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.

Introduction

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**.

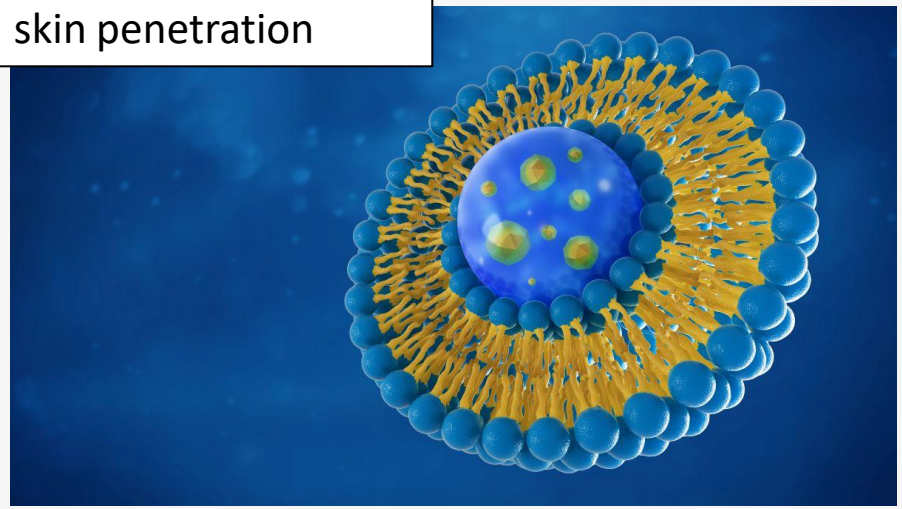
Active Description – Learning from Nature

Antioxidant enzyme

Neutralisation of free radicals

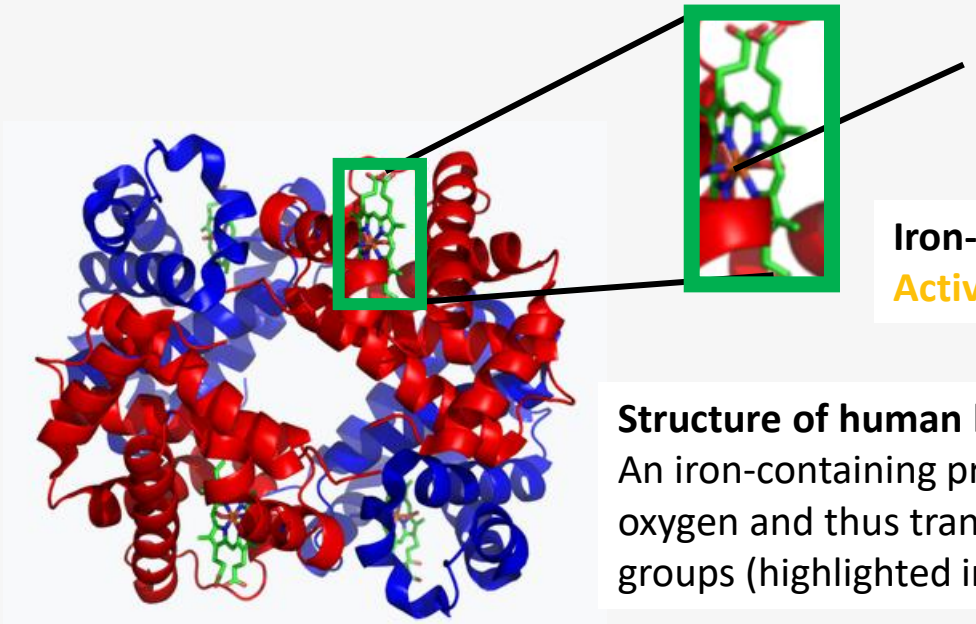
Iron peptide

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**



Iron ion in the centre of the heme group

Iron-containing heme groups:
Active centres which bind oxygen via the **iron ion in the centre**.

Structure of human hemoglobin:
An iron-containing protein complex in the red blood cells of vertebrates, which reversibly binds oxygen and thus transports it in the bloodstream. An iron ion is centred in each of the 4 heme groups (highlighted in green).

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

Active Description – Antioxidant Enzyme

Antioxidant enzyme (iron peptide):

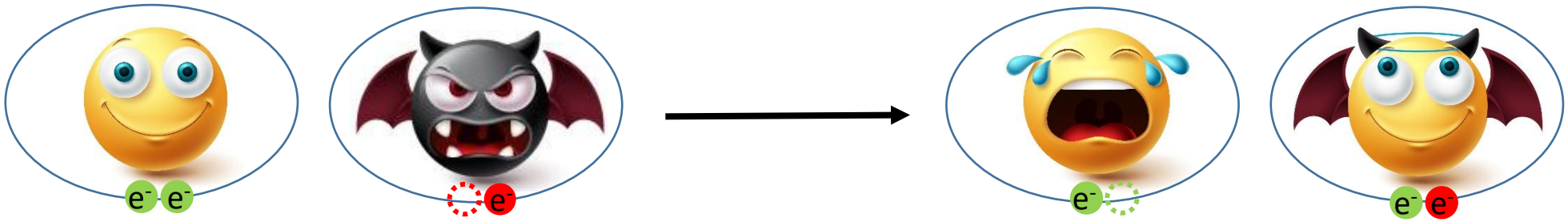
Reactive Oxygen Species (**ROS**), which include free radicals, are **continuously neutralised**.

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**



Molecule with paired electrons

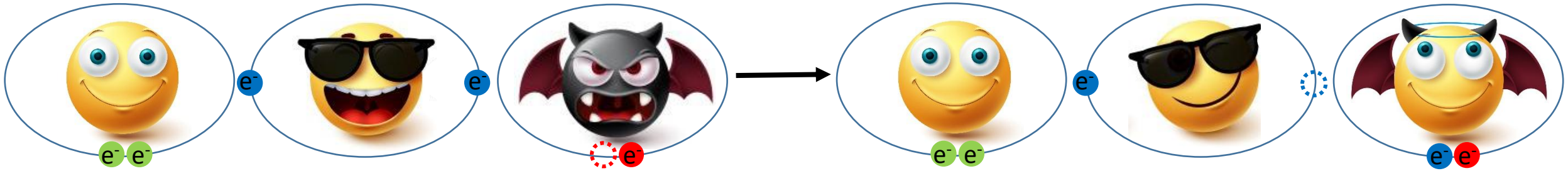
Free radical without paired electrons

Molecule without paired electrons

Free radical with paired electrons

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

Neutralisation of free radicals **with common antioxidants**



Molecule with paired electrons

Antioxidant with flexible electron to share

Free radical without paired electrons

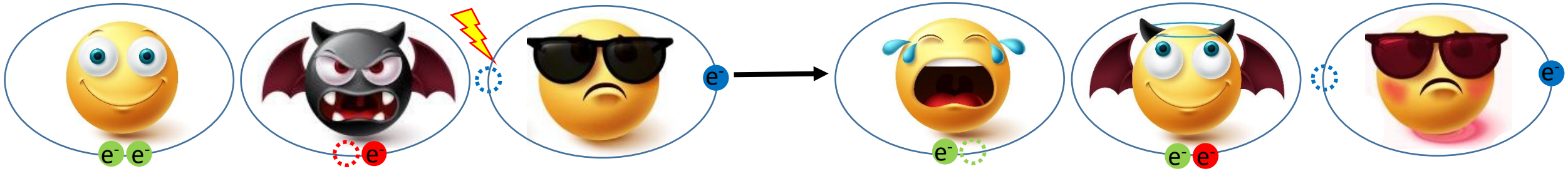
Molecule with paired electrons

Used up antioxidant without flexible electron to share

Neutralised free radical with paired electrons

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

Limits of neutralisation of free radicals **with common antioxidants**



Molecule with paired electrons

Further free radical without paired electrons

Used up antioxidant without flexible electron to share

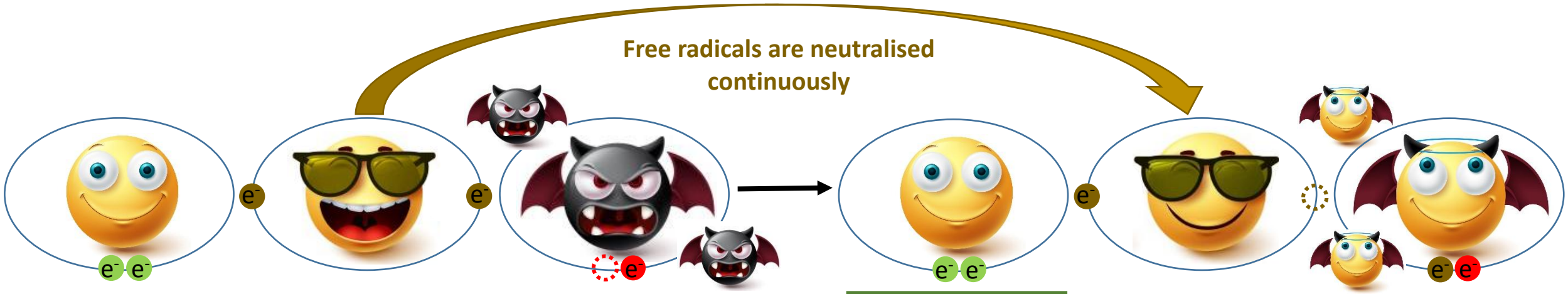
Molecule without paired electrons

Further free radical with paired electrons

Used up antioxidant without flexible electron to share – **no regeneration**

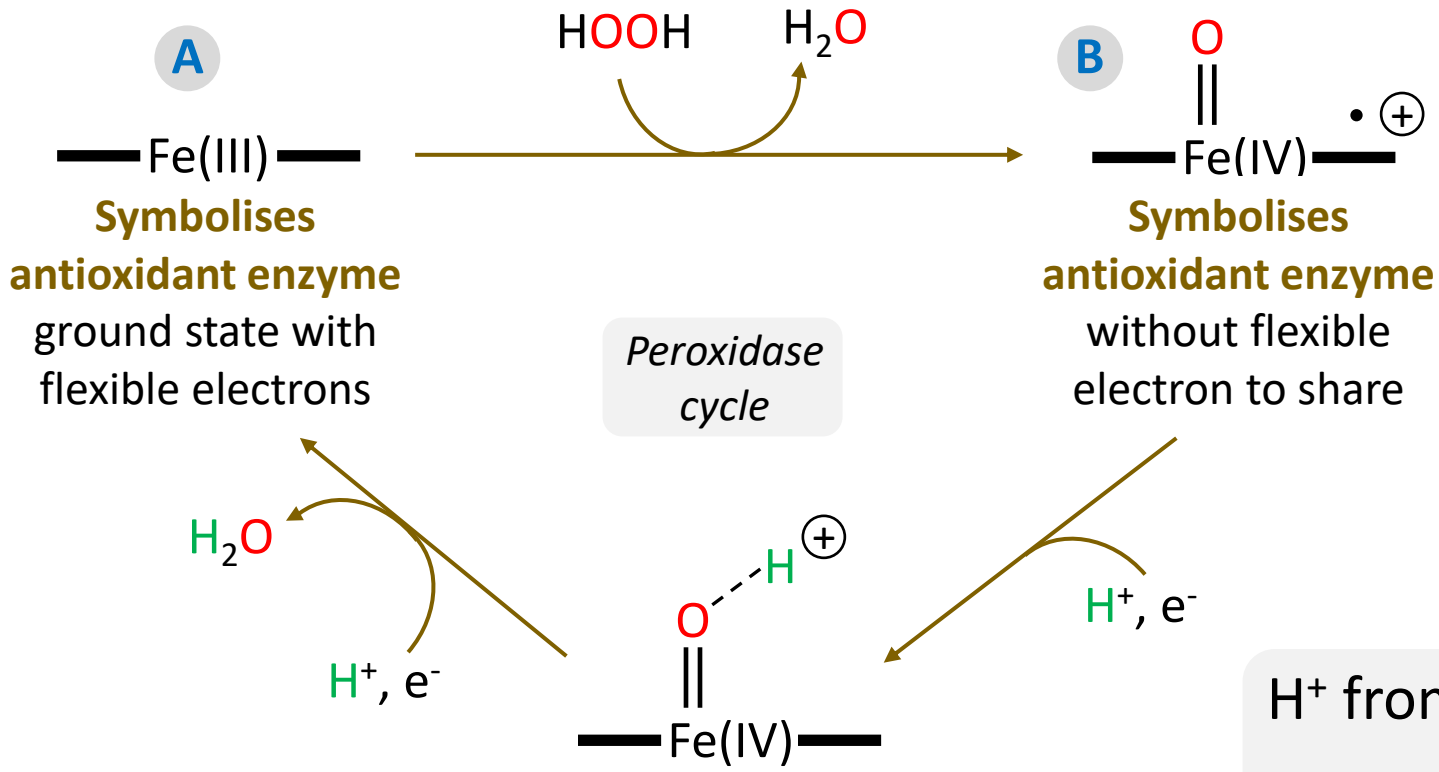
Free Radicals – Action, Neutralisation, **Long-term Radical Protection**

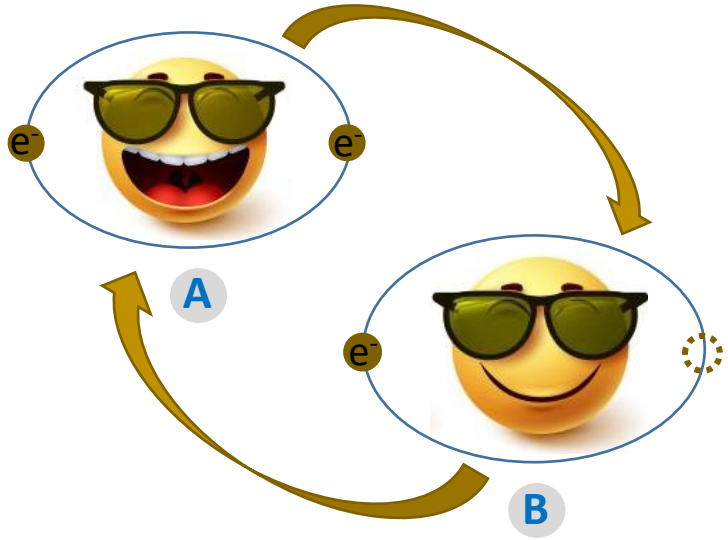
Neutralisation of free radicals **with antioxidant enzyme in Glorydermal® Bloxydur**



of antioxidant enzyme → **long-term radical protection**

Self-regeneration of the Antioxidant Enzyme





H^+ from autoprotolyse of water:

$$2\ H_2O \rightleftharpoons 2\ H^+ + 2\ OH^-$$

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)

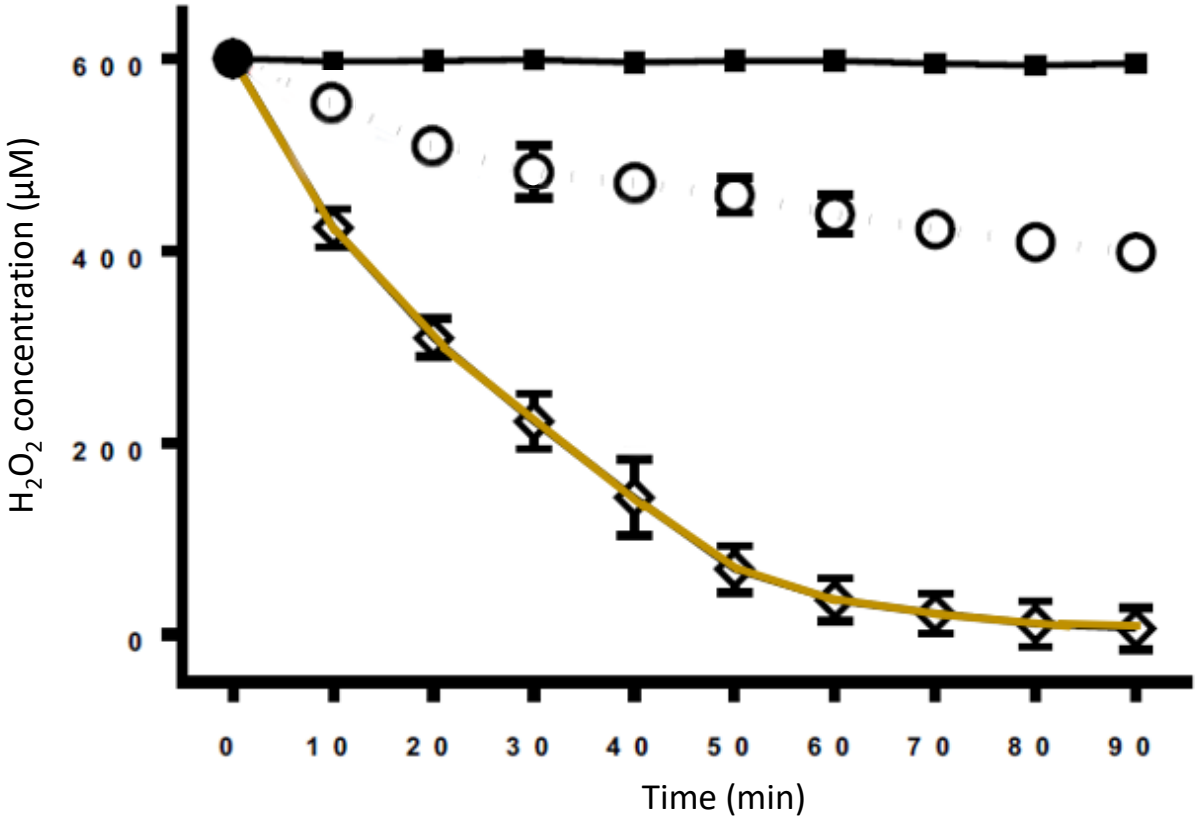
How stable is Fe(IV)?

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



Negative control, 100 µM

Vitamin E (Trolox, hydrosoluble), 100 µM

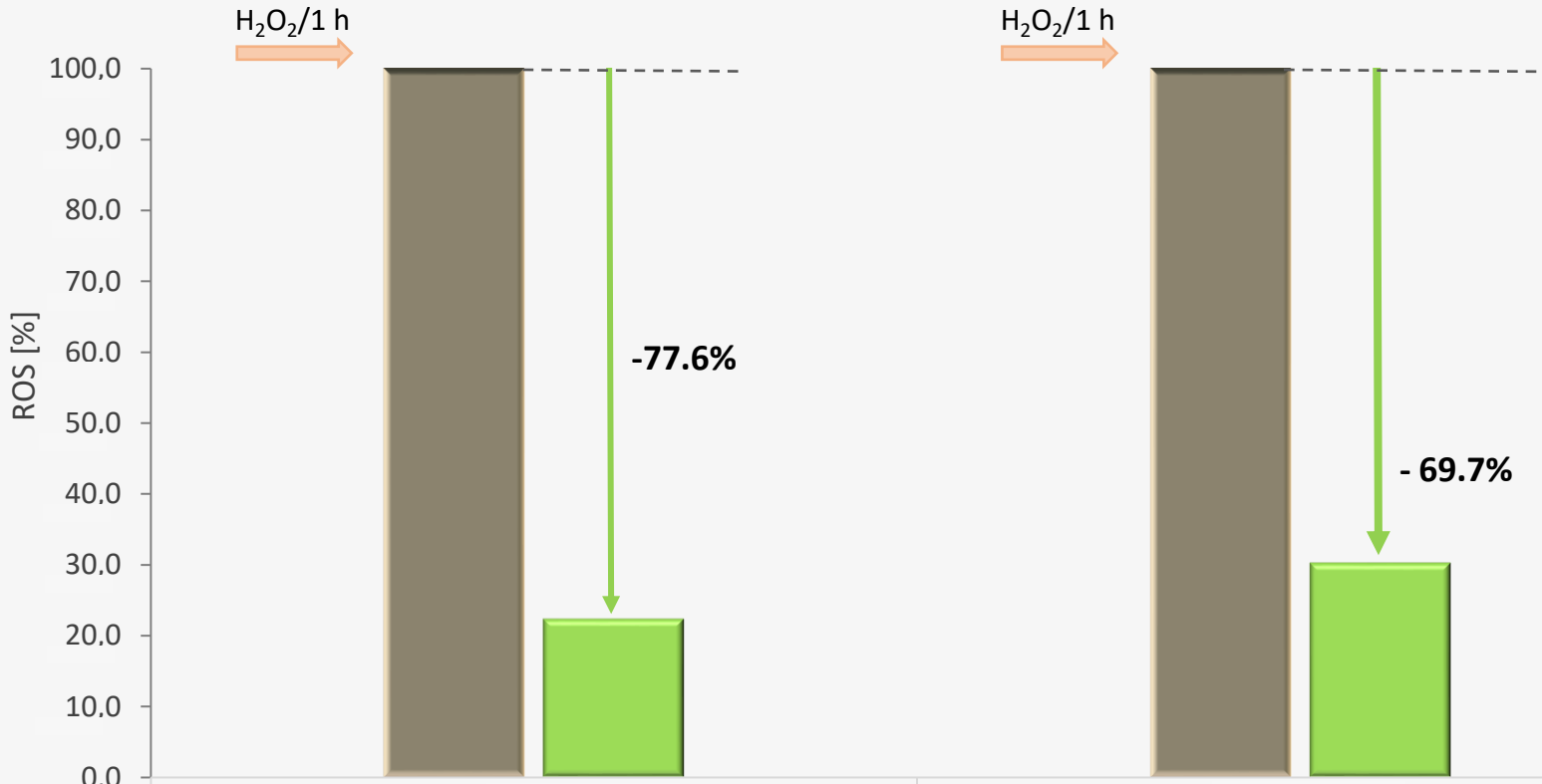
Iron peptide in Glorydermal® Bloxydur, 10 nM

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

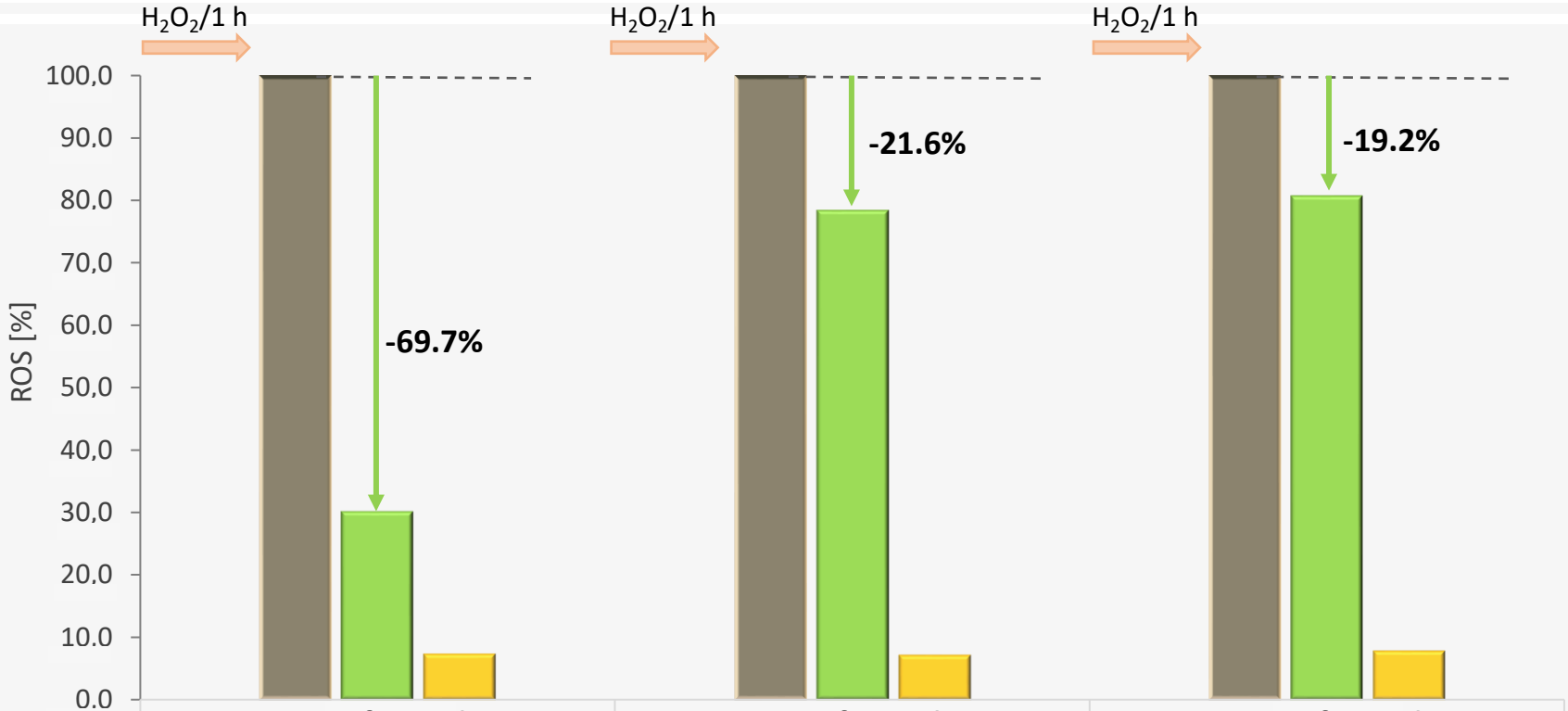


	ROS after 24 h	ROS after 48 h
untreated, ROS-induced	100.0%	100.0%
Antioxidant enzyme	22.4%	30.3%

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 H_2O_2 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



	ROS after 48 h	ROS after 72 h	ROS after 96 h
untreated, ROS-induced	100.0%	100.0%	100.0%
Antioxidant enzyme	30.3%	78.4%	80.8%
untreated, not ROS-induced	7.3%	7.1%	7.8%

The antioxidant enzyme regenerates itself and provides **long-term radical protection**.

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 H_2O_2 treatment (treatment duration: 1 h). Untreated, ROS-induced = positive control (normalised to 100%, maximum stress). Results in relation to positive control ($p<0.05$).

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)

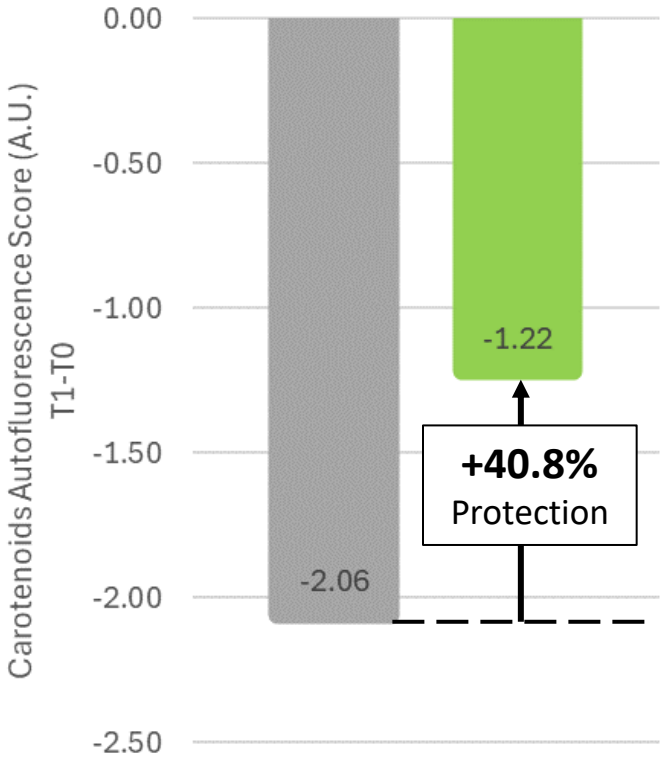
UVA
(380 nm)

HEV/Blue Light
(380-445 nm)

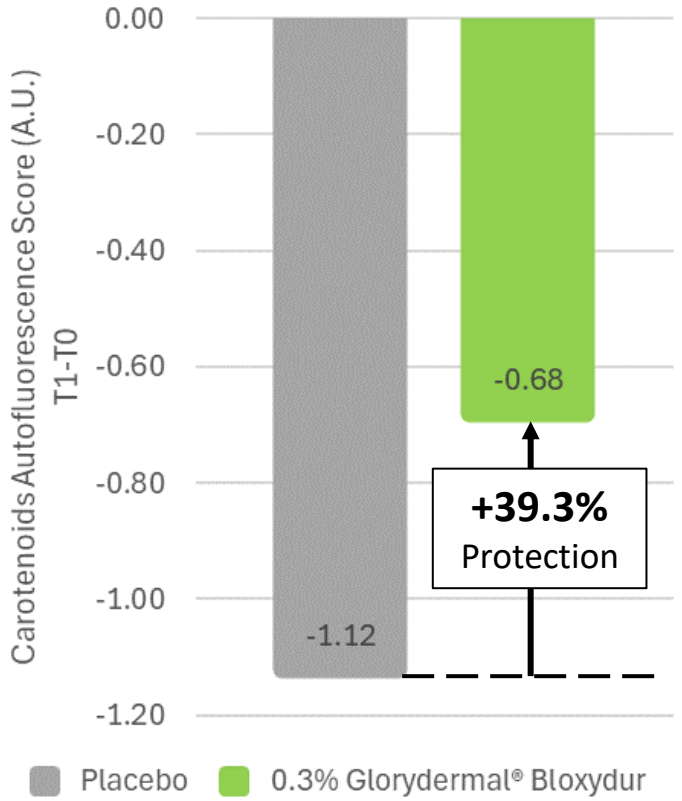
In vivo Study – Antioxidant Protection Upon Oxidative Challenges

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

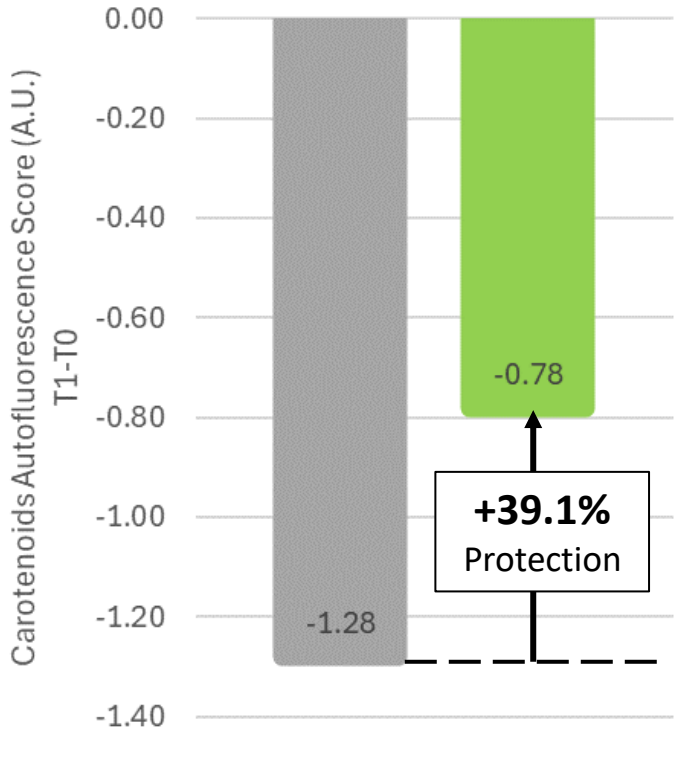
Ozone (representing urban pollution)



UVA (380 nm)



HEV/Blue Light (380-445 nm)



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.

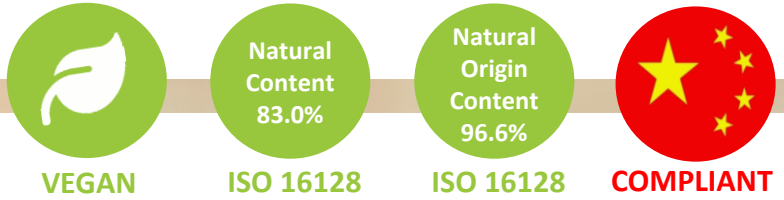
INCI CHINA (IECIC (I)) is available separately.

Appearance: yellow to light brown, turbid liquid

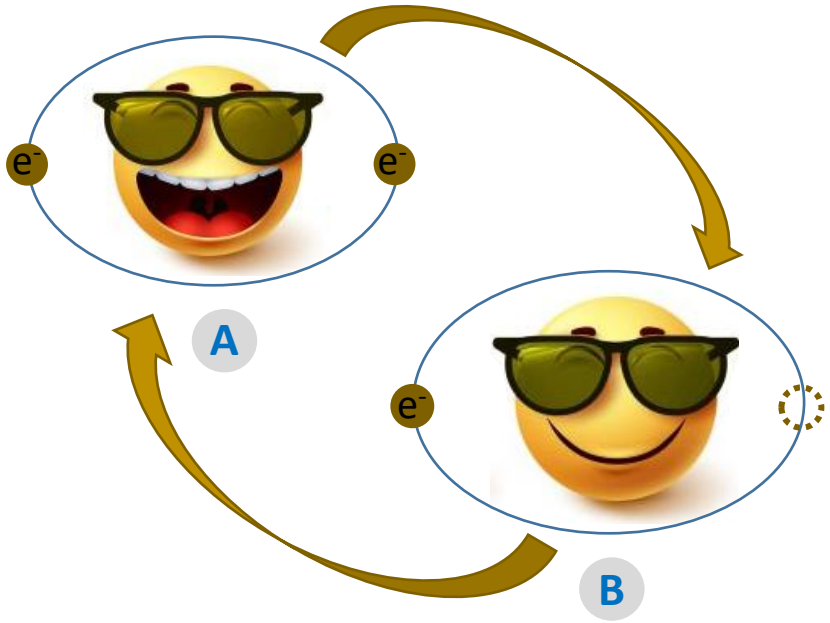
Solubility: dispersible in water

Recommended dosage: 0.3%

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



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 GmbH
Am Pruessee 46 | 21514 Guester | Germany
Tel.: +49 (0)4158 2093 299
info@glorydermal.com | www. glorydermal.com