

Formulation of An Anti Aging Cream Containing Alpha Lipoic Acid

¹Riya A. Bharate, ²Daminee R. Mane, ³Puja S. Masal

¹Associate Professor, Dept. of Pharmaceutics, Vidya Niketan College of Pharmacy, Lakhewadi (Indapur), Pune

²Student, Vidya Niketan College of Pharmacy, Lakhewadi (Indapur), Pune

³Student, Vidya Niketan College of Pharmacy, Lakhewadi (Indapur), Pune

Abstract: Alpha-lipoic acid (α LA), a naturally occurring antioxidant produced in human tissues, has garnered increasing attention in recent years due to its anti-aging properties. All eukaryotic cells' mitochondria contain α LA, a short-chain fatty acid that contains sulphur. Both α LA's reduced form (dihydrolipoic acid, or DHLA) and its oxidized disulfide both have strong antioxidant properties. As people age, their bodies gradually produce less α LA, which can lead to a number of health issues. Its absence can be made up for by obtaining it from outside sources, including dietary supplements or prescription dosage forms. An overview of the most recent two-decade studies on the usage of α LA from an anti-aging perspective was one of the main goals of this work.

Keywords: Alpha Lipoic Acid, Anti-aging, Antioxidant

I. INTRODUCTION

What is Alpha Lipoic acid?

Alpha-lipoic acid is an organic compound found in all human cells. It's made inside the mitochondrion also known as the powerhouse of cells, where it helps enzymes turn nutrients into energy. What's more, it has powerful antioxidant properties. Alpha-lipoic acid is both water- and fat-soluble, which allows it to work in every cell or tissue in the body. Meanwhile, most other antioxidants are either water- or fat-soluble (For instance, vitamin C is only water-soluble, while vitamin E is only fat-soluble). The antioxidant properties of alpha-lipoic acid have been linked to several benefits, including lower blood sugar levels, reduced inflammation slowed skin aging, and improved nerve function.[1]

Types of Alpha Lipoic Acid:-

S-lipoic acid: This is the natural form of α LA, produced by the body.

R-lipoic acid: This is the synthetic form of ALA, which is also used in supplements.

Dihydro-lipoic acid (DHLA): This is a reduced form of alpha lipoic acid which is also an antioxidant and may be more effective in some cases, according to a study published on the National Institutes of Health (NIH) (.gov).[2]

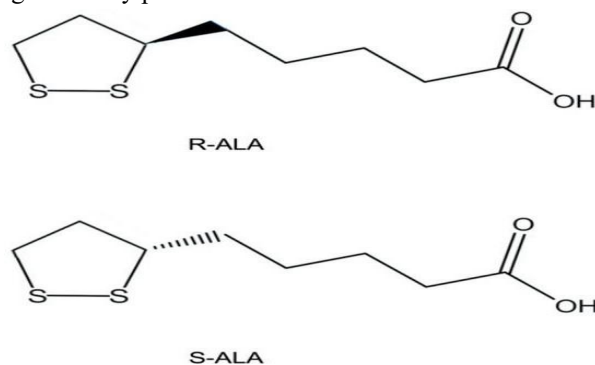


Fig 1 : R and S enantiomers of alpha-lipoic acid.

Alpha-lipoic acid, also known as 5-(1,2-dithiolan-3-yl) pentanoic acid (IUPAC), is a naturally occurring substance that has a number of health benefits. Reed and colleagues initially discovered ALA, often referred to as thioctic acid or



dithioctanoic acid, in 1951. [3] ALA is an endogenous disulfide derivative of octanoic acid that is formed in mitochondria. Easy to absorb from the gut and cross the blood–brain barrier, ALA is well-known for its strong antioxidative properties in addition to being essential for mitochondrial energy metabolism.[4] In addition, ALA has an indirect antioxidant effect that enhances the effects of other antioxidants (such coenzyme Q10, vitamin E, and vitamin C). Due to these important properties, it is used as a dietary supplement and therapeutic for the treatment of chronic diseases linked to high levels of oxidative stress. The liver, kidney, and heart are among the animal tissues with the highest metabolic activity in nature and are the richest sources of ALA.[5] Among the vegetable sources, the highest ALA content is found in spinach followed by broccoli, tomatoes, peas, Brussels sprouts, and rice.[6,7] These methods of dietary absorption are thought to be inadequate, nevertheless, as they do not provide significant levels of ALA into the bloodstream. [8] R-ALA and S-ALA are the two enantiomeric versions of ALA since it has a chiral center. ALA is a crucial cofactor in many biological systems since it is only found in the R form in nature (Figure 1) and is found in the body both free and conjugated to conserved lysine residues in an amide bond. [9]

Profile of Drug:-

1. Profile of Drug: Alpha Lipoic Acid (ALA)[121]

Official status: Official in USP, IP, and BP

Generic name: Alpha Lipoic Acid

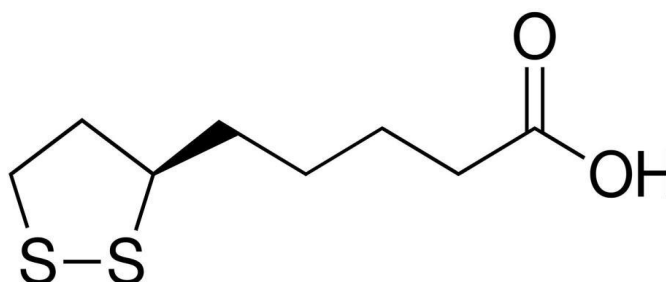
Synonyms: Thioctic Acid, 1,2-Dithiolane-3-pentanoic acid

Chemical name: (+)-5-(1,2-Dithiolan-3-yl) pentanoic acid

Trade name: Thioctacid, Thioctan, and Thiogamma

Molecular Formula: C₈H₁₄O₂S₂

CAS registry number: 1077-28-7



Alpha-Lipoic Acid

Fig.2: Structure of Alpha lipoic acid

Physicochemical properties of ALA: Molecular weight: 206.35 g/mol

Melting point: 60-62°C

Appearance: Crystalline powder

Colour: Yellow

Odour: Slight sulfur-like odour

Taste: Slightly acidic

Solubility: Alpha lipoic acid is sparingly soluble in water and soluble in organic solvents, such as ethanol and chloroform.

Present ring in the structure: 1,2-dithiolane ring.

Category: Alpha Lipoic Acid is classified as an antioxidant and a coenzyme. Mechanism of Action: Alpha lipoic acid acts as a cofactor for various mitochondrial enzymes involved in energy metabolism and exhibits antioxidant properties by scavenging free radicals.

Adverse reactions: Adverse reactions to alpha lipoic acid are generally rare but may include gastrointestinal disturbances.



Pharmacokinetics:

Absorption: Alpha lipoic acid is well-absorbed orally and undergoes rapid and extensive first-pass metabolism.

Distribution: It is distributed widely throughout the body, including peripheral tissues and the central nervous system.

Metabolism: Alpha lipoic acid undergoes rapid metabolism in the liver, primarily by Oxidation and conjugation.

Excretion: The metabolites of alpha lipoic acid are excreted mainly in the urine.

Indications: ALA reduces fine lines, wrinkles, and roughness by neutralizing free radicals and improving skin texture.

Contraindication: Alpha lipoic acid is generally well-tolerated, but it may be contraindicated in individuals with known hypersensitivity to the compound.

Side effect: Common side effects of alpha lipoic acid are generally mild and may include gastrointestinal discomfort and nausea.

Storage: Stored in a tightly sealed container, protected from light, at room temperature. In the present study, it is used as active ingredient.

Table of Composition

Sr. No.	Ingredients	Compositions	Role
1	Alpha Lipoic Acid	0.4 gm	Antioxidant
2	Distilled Water	10 ml	Vehicle
3	Beeswax	1 gm	Binding Agent
4	Lavender Oil	0.4 ml	Anti Microbial
5	Glycerine	1 ml	Humectant
6	Shea Butter	2 gm	Improve Elasticity
7	Coconut Oil	4 ml	Skin Texturiser
8	Vitamin E Oil	0.4 ml	Skin Moisturizer

METHOD OF PREPARATION

1. Weigh the ingredients accurately using a digital scale.
2. Melt the coconut oil, shea butter, and beeswax in a small saucepan over low heat.
3. Mix the distilled water, alpha lipoic acid powder, and vegetable glycerine in a separate bowl. Stir until the powder is fully dissolved.
4. Slowly add the water mixture to the oil mixture, stirring constantly.
5. Remove from heat and let cool until the mixture reaches a consistency slightly thicker than honey.
6. Stir in the vitamin E oil and lavender essential oil (if using).
7. Pour the mixture into a clean, sterilized container.
8. Allow the cream to cool and thicken completely before use.

Here's a more detailed look at how ALA anti aging cream affects the skin and their Properties:-

1. Antioxidant Properties
2. Collagen Synthesis
3. Hyperpigmentation Reduction
4. Improved Skin tone and Texture

1. Antioxidant Properties:-

ALA is a powerful antioxidant that combats free radicals, which are unstable molecules that can damage skin cells and contribute to aging.





Fig. 3

2. Collagen Synthesis:-

ALA may help stimulate collagen production, a protein that provides structure and elasticity to the skin. Increased collagen can help reduce the appearance of wrinkles and fine lines.



Fig. 4

3. Hyperpigmentation Reduction:-

ALA can help reduce the production of melanin, the pigment responsible for skin tone. By inhibiting melanin production, ALA can lighten hyperpigmentation, such as sun spots or melisma, and even out skin tone.



Fig. 5



4. Improved Skin Tone and Texture:-

ALA may help even out skin tone by reducing the production of melanin, the pigment that gives skin its colour. It can also help brighten the skin and improve overall skin texture. [10]



Fig. 6

Alpha-lipoic acid has been shown to help fight signs of skin aging; in one human study, researchers found that applying a cream containing alpha-lipoic acid to the skin reduced fine lines, wrinkles, and skin roughness without causing any side effects. Alpha-lipoic acid penetrates the skin's inner layers and provides antioxidant protection against the sun's harmful UV radiation. Additionally, alpha-lipoic acid increases the levels of other antioxidants, like glutathione, which help prevent skin damage and may lessen signs of aging. [11]

What Food Contains Alpha Lipoic Acid?

Our Bodies can naturally produce small amount of Alpha Lipoic acid. It can also be found in small amounts in foods like:

1. Broccoli
2. Spinach
3. Brussels sprouts
4. Yams
5. Green peas
6. Tomatoes
7. Liver and organ meats
8. Red meat
9. Potatoes [12]

Side effects of ALA:-

ALA is a natural antioxidant found in foods and supplied by your body in small quantities. But this doesn't mean that ALA supplements are free from side effects.

The most common side effects of ALA are:

When applied to the skin: Alpha-lipoic acid is possibly safe for most adults when used as a cream for up to 12 weeks. It might cause a rash in some people. [13]

Evaluation Parameters:- Spreadability:-

Spreadability testing of sample was done using a texture analyser.

pH:-

pH studied was done using a physical pH meter. The pH of cream base was found to be in range of 6.2-6.9 which is g

Sensitivity:-

Sensitivity testing was done by rubbing a small portion of sample on back of the hand.



II. RESULT AND DISCUSSION

Alpha lipoic acid is well known for its medicinal properties and uses. The alpha lipoic acid has significant amounts of antiaging constituents such as vitamin E, beeswax, shea butter, coconut oil, lavender oil, glycerine. These constituents help in lowering the oxidative stress and provide a cure for pre mature aging of dermal cells. Antioxidants are very much unstable in nature as they can be oxidised very easily. Therefore, it is very important to ensure their stability and other properties to make them safer for topical use on humans. Alpha lipoic acid helps in reducing oxidative stress on dermal cells along with eliminating the free radicals on the other hand shea butter agent in the formulation adding extra benefits top the cream. Evaluation studies showed that the F2 of the 3 prepared formulations was stable and considerably efficient. The physical evaluation tests provided data that reflects the neutral pH (6.2-6.8), desired apparent viscosity, consistency parameter etc. of the formulation. Optimum Spreadability was noticed in formulation with the help of texture analyser. The formulation passed the sensitivity testing as well as microbial screening tests using appropriate methods of testing. All these observations show efficacy and stability of the study on antiaging formulation.

III. CONCLUSION

The results of our study, experimental work, and the evaluation tests show that the formulation containing alpha lipoic acid anti-aging cream, lavender oil along with coconut oil is a very effective and safe antiaging cream that can be easily used topically in case of pre mature skin aging due to extrinsic and/or intrinsic factors. This concludes that the presented formulation has a potential to be used as a daily cosmetic product by masses for its antiaging and skin protective properties. Our product could be used to create a market demand and competition among pre existing brands due to its price effectiveness and skin friendly property.

REFERENCES

- [1]. <https://www.healthline.com/nutrition/alpha-lipoic-acid#what-it-is>
- [2]. <https://pmc.ncbi.nlm.nih.gov/articles/PMC6723188/>https://www.mdpi.com/2076-3921/13/10/1228?utm_campaign=CHD_die-werke
- [3]. Reed, L.J.; Debusk, B.G.; Gunsalus, I.C.; Hornberger, C.S., Jr. Crystalline alpha-lipoic acid; a catalytic agent associated with pyruvate dehydrogenase. *Science* 1951, 114, 93–94.
- [4]. Bustamante, J.; Lodge, J.K.; Marcocci, L.; Tritschler, H.J.; Packer, L.; Rihn, B.H. Alpha-lipoic acid in liver metabolism and disease. *Free Radic. Biol. Med.* 1998, 24, 1023–1039.
- [5]. Akiba, S.; Matsugo, S.; Packer, L.; Konishi, T. Assay of protein-bound lipoic acid in tissues by a new enzymatic method. *Anal. Biochem.* 1998, 258, 299–304.
- [6]. Satoh, S.; Shindoh, M.; Min, J.Z.; Toyo'oka, T.; Fukushima, T.; Inagaki, S. Selective and sensitive determination of lipoyllysine (protein-bound alpha-lipoic acid) in biological specimens by high-performance liquid chromatography with fluorescence detection. *Anal. Chim. Acta.* 2008, 618, 210–217.
- [7]. Packer, L.; Kraemer, K.; Rimbach, G. Molecular aspects of lipoic acid in the prevention of diabetes complications. *Nutrition* 2001, 17, 888–895.
- [8]. Shay, K.P.; Moreau, R.F.; Smith, E.J.; Smith, A.R.; Hagen, T.M. Alpha-lipoic acid as a dietary supplement: Molecular mechanisms and therapeutic potential. *Biochim. Biophys. Acta* 2009, 1790, 1149–1160.
- [9]. Watson, P.R.; Stollmaier, J.G.; Christianson, D.W. Crystal structure of histone deacetylase 6 complexed with (R)-lipoic acid, an essential cofactor in central carbon metabolism. *J. Biol. Chem.* 2023, 299, 105228.
- [10]. <https://www.healthline.com/nutrition/alpha-lipoic-acid#:~:text=Alpha%2Dlipoic%20acid%20has%20strong,progression%20of%20memory%20loss%20disorders>
- [11]. <https://images.app.goo.gl/XAwNf>
- [12]. <https://images.app.goo.gl/SbnHpmiNVsVFsNpU6>
- [13]. <https://images.app.goo.gl/n5NW3>



- [14]. <https://totalwraiture.ca/wp-content/uploads/2023/10/Treatments-for-hyperpigmentation-1080x675.jpg>
- [15]. <https://beminimalist.co/blogs/skin-care/lipoic-acid-for-anti-aging-uses-benefits#:~:text=It%20has%20been%20scientifically%20proved,that%20protects%20against%20skin%20damage>
- [16]. <https://www.healthline.com/nutrition/alpha-lipoic-acid#:~:text=Alpha%2Dlipoic%20acid%20has%20strong,progression%20of%20memory%20loss%20disorders>
- [17]. <https://www.webmd.com/vitamins/ai/ingredientmono-767/alpha-lipoic-acid>

winnipeg-

