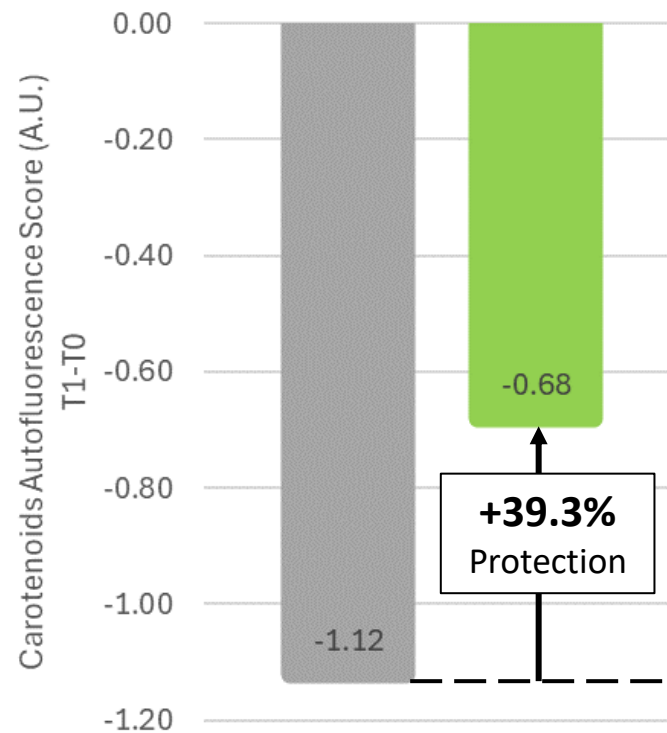
In vivo Study – Antioxidant Protection Upon Oxidative Challenges

The less oxidation of carotenoids (smaller bar) vs placebo, the higher the antioxidant protection.

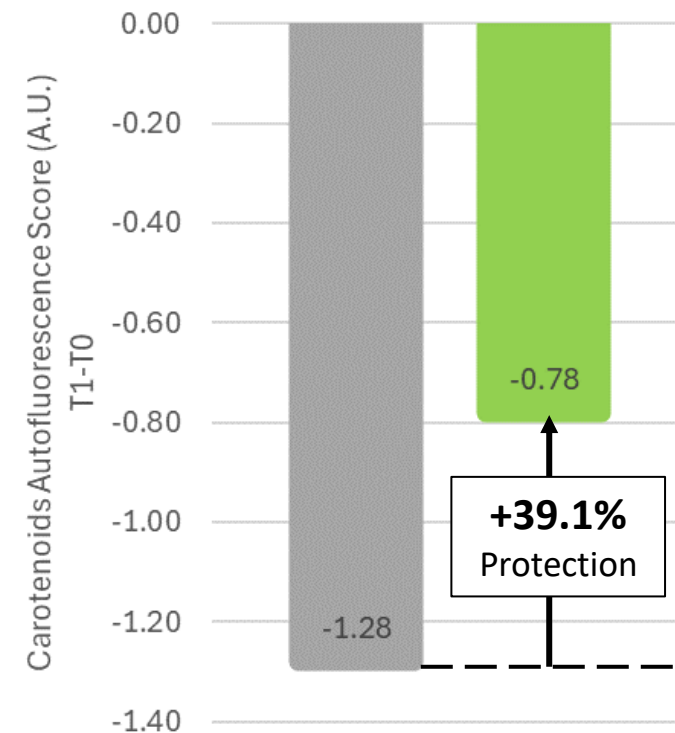
Ozone (representing urban pollution)



UVA (380 nm)



HEV/Blue Light (380-445 nm)



■ Placebo ■ 0.3% Glorydermal® Bloxydur

Strong antioxidant power: after 15 min exposure to the corresponding oxidative challenge, **less carotenoids were oxidised** in the skin in all cases **with Glorydermal® Bloxydur**.



Technical Data

Glorydermal® Bloxydur

Product Code: GD-BD-002

INCI EU (CTFA/PCPC):

AQUA (WATER), GLYCERIN, LECITHIN, XANTHAN GUM, HEMIN PENTAPEPTIDE-128 GAMMA-GLUTAMYL DIPEPTIDE-4.

ADDITIVES, PRESERVATIVES:

PROPANEDIOL, 1,2-HEXANEDIOL, CAPRYLYL GLYCOL.

INCI CHINA (IECIC (I)) is available separately.

Appearance: yellow to light brown, turbid liquid

Solubility: dispersible in water

Recommended dosage: 0.3%

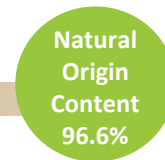
Formulation: at the end of the production process at a temperature < 40°C



VEGAN



ISO 16128



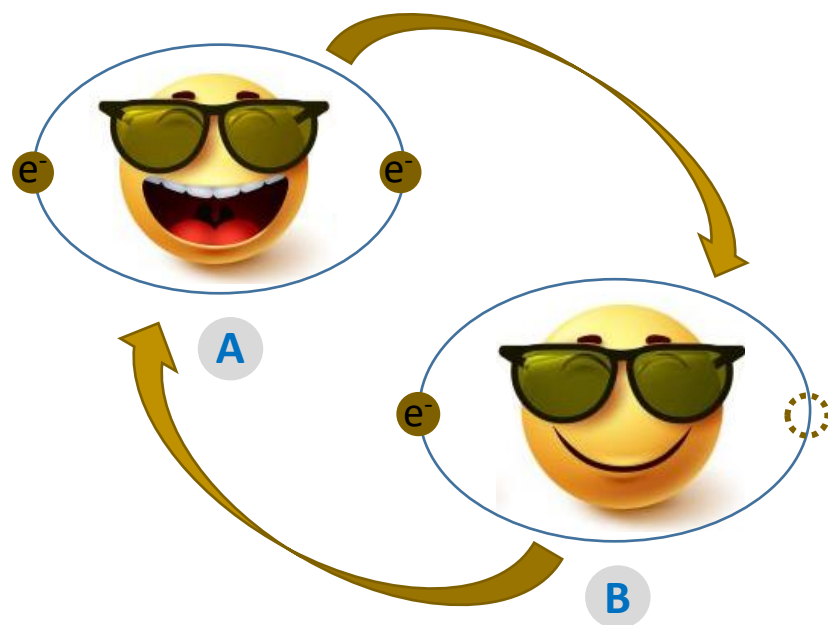
ISO 16128



COMPLIANT



Summary – LONGEVITY & PROTECTIVE BEAUTY

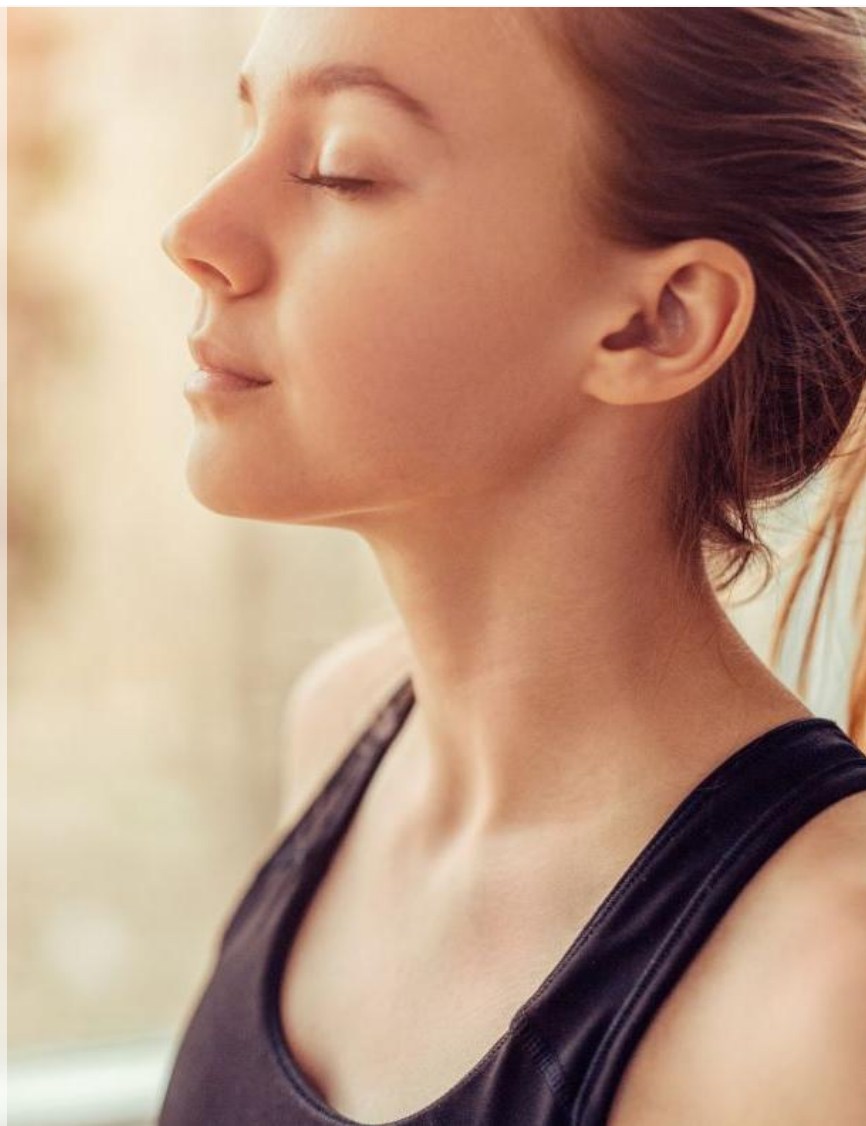


- **Oxidative stress** caused by **free radicals** leads to **premature skin ageing**.
- **Common antioxidants** are **limited** in terms of long-lasting effect.
- The **antioxidant enzyme** (iron peptide) enables a **long-lasting, continuous neutralisation** of free radicals.
- **Easy handling** in the production of cosmetic products (addition at the end of the production process, cooled bulk).
- Recommended for **daily care** (serum, cream, etc.), **body care, sunscreen** and **after sun products**.

Against oxidative stress - for a relaxed skin in balance



Glorydermal® Bloxydur



GloryDermal

GloryDermal GmbH

Am Pruessee 46 | 21514 Guester | Germany

Tel.: +49 (0)4158 2093 299

info@glorydermal.com | [www. glorydermal.com](http://www.glorydermal.com)

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