

TECHNICAL DATA SHEET

Product name: Lactobionic Acid

INCI name: Lactobionic Acid

CAS: 96-82-2

Chemical classification: Carboxylic Acid/Derivatives, Carbohydrates, Ether

Functional category: Skin conditioning agent ~ Miscellaneous, pH regulator / Buffer

IUPAC name: (2R,3R,4R)-2,3,5,6-Tetrahydroxy-4-[[(2S,3R,4S,5R,6R)-3,4,5-trihydroxy-6-(hydroxymethyl)-2-tetrahydropyranyl]oxy]hexanoic acid

Description: Lactobionic acid (4-O- β -galactopyranosyl-D-gluconic acid) is a sugar acid. It is a disaccharide formed from gluconic acid and galactose. It can be formed by the oxidation of lactose. The carboxylate anion of lactobionic acid is known as lactobionate. Lactobionic acid occurs as a white crystalline powder. It is highly soluble in water, making it suitable for various aqueous formulations in cosmetics and pharmaceuticals. As an organic acid, it decomposes before boiling point. Its melting point can vary depending on its state of hydration and ranges from about 93°C to 98°C for the anhydrous form. It is stable at normal temperatures but sensitive to prolonged exposure to heat, which can lead to its degradation. As an acid, it has a specific pKa value reflecting its acidity level. While the exact value can vary depending on conditions, it typically shows a pKa in the range of 3.8, indicating its relatively mild acidic nature. One of the significant chemical properties of lactobionic acid is its ability to chelate metal ions, meaning it can form stable complexes with metals. This property is valuable in cosmetics for stabilizing formulations. Lactobionic acid is relatively stable to oxidation due to its structure, but under specific conditions, it can participate in redox reactions, which is the basis for its antioxidative properties.

Benefits:

- **Skin hydration:** Lactobionic acid is a powerful humectant. It has the ability to attract water from the environment and retain this water in the skin. When applied to the skin, it forms a hydrating film that helps maintain skin moisture, making it soft, smooth, and elastic. It helps increase the content of NMF, the skin's natural moisturizing

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factor, further contributing to better moisture retention. Regular use of lactobionic acid can help strengthen the skin barrier, thereby reducing transepidermal water loss (TEWL). Lactobionic acid encourages the skin to produce glycosaminoglycans, which are key to maintaining skin hydration. Glycosaminoglycans can bind large amounts of water, further aiding in hydration and skin volumizing. This can lead to a reduction in the appearance of fine lines and wrinkles caused by dehydration.

- **Antioxidant properties:** Lactobionic acid acts as an effective antioxidant by neutralizing free radicals before they can cause damage to skin cells. This is achieved by donating electrons to free radicals, thus stabilizing them and preventing them from causing oxidative stress in cells. In addition to neutralizing free radicals, lactobionic acid can help reduce the concentration of reactive oxygen species (ROS) in the skin. ROS are chemically reactive molecules containing oxygen that can lead to cell and tissue damage if present in high concentrations. Exposure of the skin to ultraviolet (UV) radiation is one of the main causes of free radical formation. Lactobionic acid can help reduce damage caused by UV radiation, partly thanks to its ability to absorb UV rays. Besides its direct antioxidant action, lactobionic acid can indirectly contribute to skin protection by strengthening its barrier function. A strengthened skin barrier better protects against external harmful factors, including those that can generate free radicals. Through its hydrating and antioxidant effects, lactobionic acid aids in skin regeneration.

- **Gentle exfoliant:** Lactobionic acid helps break down the bonds between dead skin cells on the surface, allowing for their easier removal. By stimulating gentle exfoliation, it encourages the natural cell renewal process of the skin. This leads to improved skin texture, reduced appearance of fine lines and wrinkles, and more even skin tone. Unlike some other exfoliants that can dry out the skin, lactobionic acid's exceptional water-retention ability allows it to hydrate the skin while exfoliating it. Due to its molecular structure, lactobionic acid provides gentler exfoliation compared to AHA and BHA acids, making it suitable for sensitive skin. Its lower risk of irritation makes it an excellent choice for those with sensitive skin.

- **Anti-aging effects:** Lactobionic acid stimulates the synthesis of collagen and elastin, which are key to maintaining skin elasticity and firmness. Its ability to improve skin texture and reduce the appearance of fine lines and wrinkles makes it a valuable ingredient in anti-aging care products.

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• **Soothing irritation:** It has anti-inflammatory properties that can help soothe irritated skin. It reduces skin redness and discomfort.

• **Wound healing:** The healing process can be accompanied by inflammation, which is a natural body response to injury. Lactobionic acid can help reduce inflammatory processes in the skin, thereby facilitating faster healing and reducing the possibility of scar formation. Through its exfoliating and hydrating effects, lactobionic acid can help improve skin texture and its overall appearance, including reducing the visibility of scars and hyperpigmentation.

Usage: At lower concentrations of 0.1% to 3%, lactobionic acid primarily acts as a humectant. It attracts moisture from the environment into the skin and helps maintain its hydration. For exfoliation purposes, concentrations above 3% are recommended. At these levels, lactobionic acid effectively removes dead cells from the skin surface, leading to improved texture, reduced fine lines and wrinkles. Research has shown that there is no significant difference in skin reaction between using 10% and 30% lactobionic acid when used as a facial peel. This suggests that higher concentrations do not provide more intense or faster, i.e., better results.

Applications: Due to its ability to attract and retain moisture, lactobionic acid is a common ingredient in moisturizing creams and lotions. It is suitable for all skin types, including sensitive. Serums containing lactobionic acid can help target specific skin issues, such as dryness, signs of aging, or uneven skin tone. Its ability to penetrate the skin and provide deep hydration makes it a popular choice for serum formulas. Lactobionic acid can help reduce the visibility of fine lines and wrinkles thanks to its exfoliating and hydrating properties. Stimulating skin renewal and improving skin texture make it an effective ingredient in anti-aging products. The gentle exfoliating properties of lactobionic acid make it an excellent addition to facial cleansing products, such as gels and foaming cleansers. These products can help remove impurities and dead skin cells, leaving the skin clean and refreshed. Masks containing lactobionic acid can provide intense hydration and gentle exfoliation, thereby improving the appearance of the skin. These masks are particularly beneficial for individuals with dry or damaged skin. The properties of lactobionic acid in combating free radicals can contribute to skin protection from damage caused by UV radiation when combined with SPF ingredients.

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Source materials: Lactobionic acid is obtained from lactose, a natural sugar found in milk. The production process of lactobionic acid involves the enzymatic oxidation of lactose.

Production method: Lactose undergoes a process of enzymatic oxidation using specific enzymes, such as glucose oxidase. This process converts lactose into lactobionic acid. Enzymatic oxidation is preferred due to its specificity, efficiency, and environmental friendliness, as it occurs under mild conditions and produces minimal by-products.

Animal testing: The substance is not tested on animals.

GMO: Non-GMO

Storage: Lactobionic acid should be stored at room temperature, away from direct heat sources. Extreme temperatures can alter the stability and effectiveness of the product. Exposure to direct sunlight can also affect the stability of the product.

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