ALPHA-ARBUTIN
Superior skin lightening enhancer for a perfect even skin tone
The mechanism of skin pigmentation

UV light stimulates melanin production by human epidermal melanocytes

**Melanocyte**
- located at the basal cell layer of the epidermis
- forms long, finger-like dendrites
- contains melanosome
- produces enzymes involved in melanogenesis (e.g. tyrosinase)
- transfers melanosome to neighboring keratinocyte

**Melanosome**
- organelle (specialized subunit within a cell)
- produces melanin
- migrates upward into the dendrites and are taken up by keratinocytes

**Melanin**
- Eumelanin (brown - black)
- Pheomelanin (yellow - red)
Tyrosinase, one of the major enzyme involved in the formation of skin tan and age spots

Tyrosine → Dopa → Dopaquinone → Leucodopachrome → Indole-5,6-quinone → Eumelanin

Tyrosinase → DHI → Leucodopachrome

Tyrosinase → Dopachrome

Indole-5,6-quinone-2-carboxylic acid → Eumelanin

+ Cysteine SH compounds Polymerization

Pheomelanin

TRP1/2/DCT

DSM

BRIGHT SCIENCE. BRIGHTER LIVING.
ALPHA-ARBUTIN
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ALPHA-ARBUTIN

Unique product features

• ALPHA-ARBUTIN is an α-glucoside compared to the β-form of the related Beta-arbutin
  • ALPHA-ARBUTIN
    ![Chemical structures of α-form and β-form of arbutin]
  • Beta-arbutin

• High performing enzyme related biotechnology
• Highly pure biosynthetic active ingredient
• Scientifically proven effects at low concentrations
  - Outstanding tyrosinase inhibition activity *in vitro*
  - Nine times more effective than Beta-Arbutin *in vitro*
  - More effective at 1.0% than Beta-Arbutin *in vivo*
ALPHA-ARBUTIN

Impressive tyrosinase inhibition

- *In vitro* tests show that ALPHA-ARBUTIN exhibits impressive tyrosinase inhibition

- Very low IC$_{50}$ values = 1.0 mMol (the concentration that produces a 50% inhibition of human tyrosinase) indicates the power of ALPHA-ARBUTIN. ALPHA-ARBUTIN is nine times more effective than Beta-Arbutin.

  ALPHA-ARBUTIN: IC$_{50} = 1.0$ mMol  
  Beta-Arbutin: IC$_{50} = 9.0$ mMol
**ALPHA-ARBUTIN**

perfect affinity to the active site of tyrosinase

The superior efficacy of ALPHA-ARBUTIN is due to its perfect affinity to the active site of tyrosinase

DFT (density functional theory)-optimized structures and ESP (electrostatic potential) calculations on ALPHA-ARBUTIN, Beta-Arbutin, Tyrosine (the substrate of tyrosinase) reveals that the ESP for ALPHA-ARBUTIN is similar to that of Tyrosine.

The ESP potential for Beta-Arbutin indicates potential difficulties when binding to tyrosinase, meaning the inhibitory activity of Beta-Arbutin is low.

DFT (density functional theory)-optimized structures and calculated ESP’s. The yellow dots represent the negative regions and the blue dots represent the positive regions of the electrostatic potential.
ALPHA-ARPUTIN

Benefits

*IN VIVO* proven

- Ensures an even, lighter skin tone
- Helps to minimize the appearance of liver spots
- Reduces the degree of skin tanning after UV exposure
**ALPHA-ARBITUN** ensures an even, lighter skin tone

One-month skin lightening study
- Four emulsions containing ALPHA-ARBITIN, Kojic acid, Beta-Arbutin and Hydroquinone at 1% use level were applied twice a day for one month on the forearm of 80 women of Chinese descent.
- The parameter L which represents the lightness of skin was determined by means of chromameter.

Interaction curve for parameter “L”: treated zone vs control, difference

**ALPHA-ARBITIN ensures an even lighter skin tone when compared with Beta-Arbutin, Kojic acid and Hydroquinone at 1% use level**
ALPHA-ARBITIN

Reduces the degree of skin tanning after UV exposure

Two weeks skin tanning reduction study

• A double blind study was performed on 23 healthy volunteers.

• The inside of the upper arm of each volunteer was irradiated with ultraviolet rays (1.4 MED) using a solar simulator, and immediately thereafter test samples with ALPHA-ARBITIN (1% and 2%) were applied twice a day for two consecutive weeks.

• Skin color ($\Delta L$ value) was evaluated by means of chromameter one and two weeks after the end of UV exposure.

2% ALPHA-ARBITIN reduces the degree of skin tanning after UV exposure after one and two weeks.
**ALPHA-ARBITIN**

Combination with UV filter lightens the skin very effective

Three month study under sun light exposition
- The formulations (1% ALPHA-ARBITIN, 6% UV-filter, 1% ALPHA-ARBITIN + 6% UV filter, placebo) were applied on 20 female Asian volunteers (mean age 35 years) in a dose of 2 mg/cm² once a day 60 minutes before sun light exposition.
- Sun light exposition (< 1 MED) three times each week
- Skin Colour was assessed according to the L*a*b* system with a chromameter

The figure shows a simulation of the skin colour based on the L*a*b* values.

Combination of ALPHA-ARBITIN with UV filters (UV-A, UV-B) have very effective skin-lightening and tan preventing activities already after 4 weeks
ALPHA-ARBUTIN helps to minimize the appearance of liver spots

Three month liver spot study

- A three-month study was performed on 26 women (aged between 40 and 65) with liver spots. Creams (2% ALPHA-ARBUTIN; 2% Beta-Arbutin) were applied twice daily.

- After three consecutive months of application, the liver spot reduction efficacy was visually evaluated following five-grade scale: markedly improved, slightly improved, ineffective and aggravated.

53.7% of the panelists reported a markedly improved or improved condition with ALPHA-ARBUTIN against only 30.6% for Beta-Arbutin.
ALPHA-ARBUTIN

Cosmetic application

- Intensive skin lightening products
- Even skin tone care
- Age spot treatment
- BB/CC creams

Formulation guidelines

Suggested concentration

- Up to 2% for face and neck preparations

Stability

- Stable in the pH range from 3.5 to 6.5

INCI name

- Alpha-Arbutin
ALPHA-ARBUTIN

Summary

- Scientifically proven effects at low concentrations:
  - Outstanding tyrosinase inhibition activity
  - Nine times more effective than Beta-Arbutin
- Perfect affinity to the active site of tyrosinase leads to superior efficacy
- Ensures an even, lighter skin tone
  - More effective at 1.0% than Beta-Arbutin
- Combination with UV filter lightens the skin very effective
- Helps to minimize the appearance of liver spots
- Reduces the degree of skin tanning after UV exposure