Research on Efficacy and Application of Natural Molecules for Anti-aging of Human Skin

Jiaying Ye

Ulink College of Shanghai, 559 South Laiting Road, Jiuting Town, Songjiang District, Shanghai, 201615, China
Corresponding Author: Jiaying Ye, Email: 2401660172@qq.com

Abstract

As appearance anxiety becomes a hot topic nowadays, it also reflects the urgent need for people to pursue a younger and healthier skin condition. While being environmentally friendly and green is also a popular lifestyle concept, the effectiveness of natural molecules in skin anti-ageing will also receive more attention. This dissertation focuses on the efficacy and application of natural molecules in anti-ageing in human skin. Starting from the definition of anti-ageing and the classification of ageing, it extended to the overall anti-ageing strategies for different types of ageing. The application and efficacy of natural molecules in other mediums are compared according to their anti-ageing mechanisms of action. Not only are the efficacy of individual molecules and the overall anti-ageing strategy considered, but the effects of different molecules in specific mediums on human skin are also compared. Then the conclusion is that in the anti-ageing process, more emphasis is placed on preventing ageing, primarily by maintaining a good lifestyle and diet. Secondly, if ageing has already occurred, it can be improved by using skincare products containing natural ingredients with different functions and other medical aesthetic means to improve.

Keywords

Anti-ageing; Natural molecules; Skin care products; Mechanism of action

Introduction

Ageing is an inevitable part of human biological progress. As the largest organ in the body, the skin contains almost all the support systems: blood, nerves, muscles, immune, endocrine function, etc. The skin also plays a vital role as a sensory barrier to the external environment. Therefore, the signs of ageing are most apparent and visible when the skin is affected by both internal physiological factors and external environmental factors.

As modern standards of living and life expectancy increase, people tend to live longer. Moreover, appearance anxiety has become a hot topic, so people are increasingly concerned

Citation: Jiaying Ye. (2022) Research on Efficacy and Application of Natural Molecules for Anti-aging of Human Skin. The Journal of Young Researchers 4(11): e20220606

Received on May 7, 2022; Accepted on May 10, 2022; Published on June 6, 2022

about the effects of ageing and are more willing to invest in improving their appearance. Since skin is the most visual representation of the state of the body, maintaining healthy and youthful skin is essential for those who wish to reverse or delay the signs of ageing. While many cosmetic medical procedures can achieve some of these results, there is generally a greater demand for daily anti-ageing products or even changing eating habits.

Furthermore, the use of natural ingredients in the anti-ageing process has a greater demand due to promoting a greener and healthier lifestyle. The richness of active ingredients in natural plants provides the theoretical basis for researching and developing botanical resources (Angerhofer et al., 2009). Therefore, research into this has greater significance. I have initially driven to research these natural ingredients because my mother is a big fan of these anti-ageing skin care products. Most ingredients are well established in the cosmetic business and have proven formulations in major brands. Still, at the same time, many natural plant ingredients are cheaper and also have the benefits of anti-ageing, so it would be valuable to research the mechanisms and effects of these natural molecules. Before doing so, it is also necessary to study the mechanisms of ageing, identify the corresponding anti-ageing strategies, and then classify and describe the mechanisms of action of some typical natural molecules to better discuss their efficacy and application in different mediums.

Therefore, I choose to review existing research findings by reading papers, journals, etc., about the anti-ageing efficacy of different natural components and the mechanism of those compounds. Based on these researches and comparisons of several natural compounds in anti-ageing processes, I can discuss more innovative ideas of effective means of anti-ageing and prevention later.

Definition of Skin Anti-aging

Ageing can be defined as a progressive deterioration of physiological function accompanied by an increase in vulnerability and mortality with age (de Magalhães et al., 2017). Therefore,anti-ageing refers exclusively to slowing, preventing, or reversing the ageing process in the skin. It means to improve the appearance of wrinkles, sagging of the skin, loss of lustre, radiance, smoothness, coarsening of texture and increased pigmentation (Trojahn et al., 2015).

Mechanism of Intrinsic Aging and Extrinsic Aging

There are many studies on the mechanisms of skin ageing; some of the more representative ones are free radical ageing theory, metabolic dysregulation theory, photoaging theory, mitochondrial theory, non-enzymatic glycosylation ageing theory, carbonyl toxicity ageing theory, etc. (Lai et al., 2009).

It is a slow and irreversible process over time. The changes are partly caused by accumulated endogenous damage caused by the production of reactive oxygen species (ROS) produced by oxidative cellular metabolism. Damage caused by ROS affects cellular constituents such as membranes, enzymes, and DNA, despite a powerful antioxidant defence system.

Extrinsic ageing is caused by various conditions, including ionizing radiation, extreme physical and psychological stress, alcohol consumption, poor diet, overeating, pollution, and UV exposure.

Scavenging Excess Free Radicals (Free Radical Doctrine of Aging Theory)

According to the free radical theory of ageing, excess free radicals can damage the body and

cause ageing. As a result, scavenging extra free radicals is critical for slowing the ageing process. Vitamin C, vitamin E, and coenzyme Q10 are the most common active substances that have the potential to scavenge excess free radicals. Furthermore, several of the most popular plant extracts, such as pomegranate, green tea, and coffee fruit extracts, are effective free radical scavengers.

Protection Against UV Rays (Photoaging Theory)

Photoaging the skin is a phenomenon caused by prolonged sunlight that causes the skin to age or age at an accelerated rate. The ultraviolet rays in sunlight can cause skin erythema and delayed melanin deposition, disrupting the skin's moisturizing. The skin becomes rougher and more wrinkled in the long term. Therefore, proper sun protection according to the UV index, either physical or chemical, will help slow down the skin's ageing (Scharffetter–Kochanek et al., 2000).

Adjustment of Metabolism (Metabolic Dysregulation of Aging Theory)

The metabolic disorders of the body can cause cellular ageing and lead to the ageing of the body, so improving the body's metabolic function and promoting cellular metabolism can significantly delay the onset of ageing. Ingredients include vitamin A and isoflavones, which activate cellular regeneration and boost cellular metabolism, resulting in smooth and delicate skin (MIQUEL, 2002).

Supplementation of Collagen and Elastin (Matrix Metalloproteinase Doctrine of Aging)

Collagen and elastin, as structural proteins, are widely found in animal skin, tendons, and other connective tissues. Collagen-rich tissues are susceptible to exhibiting some age-related physiological changes. In skin ageing, collagen and elastin are lost, resulting in reduced elasticity, sagging, and wrinkles. Replenishing collagen and elastin in the skin is another essential way to slow down ageing (Lahmann, 2007).

Compounds Currently Commonly Added to Anti-aging Cosmetics

These compounds have been classified into the following categories according to the main effects of anti-ageing cosmetics. The mechanisms of action of typical compounds in each category are compared and summarized concerning the experimental studies that have been carried out. Finally, an evaluation of their efficacy is carried out.

Ingredients with Moisturizing and Skin Barrier Repair Functions

These ingredients keep the water content in the skin's stratum corneum within a suitable range and reduce the formation of wrinkles. They include ceramides, hyaluronic acid, alpha-hydroxy acids, etc.

Ceramides not only repair skin barrier function but also inhibit inflammatory responses by suppressing the production of inflammatory factors. Moisturizers containing ceramides reduce the expression of inflammatory factors and reduce water loss through the epidermis, thereby improving skin hydration and reducing the severity of skin lesions. The sphingosine carbon chain of ceramide has a double bond and a terminal hydroxyl group, indicating that it can be oxidized to break the double bond and therefore has an antioxidant effect. Studies have shown that small amounts of ceramide increase the proliferation of fibroblasts and inhibit the expression of matrix metalloproteinases, suggesting that ceramide may have anti-ageing properties. It has also been shown that water-soluble ceramide has a triple anti-ageing effect:

1. It keeps the epidermis hydrated by reducing water loss.
2. It stimulates the activity of fibroblasts, which produce collagen and other substances.
3. It activates matrix metalloproteinase inhibitor (TIMP-1) activity.

Hyaluronic acid is a vital water retainer in the extracellular matrix, together with other substances, including sulfated mucopolysaccharides, collagen, and fibrous proteins such as elastin. It forms an extracellular gelatinous matrix containing a large amount of water, which acts as a medium of exchange for cellular metabolism. Hyaluronic acid bound to the cell surface blocks the release of some enzymes from the cell to the outside of the cell, reducing the production of free radicals. It also limits the proximity of several free radical-producing and lipid peroxidation enzymes to the cell membrane, thereby reducing the influx of free radicals to the cell membrane surface.

Alpha hydroxy acids (AHA) include glycolic, lactic, citric, and malic acids extracted from fruits such as lemons, apples, and grapes. Alpha hydroxy acids penetrate the stratum corneum of the skin, causing a significant increase in the bonding between cells in the ageing stratum corneum, accelerating the rate of cell renewal and promoting the metabolism of dead cells, thus improving the condition of the skin. Alpha hydroxy acids smoothen and soften the surface of the skin. It has been used in cosmetics for a long time and is now a more effective active additive in skincare cosmetics to promote skin regeneration or peeling (Qiu & Gang, 1995).

Ingredients that Promote Cell Proliferation and Metabolic Capacity

These ingredients promote cell division and proliferation, and cell metabolism, thereby accelerating the rate of epidermal cell renewal and slowing down skin ageing. They include cell growth factors (epidermal growth factor, fibroblast growth factor, and keratinocyte growth factor), deoxyribonucleic acid (DNA), retinoic acid, Fructis acid, marine peptides, and beta-glucans.

Retinol restores the life cycle of keratinocytes, thereby minimizing keratinocyte atypia and controlling the spread of melanosomes in the epidermis. Increases in collagen, elastin, and glycosaminoglycans indicate alterations in the dermis. These changes are manifested histopathologically as structural changes in solar elasticity and collagen degeneration. (Mukherjee S et al.2006). Retinoic acid (tretinoin) is one of the most potent substances for treating age indicators, such as fine lines and spots (Kafi R et al. 2007). Retinaldehyde, a byproduct of the conversion of retinol to retinoic acid, has also been shown to help reduce wrinkles (Creidi P et al.,1998).

Fruit acids activate the synthesis of end glucosamine and other intercellular matrices, stimulating the synthesis of more hyaluronic acid within the dermis while thinning the connective tissue in the papillary layer of the dermis, achieving the effect of enhancing the skin's ability to retain water and increasing the amount of moisture in the skin, with the result of rejuvenation and moisturization (Tang & Yang., 2018).

Marine peptides are derived from marine organisms and aquatic organisms. The effects of sea cucumber peptides on fibroblasts have been studied, compared with commonly used cosmetic anti-wrinkle agents such as oat polypeptides, and found that sea cucumber peptides can promote the growth of NIH/3T3 in

fibroblasts, indicating that sea cucumber peptides have promising applications in cosmetics (Chai et al., 2015). There is also a relationship between the molecular weight of short collagen peptides and their moisturizing ability. A skincare validation of collagen and peptides from tilapia was conducted and analyzed the effect of applying them to mouse skin by measuring changes in skin water content, skin whiteness, and skin tissue morphology. The results proved that they could indeed increase the water content of mouse skin stratum corneum.

Beta-glucan has skin regenerative properties, which involve stimulating immune cells in the skin and regenerating collagen-producing cells to strengthen the skin's ability to cope with adverse environmental effects. Its contribution to skin health includes anti-wrinkle, antioxidant, anti-ultraviolet (UV) affects, and moisturizing effects (Du et al., 2013).

Ingredients that Act as Antioxidants

Vitamins, such as vitamin C, vitamin E, etc. Vitamin C is a reducing component found in abundance in vegetables and fruits, and upon entering the cell, it can directly use its enol structure to remove singlet oxygen from the cell interior; Vitamin C has been demonstrated to prevent AP-1 activation, resulting in a decrease in MMP synthesis and collagen damage. It has also been shown to impair the formation of elastin in vitro tests (Pullar et al., 2017). The study demonstrated an inverse relationship between vitamin E depletion and lipid peroxidation after exposure to UV, and O3, implying that vitamin E may protect keratinocytes from oxidative stress. This also indicates that vitamin E plays a vital function in the detection and prevention of oxidative skin damage (Packer & Valacchi, 2002). Vitamin C's antioxidant activity is maximized when present in conjunction with vitamin E; when combined, they act to limit oxidative damage to cell membrane structures (Rizvi et al., 2014).

Lipoic acid is a multifunctional antioxidant, mainly in the form of R-isomers, and is widely found in plant and animal cells. In addition to scavenging reactive oxygen species, it can also chelate metal ions, repair oxidative damage to cells, and convert them into vitamins C and E in the body, which, together with its reduced form of dihydrolipoic acid, has several times the synergistic effect of other vitamins in the body. It is a veritable "all-purpose antioxidant."

Biological enzymes, such as coenzyme Q10, etc. Coenzyme Q10 is considered to be a regenerative antioxidant. It is a mitochondrial electron transport chain component that is depolarized by UVB radiation. When the skin is exposed to coenzyme Q10 before UVB exposure, it can reduce the effects of UVB on skin cells and improve cell survival. Other studies have shown that coenzyme Q10 prevents reactive oxygen radical-induced cell death and promotes the synthesis of basement membrane components in epidermal-dermal cells. Wrinkles and skin laxity are mainly caused by damaged collagen and elastin fibres, while newly produced collagen and elastin fibres are not replenished in time, which is closely related to fibroblasts. Fibroblasts are the "processing plant" for collagen and elastin and also produce matrix metalloproteinases, such as MMP-1, which degrade collagen; therefore, the number and viability of fibroblasts and their internal metabolic regulation are closely related to skin ageing.

Studies have shown that coenzyme Q10 significantly promotes the increase of fibroblast number and the regulation of protein expression. It can encourage the rise of fibroblast viability, the expression of elastin and type IV collagen, as well as the inhibition of

MMP-1 expression. In addition, studies based on a dermal fibroblast model found that coenzyme Q10 reversed some indicators associated with cellular senescence. Coenzyme Q10 is also a good hand in protecting against skin damage by light. It was found that coenzyme Q10 could inhibit the expression and activity of MMP-1 and prevent skin damage by UVB through studies on mice (Prahl et al., 2008).

Flavonoids, e.g., proanthocyanidins, tea polyphenols, etc. Proanthocyanidins have been shown to increase skin elasticity by maintaining collagen synthesis and inhibiting the production of elastase, thereby assisting the body in preserving collagen. Proanthocyanidins also inhibit tyrosinase activity, reducing the formation of wrinkles while reducing the structure of melanin to a phenolic form, inhibiting the formation of lipofuscin and age spots. Proanthocyanidins work synergistically with vitamins to also provide sun protection and whitening effects (Dixon et al., 2004). Tea polyphenols act as antioxidants in vitro by scavenging reactive oxygen and nitrogen species and chelating redox-active transition metal ions.

Proteins, such as sheep placenta peptides, etc. The prepared sheep placenta peptide in human experiments to evaluate its anti-ageing properties in anti-ageing cosmetics, and the results showed that it was effective in altering the moisture content of the stratum corneum, skin water loss, and elasticity.

Following the above summary of the anti-ageing effects of natural molecules and related literature review, we will introduce some of the more popular and emerging natural sources of anti-ageing substances and describe how they are used in a wide range of products on the market problems remain.

Based on the classification and principles of ageing mentioned in the previous review, combined with the corresponding anti-ageing mechanisms, we can briefly summarize the academic and clinical classification. Intrinsic ageing occurs naturally and inevitably as the body ages; it can be delayed by taking antioxidant ingredients internally, whereas extrinsageinging is the part that we can intervene with skincare products and medical aesthetics. However, not all sageingging phenomena can be alleviated by skincare products, and if static wrinkles and wrinkles occur, tenants-ageing skincare products have minimal effect and require some medical aesthetic intervention. The following will comment on the classification and effectiveness of specific anti-ageing methods.

Intrinsic Anti-aging: Oral Health Care Products

Nowadays, Vitamin C and Vitamin E are added to the more popular health supplements, and there are many multivitamin tablets on the market, most of which are also advertised as anti-ageing. In short, the majority of scientific evidence suggests that anti-ageing, anti-cancer, and cardiovascular disease supplements are not very effective, nor are they any more effective than eating fruits and vegetables rich in these vitamins and minerals (Riley, 2016). However, most trials have been conducted over fewer than ten years, and it is uncertain whether regular use of these nutrients for more than ten years is equally ineffective. Some experiments seem to prove the use of an oral supplement based on a unique bio marine complex, vitamin C, grape seed extract, zinc, and tomato extract produced improvements in the signs of skin ageing in men. However, the limitation was the sample size is too small, and it is not certain that vitamin C alone plays the most important role or that the final result can be obtained with the vitamin alone.

The collagen is broken down into amino acids or peptides in the digestive tract after consumption, and the broken down amino acids or peptides will eventually be synthesized into protein, not necessarily the previous collagen, and the collagen consumed is not as precisely transported to the skin to perform its skincare functions. However, with a total of 1,125 participants aged between 20 and 70 years (95% women), a grouped analysis of studies showed results that ingestion of hydrolyzed collagen for 90 days is effective in reducing skin ageing, as it reduces wrinkles and improves skin elasticity and hydration (Miranda et al., 2021). A double-blind clinical trial was conducted on 120 subjects who consumed either the test product or placebo daily for 90 days. Oral supplementation with collagen bioactive peptides combined with chondroitin sulphate, glucosamine, L-carnitine, vitamins, and minerals significantly improved the clinical parameters related to skin ageing and joint health, and therefore, might be an effective solution to slow down the hallmarks of ageing. However, the effect is achieved by all products added working together, not only by collagen peptides (Czajka et al., 2018). Overall, the anti-ageing effect of single collagen consumed orally cannot be concluded as effective since there was no sufficient experimental evidence to support it.

Food

Grapes had been thoroughly studied in terms of their composition and qualities. Its high polyphenol content slows down skin oxidation by forming free radicals of a barrier to slow down the oxidation of the skin—the strong antioxidant nature of polyphenols, which is based on their ability to absorb free radicals. Phenolics scavenge free radicals, and this property interferes with the initiation and propagation of free radical chain reactions in test systems.

Blueberry anthocyanin has attracted the most attention. They have high antioxidant characteristics because their chemical structure allows the dissociated electron to be relocated, resulting in the formation of a stable radical. Besides, other bioactive compounds inside also have a variety of mechanisms, including stimulation of metabolizing enzymes, gene regulation, and modulation of multisignallingling pathways.

Several studies evaluated the bioactive compounds of these berries and their role in the protective response mechanisms to skin damage caused by ROS, both in vitro and in vivo models. Results showed protective effects on skin cells associated with blueberries phenolic compounds that included inhibition of proliferation and cell cycle arrest in malignant cells, decreased oxidized macromolecules, down-regulation of inflammatory cytokine genes, and mitigated oxidative stress (Maya-Cano et al., 2021).

Extrinsic Anti-aging: Sun Protection

Coconut oil has a miraculous effect on UVB rays by not blocking the UVB rays necessary for vitamin D synthesis and preventing damage to the skin and subcutaneous tissues caused by overexposure. Coconut oil fatty acids have a sealing effect on the skin, reducing moisture loss from the epidermis and providing a moisturizing effect. MyChelle Coconut Sunscreen (SPF 28), BANYAN TREE Coconut Skin Care Physical Sunscreen (SPF 30), and Florestan Coconut Almond Sunscreen (SPF 30) all add coconut oil as a sunscreen component.

Shea butter contains cinnamic acid, which, in addition to its moisturizing properties, also has

a UV-absorbing effect and is, therefore, a natural sunscreen. Sunscreens and after-sun creams with shea butter as an additive improve the sun protection of sunscreens and the healing power of after-sun creams. MAMABUTTER Baby Shea Butter Sunscreen and L'Occitane Shea Butter Sunscreen (SPF 20) both contain shea butter as an active ingredient.

Grapeseed oil contains high levels of squalene, which can effectively scavenge free radicals and inhibit skin damage caused by UV rays; and also has certain repairing abilities, antioxidant, and UV damage reducing effects. Studies have shown that grape seed oil can increase blood circulation, protect collagen and elastin fibres in the fibres from UV damage and prevent melanin deposits. Ottilie Grand Grape Seed Repairing Sunscreen (SPF 50) uses grapeseed oil as a skin conditioning agent.

Skincare Products (Mainly Using Natural Compounds)

According to the classification of natural molecules mentioned in the literature review section, there are three kinds of anti-ageing skincare products according to their function and efficacy. Although in skincare products, these molecules do not act singularly, as previously mentioned, but together with other ingredients, their effects may be a combination of all; in the final assessment, the most apparent effects of such skincare products are used to differentiate them.

Table 1. Several age-delaying cosmetics with cell metabolism-boosting effects

Brand (product)	Main active ingredients	Efficacy
L'Oréal (Anti-Wrinkle Firming Cream)	Pro-Retinol (Retinyl palmitate or Provitamin A)	It is gradually bio-converted into retinol by the skin directly. It helps improve epidermal structure and promotes its cell regeneration to reduce the appearance of surface wrinkles and brown spots.
YSL (Pure Shots Night Reboot Resurfacing Serum)	Proprietary blend of Argan and Seed Oil, Moonlight cactus flower	Repair and protect skin cells to reactivate skin regeneration over time, making the skin smoother and more luminous
Sisley (ALL DAY ALL YEAR)	Sesame seed extract, Myrtle extract, Marshmallow polysaccharides	Help strengthen the skin barrier and activating the skin's self-defense capabilities to limit the harmful effects of pollutants

Table 2. A few cosmetics that have the effect of scavenging free radicals to slow down the ageing process

Brand (product)	Main active ingredients	Efficacy
fresh (Black Tea Age-Delay Eye Cream)	Black Tea complex, Vitamins C and E	Super antioxidant action to protect against free radical damage and soothe
Kiehl's (Powerful-Strength Vitamin C Serum)	Pure Vitamin C, Vitamin Cg (a derive), and hyaluronic acid	Helps neutralize free radicals before they have the chance to accumulate and boosts radiance while helping to smooth skin's texture
Avène (Revitalizing Nourishing Cream)	Red Fruit Extract, Pre-Tocopheryl (a photostable form of Vitamin E)	Helps protect against environmental stress and pollution for a natural flowing complexion
Lancôme (RÉNERGIE H.C.F. TRIPLE SERUM)	Ferulic Acid, fast-working form of Vitamin C	Helps to neutralize harmful free-radical damage and protect against oxidative stress.

Table 3. A few cosmetics with collagen and elastin replenishment to slow down the ageing process

Brand (product)	Main active ingredients	Efficacy
Dior (CD Kristin Day Cream)	Alpha- Hydroxyfruit Acid (AHA)	Promotes collagen synthesis
Estee Lauder (Advanced Night Repair Eye Supercharged Complex Synchronized Recovery)	Tripeptide-32, AKA Hyaluronic Acid	Promotes collagen production, strengthens skin elasticity around the eyes, and fights sagging under the eyes
CPB (THE SERUM)	Platinum Golden Silk Extract, Japanese Pearl Shell Extract, Perilla Extract, and Angelica Acutiloba Extract	Activate skin's regenerative powers and enhances skin's ability to defend itself against internal and external stressors.
Givenchy (LE SOIN NOIR CREAM)	Marine collagen (Vital Algae)	Promotes the self-synthesis of collagen fibers and the migration and proliferation of collagenoblasts to wrinkled area

Medical Aesthetic Products

Whether anti-ageing with skincare products or through medical aesthetic treatments is a topic of ongoing debate, but we can measure and analyze it in several dimensions such as onset

and maintenance time and safety and longevity. The ultimate aim of medical anti-ageing, using various means, is to re-establish the healthy barrier function of the skin, maintain the appropriate thickness and renewal rate of the stratum corneum, and maintain and activate the activity of dermal fibroblasts, tighten and regenerate new collagen. The compound hydration injection can cross the skin surface stratum corneum as a barrier to reach the dermis, thus playing the role of hydration lock water. Much compound hydration injection will be added to hyaluronic acid according to the demand for some vitamin C or glutathione. This can be used to brighten and whiten the skin and slow down the ageing process (Tejero, P. T., & Pinto, H., 2020).

Other Methods and Suggestions

Lifestyle habits are one of the more potentially influential factors. Nighttime is a critical time for the body to recuperate and adjust. If you stay up late for a long time, it will slow down your body's metabolism and cause health problems and lead to rough, dull, yellow skin, loss of lustre, and most likely break out in acne spots and wrinkles. Therefore, establishing a regular bedtime and rising time and sticking to it.

Using computers and mobile phones for long periods can have a particular radiation effect on the skin. Try to use them as little as possible, and stick to sunscreen. Instead of using skincare products and other medical treatments after ageing has gradually occurred, it is imperative to start changing your lifestyle habits to prevent ageing skin and body. Overall, for anti-ageing, prevention is far more important than treatment. While researching and reading the literature, the highest correlation is between how quickly the skin ages and genes, followed by lifestyle and dietary habits, and finally, skincare products or medical treatments.

Conclusion

As anti-ageing is now a topical issue, this paper focuses on the efficacy and application of natural molecules for anti-ageing in humans. From the definition of anti-ageing and the classification of ageing as a starting point, the paper extends to the overall anti-ageing strategy for different types of ageing. Based on the mechanism of action of molecules on the skin, a review of representative molecules from each category is presented to help gain a deeper understanding of the overall anti-ageing process of the skin. This is followed by a comparison of the application and efficacy of the natural molecules in different vehicles, not only in terms of the efficacy of individual molecules and the overall strategy of anti-ageing thinking but also in terms of the effects of different molecules on human skin in certain vehicles, such as health products, skincare products, medical and aesthetic practices, etc. In the end, after comparing this detailed range of anti-ageing methods, it is concluded that in the anti-ageing process, more emphasis is placed on the prevention of ageing, primarily by maintaining a good lifestyle and dietary habits, which can be improved by the use of skin care products containing natural ingredients with different effects after the onset of ageing. In contrast, medical aesthetic products rarely use natural ingredients directly, depending on the individual's condition.

Conflict of Interests: the author has claimed that no conflict of interests exists.

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