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FORMULATION AND EVALUATION OF VITA-C SERUM

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ABSTRACT

Vitamin C serum is a topical skincare product containing a high concentration of ascorbic acid, the active form of vitamin C. It provides numerous benefits for the skin, including increased collagen production, reduced signs of aging, improved skin tone and texture, and protection against sun damage. Vitamin C is an unstable molecule that can easily degrade when exposed to light, heat, and air Maintaining a low pH (below 3.5) is crucial for stabilizing vitamin C in serum formulations and enhancing skin penetration. The efficacy of vitamin C serum is directly proportional to its concentration, with 20% being the maximum effective level. Regular application of vitamin C serum can lead to a tenacious reservoir in the skin, providing long-lasting photoprotection. However, not all vitamin C derivatives used in cosmetic products are physiologically effective, as some may not be adequately delivered into the dermis or converted to the biologically active form. This project aims to develop a stable and effective vitamin C serum by improving the extraction and quantification methods .The stability and skin penetration of the serum will be evaluated under different storage conditions and application methods. The findings of this project will contribute to the development of improved vitamin C-based skincare products with enhanced efficacy and stability.

KEYWORD: *vitamin c serum, ascorbic acid, skin penetration, photo protection, skincare*

INTRODUCTION

Vitamin C is an important water-soluble substance with great significance in human health. It also helps in collagen production as well as the synthesis of neurotransmitters, boosting an immune system against scurvy and as an antioxidant. It was discovered in 1912 and initially synthesized in 1933 because it is not manufactured by the body itself hence people have to obtain it from their food. The presence of this particular nutrient in many citrus fruits makes them vital for overall wellness and numerous metabolic processes, as well as diverse health outcomes. Ascorbic acid or vitamin C is a powerful anti-oxidant that protects cells from damage due to free radicals. Furthermore, it promotes growth of tissues, repairs them when needed thus helping wounds heal faster and skin healthy, bones strong and teeth intact too. Additionally, Vitamin C enhances absorption of iron found in plant foods which boosts immunity thereby providing protection against infections caused by bacteria like microorganisms among others. There are various vegetables containing vitamin c such as garlic or onion which can enable you get your daily requirement of this essential nutrient.

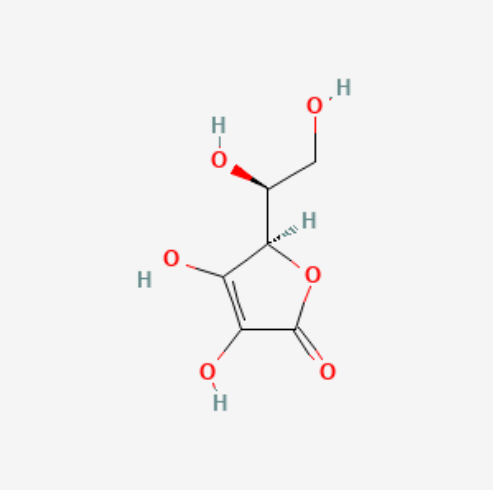

Fig 1. Chemical structure of ascorbic acid -Vitamin C.

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The chemical structure of vitamin C determines its physical and chemical properties. It is a weak, water soluble, unstable organic acid which can be simply oxidized or demolished by light, aerobic situations (oxygen), high temperatures, alkali, copper, and heavy metals. [i]

Vitamins are organic substances that preserve metabolic functioning and are extremely sensitive to different physical and chemical agents. From the study of the chemical structure of vitaminC, we can determine some of its physicochemical properties, which is a weak organic acid, water-soluble and easily degraded by changes in temperature, experience to sunlight, and oxygen concentration.

The absorption of vitamin C in the intestine is limited by an active transport mechanism. Hence, a limited amount of the drug is absorbed despite the high oral dose. The bioavailabilityof vitamin C in the skin is insufficient when managed orally. Consequently, oral route cannot actually provide a source of vitamin C to peripheral structures as skin. The only route that can provide an vitamin C source for skin is the topical or local routes, demonstrating that the usage of local application promotes the surgical healing and better tissue reconstruction. Consequently, the oral route of administration does not provide a source of vitamin C to structures such as the skin. Instead, topical or local ways can provide a source of vitamin C, representing that local application indorses surgical healing and better tissue reconstruction.The main function of the skin is to act as a barrier against external agents, and its unique structure demonstrates this. The skin, a continually changing dynamic organ, is composed of two main layers. First is the epidermis, which is the outermost, highly cellular layer that protects us against poisons, bacteria, and fluid loss. [ii] Second is the dermis, which is a deeper layer that confirms strength and elasticity and provides nutritional provision to the epidermis. This organ is vital for our health and relief.

Normal skin contains high concentrations of Vitamin C, with levels comparable to other bodytissues and well above plasma concentrations, suggesting an active accumulation of this compound.[iii] Ascorbic acid (Vitamin C) is related to the cells from the blood vessels presentin the dermal layer. There are only a few reports regarding vitamin C levels in the skin, and usually they are not concordant. These variations may be due to the difficulty in managing skintissue, which is very resistant to degradation and solubilization, but may also be due to the location of the skin model and the age of the donor. Because ascorbic acid (Vitamin C) is a natural antioxidant soluble in water, it has been used as an element in numerous enhancing products to protect and rejuvenate the skin. Most of the vitamin C in the skin appears to be located in the intracellular compartments, with concentrations likely to be in the millimolar range. Intracellular compartment was the site where the highest concentrations in the millimolar range have been measure, Vitamin C content in mg per 100g fresh weight in skeletal muscle is approximately 4, in the liver between 10 and 16, in the brain between 13and 15, in the dermis between 3 and 13 and in the epidermis between 6 and 64.
Further more, the skin collaborates in other functions such as antioxidant protection against UV-induced photo damage and collagen synthesis. All of the above serves as a basis to demonstrate the fundamentals of the use of topical vitamin C in dermatological practice.

Wound Healing
Vitamin C acts as a cofactor for several enzymes, such as lysyl hydroxylase and prolyl hydroxylase. It is a steadying collagen and is essential in wound healing. When vitaminC is deficient, fibroblasts produce unstable collagen, providing a weak framework for repair, which makes wound healing difficult.

Phillips and Pinnell showed that vitamin C counteracted the reduced proliferative capacity of in vivo fibroblasts in older people. Finglas et al. reported lower plasma vitamin C concentrations in the elderly (64–74 years) compared to healthy adults (20–64 years). VitaminC levels are usually low in older patients, which may contribute to slower and more difficult wound healing.

The role of vitamin C supplementation in wound healing remains controversial. There is no evidence that wound healing is improved by vitamin C supplementation, although critically illpatients may benefit from supplements because their reserves are depleted. When patients havelow levels of vitamin C, it is usually observed to a slower and more difficult wound healing. At present, the role of vitamin C supplementation in wound healing is still being discussed.

For preparation of Vitamin C serum we have used these ingredients- Lemon juice, Rose water,Vitamin E capsule, Glycerine, Sodium benzoate preservative benzoate as a preservative.

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Equipment Used

- Beaker
- Measuring cylinder
- Stirrer
- Water bath
- burner
- Glass container for storing the serum

Drugs Used

1. Orange peel extract – 10 ml
2. Rosa damascena flowers (Rose water)- 10 ml
3. Vitamin E capsule- 3capsules
4. Glycerol (Glycerine) – 10 ml
5. Sodium benzoate as a preservative- 0.03gm

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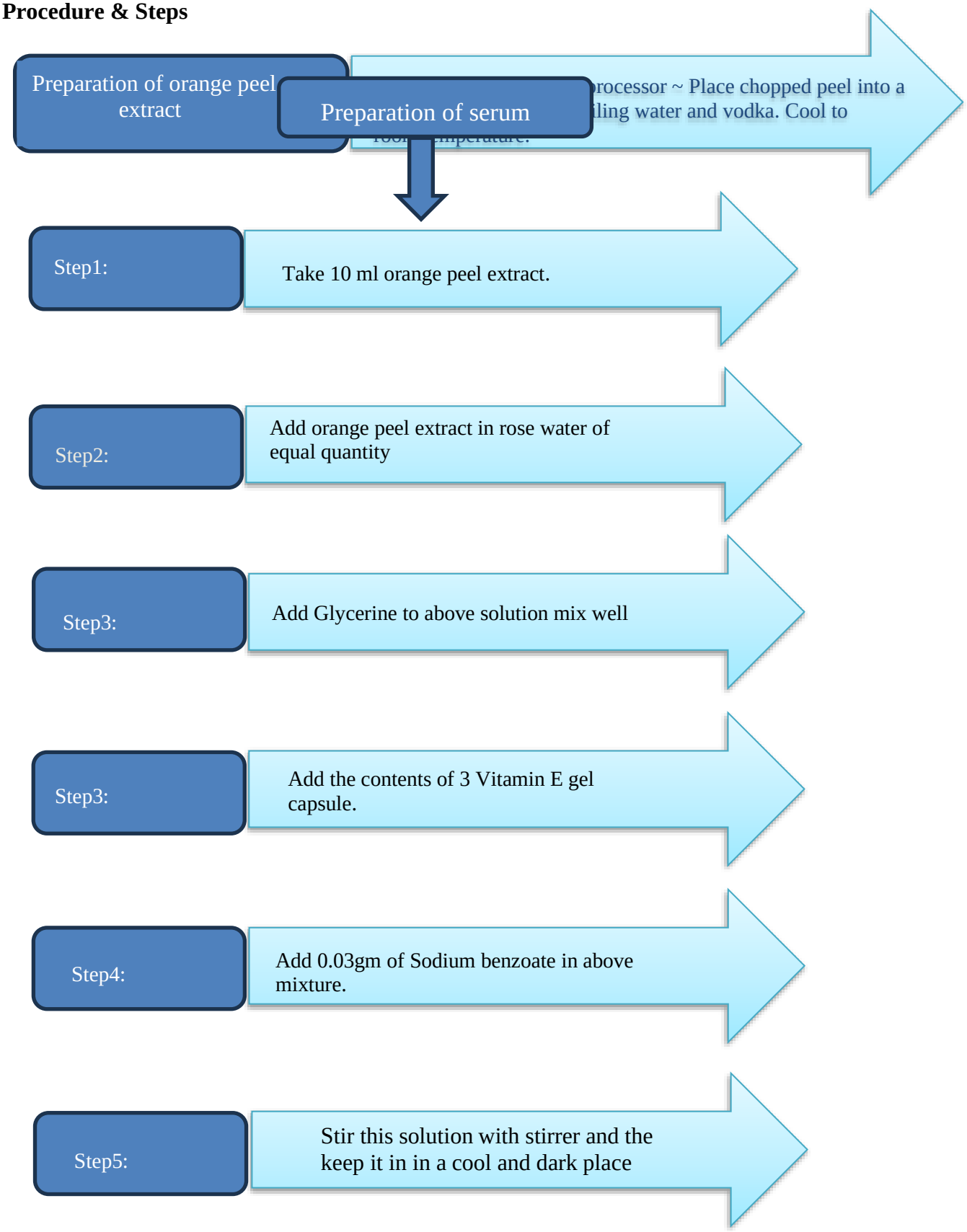
Procedure & Steps



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1) Orange Peel Extract :

Fig : Orange Peel extract

Texonomical Properties

Odour	Sapindales
Family	Rutaceae Juss Rue family
Genus	Citrus l-citrus P
Species	Sweet orange (Citrus × sinensis), believed to be a hybrid of Citrus maxima and Citrus reticulata.

Physiological Information

Orange peels contain flavonoids – like poly methoxy flavones (PMFs) and hesperidin – and other phytochemicals that are very helpful for your health. Flavonoids are antioxidant compounds that benefit prevent chronic diseases such as cancer and heart diseases. It also contains higher amounts of certain nutrients.

Pharmacological Properties

1) It may show antioxidant activity.
2) It may show anti-inflammatory property.
3) It may show anti-arthritic activity.
4) It may show anticancer activity.
5) It may show anti-ulcer activity.
6) It may show anti-typhoid activity.
7) It may show anti-anxiety activity.

Uses

numerous benefits will be gotten by using orange peel serum on the skin, thanks to its being enriched with vitamin c and antioxidants. Key Advantages include:

Skin brightening: Orange peel serum helps in reducing dark spots and blemishes hence promoting a radiant complexion
Anti Aging: Orange peels are rich in antioxidants which combat free radicals, which aids in reducing wrinkles and sagging skin.
Peeling: For clearer skin, orange peel serum gently exfoliates the dead cells of the skin and unclogs pores
Acne Control: Dried up zit with citric acid from oranges and it also regulates sebum production to prevent acne breakouts.Stimulation of Collagen Production: It is responsible for stimulating collagen synthesis in the body leading to improvement of the skin structure as well as removal of fine lines.

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2. ROSA DAMASCENA FLOWERS (ROSE WATER)

Rose water is a mild and perfumed aqueous solution made by extracting the essence of rose petals in water. There are three methods of making it: Simmering, Distilling, and treating Important Oils. These methods want the expertise of professionals but may also be approved out at home.

It is thus a natural solution to treating various skin care and health care problems. Thoughit can be consumed internally to recover digestion, rose water useful for skin come better advised. Primary among these is its ability to soothe the skin's inflammation and uphold its natural pH balance.

Considered to be particularly effective as a toner, rose water is light and gentle on the skin, thus creating it ideal for all skin types. It is one of the best reasons that rose toner benefits outshine its chemical-based complements.

Proven Benefits of Rose Water on face

The following pointers list some benefits of using this simple and slight fragrance water.Skin care specialists believe its benefits magnify with a long-term application, particularly when used overnight, and this fact holds regardless of the skin type.

1. Cleanses and brightens skin:

This fragrant water gently removes additional oil and other environmental impurities, and thus reduces black heads and white heads. It also benefits combat dark spots, acnescars, and discolorations on the skin, thus giving you a radiant appearance.

2. Soothes irritated skin:

Cool and refreshing, rose water contains anti-inflammatory and antibacterial properties that help decrease redness and acne. It is also known to help soothe majorskin care problems like eczema or rosacea.

3. Balances natural oils

It can retain the skin's natural oils in check. This helps the skin cells stay sufficientlynourished, whether the skin type is dry or oily. This helps preserve the cells healthy, nourished, and sufficiently hydrated at all times.

4. Decongests skin pores

It helps explain and balance the skin, and decongest and diminish enlarged pores.This decreases frequent breakouts and improves skin texture.

5. Tightens skin

Rose water tones and tightens the skin for a plane, firm look. It too helps reduce blemishes and wrinkles too.

6. Moisturizes skin

A natural hydrator, rose water preserves the skin rejuvenated by providing deep moisturization. It similarly moisturizes the lips, and helps them stay softer, smoother, and healthy cared for.

7. Slows down multiple signs of aging

It helps smoothen fine lines and actively works to stop new lines from setting in by reducing cell damage.

8. Reduces under-eye puffiness and dark circles

It revitalizes and moisturizes the sensitive skin under the eyes, efficiently reducingpuffiness caused by allergies, stress, or fatigue. Rose water also has Vitamin C, which reduces dark circles and brightens the skin.

9. Protects your skin

Rose water strengthens the skin barrier and protects it from environmental attackers like dust and pollution. It also defends against harmful ingredients found in certain beauty products.

10. Nourishes from within

It penetrates deep into the skin, flushing it with antioxidants and providing thenutrients it necessities. The result is skin that is healthy, beautiful, and prepared for anything.

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3. VITAMIN E CAPSULE

Vitamin E is an antioxidant that help fight free radicals, which are molecules that harm the DNA in cells. People can typically get adequate vitamin E from their diet, but it is also accessible in the form of supplements and skin care products.[iv]
Vitamin E is a nutrient that the body can't make on its individual. It originates from definite foods, such as nuts and seeds, and supplements.

Vitamin E is an antioxidant, which means that it can stop or opposite the damage that free radicals reason to cells. It can also decrease inflammation around the body.

The body supplies vitamin E in the skin, in both the outer epidermis and he deeper dermislayers. This is one reason why numerous skin care products contain vitamin E.

The nutrient exists in sebaceous glands, which produce the base of hair follicles. The bodycarriages vitamin E to the skin through sebum, an oily material that protects and lubricates the skin.

Some potential skin benefits of vitamin E contain:

Moisturizing

Researchers have establish that products having vitamin E can moisturize the skin.However, they have not recognized links between vitamin E intake and skin hydration. Therefore, people who wish to use vitamin E as a moisturizer should branch withtopical products that hold the vitamin.

Fighting UV-related skin damage:

Oregan State University highlights several educations suggesting that vitamin E could fight skin harm from sun contact. However, most of the research to date has intricate animals or human skin cells in a lab setting.

It is possible that adding vitamin E to sunscreen delivers some extra skin benefits, but it is significant to note that vitamin E itself is not an operative sunscreen.

Wound Healing

The author of a appraisal article in the International Wound Journal Trusted Source proposes that vitamin E can promote wound healing.

The theory is that since vitamin E shortages can slow wound healing, a good amount of this nutrient could have the reverse effect. However, the review highlighted the lack of excellence investigation to support this idea.

Anti-Inflammatory Properties

Inflammation is the body's response to a damage or infection. It can cause hurt, discoloration, and swelling. Many mutual skin situations cause inflammation, including acne.

A 2020 study in Scientific Reports Trusted Source reviewed 26 clinical judgments and found some evidence that vitamin E additions decrease inflammation in adults. More high quality research is necessary to confirm this discovery, though.

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3. GLYCEROL (GLYCERINE)

Glycerin, also identified as glycerol, is a natural compound derived from vegetable oilsor animal fats. It's a clear, colorless, odorless, and syrupy liquid with a sugary taste.

Glycerin is a humectant, a kind of moisturizing agent that jerks water into the outerlayer of your skin from bottom levels of your skin and the air.

In skin care products, glycerin is usually used with occlusive, another type ofmoisturizing agent, to trap the moisture it inducements into the skin.

Rendering to the American Academy of Dermatology Association, glycerin can:

- hydrate the outer layer of the skin (stratum corneum)
- improve skin barrier function
- provide protection against skin irritants
- accelerate wound-healing processes
- relieve dry skin
- may help with psoriasis

4. SODIUM BENZOATE AS A PRESERVATIVE:

Sodium benzoate is a common preservative used in acidic foods and drinks to prevent mold and bacteria growth.

Sodium benzoate (rendering to the European nomenclature E211) is a salt of benzoic acid and soluble in water, tasteless, and odorless, and due to its antifungal and antibacterial possessions, it is a preservative added to food in severely defined doses. It constrains the growth of bacteria, yeast, and mold.

IUPAC Name	Sodium benzoate
Alternative Names	sodium benzoate
Molecular Formula	C7H5NaO2
Molar Mass	144.105 g/mol
InChI	InChI=1S/C7H6O2.Na/c8-7(9)6-4-2-1-3-5-6;/h1-5H,(H,8,9);/q;+1/p-1

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A detailed instructional manual for utilizing facial serum.

Get healthy, radiant, and healthy skin by using a face serum and below these steps:

Step 1: Take a pea-sized quantity (about 3-4 drops) of a face serum from the dropper on your palms. (For best effects, you can use a vitamin C serum.)

Step 2: Spread it among your palms without rubbing the material too much.

Step 3: Spread the serum all over your face and neck using small and gentle drumming motions. Wait for a couple of minutes before ongoing with your skincare regime.[v]

Evaluation Parameters

Table 1: Physicochemical Tests.

Sr. No.	Parameter	Result
1	Color	White
2	Odor	Citrus, fruity
3	PH	4.5

Conclusion

The appearance of formulated serum was very attractive regarding color and odor. The pH of the serum is acceptable for use on skin. The Vitamin C serum after applying on skin at bed time and leaving for overnight is appealing in fresh appearance to skin and hence proven tobesafe. Sensitive skin beauties may feel slight tingling sensation initially. If this happens,one may want to start using it on alternate nights for the first few weeks until skin adapts to it.

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LITRETURE REVIEW

1."**Stability of Topical Vitamin C Derivatives**"
This study by Lin and Zhong (2020) evaluated the stability of various Vitamin C derivatives in cosmetic formulations. It found that certain derivatives, such as ascorbyl glucoside and magnesiumascorbyl phosphate, exhibited better stability compared to L-ascorbic acid.

2**."Enhancing Skin Penetration of Vitamin C"**
Research by Telang (2013) explored techniques to enhance the skin penetration of Vitamin C, such as microencapsulation and the use of penetration enhancers. This study highlighted the importance ofdelivery systems for maximizing Vitamin C efficacy.

3."**Efficacy of Vitamin C in Skincare**"
A review by Pullar et al. (2017) summarized the clinical evidence supporting the efficacy of Vitamin C in skincare. It discussed its role in collagen synthesis, antioxidant protection, and skin brightening,emphasizing the importance of stable formulations for optimal results.

4."**Effect of pH on Vitamin C Stability**"
A study by Al-Niaimi and Chiang (2017) investigated the influence of pH on the stability of Vitamin C formulations. It found that acidic pH levels (around 3.5) were optimal for maintaining Vitamin Cstability and skin penetration.

5**."Antioxidant Synergies in Skincare**"
Research by Działo et al. (2019) explored the synergistic effects of combining Vitamin C with other antioxidants, such as Vitamin E and ferulic acid. This study highlighted the potential for enhanced antioxidant activity and photoprotection in skincare formulations.

6."**Clinical Evaluation of Vitamin C Serums**"
A clinical trial conducted by Humbert et al. (2003) assessed the efficacy of a Vitamin C serum in improving skin texture and reducing wrinkles. The study demonstrated significant improvements inphotoaged skin after regular application of the serum.

7**."Photostability of Vitamin C Formulations**"
An investigation by Lin et al. (2012) examined the photostability of Vitamin C formulations under different light conditions. It identified factors such as packaging materials and antioxidants that couldhelp mitigate Vitamin C degradation upon exposure to light.

8**."Comparison of Vitamin C Derivatives**"
A comparative study by Campos et al. (2008) evaluated the stability and efficacy of various Vitamin C derivatives in skincare formulations. It provided insights into the relative performance of differentderivatives in terms of antioxidant activity and skin penetration.

9."**Safety Assessment of Topical Vitamin C**"
Research by Raschke et al. (2004) investigated the safety profile of topical Vitamin C formulations through clinical testing. The study concluded that Vitamin C serums were generally well-tolerated,with minimal risk of irritation or sensitization.

10**."Role of Vitamin C in Wound Healing**"
A review by Pullar et al. (2017) discussed the role of Vitamin C in wound healing and collagen synthesis. This study emphasized the potential benefits of Vitamin C serums in promoting skin repairand regeneration.

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