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Antiwrinkle herbal drugs – An update

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Abstract

The largest part of human body is skin, which is also the outermost organ; it acts as a first line of defense of our body. After a certain period of time there is a gradual loss of skin elasticity and collagen fibres that we called aging. There are various signs of aging and one of them is skin wrinkling. When aging starts a fold or crease formed in the skin which is known as wrinkles or rhytide. Wrinkles formation occurs due to weakening or loss of body mass or long time contact with water. Collagen and elastin are primary structural components of our skin and it is essential to stop the breakdown of collagen to prevent ageing and wrinkles formation. There are different factors which enhance wrinkling and are sun damage, aging, smoking, lack of hydration, unnatural facial expressions, genetics and various other factors. There are so many herbs available for treatment of wrinkles such as Manjistha (*Rubia cordifolia*), Sirish (*Albizia lebbek*), Aloe vera, Cucumber (*Curcumis sativum*), *Haberlea rhodopensis*, Ginger (*Zingiber officinalis*), *Panax ginseng*, *Glycyrrhiza glabra* and Honey etc. The present review article is a compilation of herbs used for treatment of skin wrinkles with all the necessary information regarding mechanism of action, availability etc.

Keywords: herbal drugs, *Rubia cordifolia*, *Albizia lebbek*, outermost organ

Introduction

Aging is a common process of human beings in which there is inability in maintenance of homeostasis and risk of dying increases. After the age of 20 its symptoms appears as the collagen content per unit area starts decreasing, there is 1% decrease in collagen content per unit area of the skin every year^[1]. It is divides into two types, intrinsic and extrinsic aging. The intrinsic aging is associated with genetics whereas extrinsic aging is caused by external factors such as sun exposure, smoking, diet, lifestyle etc. Aging occurs due to sun exposure is known as photoaging various signs of photoaged skin are deep wrinkles, rough and dry skin, dark and light patches and loss of skin's elasticity. However, we can protect ourselves from photoaging with the help of following agents like ozone, water, skin thickness, melanin, cosmetics, fabrics. During aging there is imbalance between collagen production and degradation, its production decreases whereas level of collagen degrading enzymes increases. Skin wrinkling is one of the important features of aging of human skin, exact mechanism of wrinkles formation is still unknown but it has been observed that chronic exposure to sun and smoking causes enhancement in the expressions of matrix metalloproteinases, an enzyme which in turn causes repetitive breakdown of collagen fibres and responsible for structural defect in dermis and wrinkles development^[2]. Wrinkles also known as waviness, both the term associated with "fibres misalignment", which refers to displacement from its original position. There are so many factors which increases skin wrinkling such as smoking, ultraviolet irradiation, alcohol, diet, genetic factors, in case of smokers the degradation or loss of collagen fibres occurs due to changes in vasodilatory capacity of the skin microcirculation. Skin elasticity is one of the major factors in skin's health; low tensile strength of skin, excessive stress, improper hormone balance and mutation also leads to skin tension and wrinkling^[3]. Dryness of epidermal layer causes skin wrinkling so proper hydration should be maintained to decrease wrinkles. Tobacco smoking causes premature skin aging, the smoke extract of tobacco disturbs the production of collagen fibres and hence skin elasticity. The enzyme angiotensin 2 plays a pivotal role in photoaging of skin as it involved in healing wounds and scar formation, appearance of scars leads to wrinkles. So by using angiotensin converting enzyme (ACE) inhibitors which prevent the conversion of angiotensinogen (inactive) to angiotensin (active) we can decrease the effect of angiotensin 2 induced skin aging and wrinkles^[4].

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Herbs used for treating wrinkles

Aloe vera

Aloe vera (*Aloe barbadensis*) belongs to family liliaceae contains different vitamins and minerals, enzymes, amino acids, natural sugars and agents which may be anti-inflammatory, antioxidant and anti-microbial. It is well known for its considerable medicinal and healing properties, and its leaves are commonly used in anti-aging and anti-wrinkle creams and moisturizers. Aging is a natural process in all living organisms that leads to progressive and deleterious changes in organisms. UV radiations cause photo damage to the skin, which leads to depletion of the dermal extracellular matrix and chronic changes in skin structure. Skin wrinkle formation is associated with collagen synthesis and expression of matrix metalloproteinases. In the treatment of aging and wrinkles the constituents of aloe vera such as aloin A and B have shown the property to inhibit the activity of collagenase, the enzyme which causes degradation of collagen fibres and it also inhibits the expression of matrix metalloproteinases (MMPs) [5]. In an experiment it has been found that the baby aloe shoot extract (BAE) has more potential than adult aloe shoot extract (AE) in the treatment of UV damaged skin. The plant possesses many other pharmacological activities such as antioxidant, antimicrobial, anticancer, antidiabetic, immune stimulating agent, smooth functioning of gastrointestinal tract and wound healing. Many traditional uses are also there such as burns, cuts, swelling, fever and in cosmetics. Aloe vera (*Aloe barbadensis*) has high potential as skin healing ailment it belongs to family liliaceae. Leaves of aloe vera are used. It can be used externally as well as internally, usually taken as a health drink [6]. It is commonly used for treating acne, wrinkles, dark or white patches and stretch marks. Other uses of aloe vera are, it has immunomodulatory, antiviral and anti-inflammatory action. Aloe vera is available in Africa, India and arid areas.

Wheat

Wheat (*Triticum aestivum*) belongs to family poaceae. Wheat grain contains phenolic compounds, phytochemicals, carbohydrates etc. It possesses the potential of treating cancer, drowsy, heart problems, skin aging and wrinkles etc. It increases the synthesis of collagen fibres in dermis [7]. Wheat proteins enhance the synthesis of collagen fibres and increase skin elasticity. Wheat available in India, China, USA, France Australia, Pakistan, Sri-Lanka etc.

Astragalus membranaceus

Astragalus membranaceus belongs to leguminosae family, its roots are used. Various experiments have been done to prove the antioxidant activity of *Astragalus membranaceus*. In an experiment on mice, the activity of antioxidant enzymes such

as catalase, peroxidase, superoxide dismutase etc. increased by using roots of it [8]. We know that free radicals are important factor in causing aging and wrinkling and *Astragalus membranaceus* prevent the action of free radicals by increasing the activity of antioxidant enzymes and hence useful in treatment of aging and wrinkles.

Cucumber

Cucumber (*Curcumis sativum*) belongs to cucurbitaceae family, its fruits and seeds are used. Cucumber as a medicine is very good for skin, in different kinds of cosmetics the fruits and seeds of cucumber are used as a main ingredient to treat skin wrinkles and sunburn, it has a potential to maintain the elasticity of skin and prevents wrinkling and aging [9]. Other uses of cucumber are as a moisturizer and make our skin fairer by inhibiting tyrosinase.

Haberlea rhodopensis

Haberlea rhodopensis belongs to family Gesneriaceae, found mainly in European countries. It has very strong antioxidant and antiaging potential, it is involved in synthesis of collagen and elastin genes of human skin by increasing activity of messenger RNA, activity of mRNA is enhanced by a substance known as caffeoyl phenylethanoid glycoside myconoside [10]. It is commonly used in antiwrinkles cosmetics for its ability to improve the skin elasticity.

Black tea

Black tea (*Camellia sinensis*) belongs to family Theaceae. In an experiment performed in-vitro, it was found that is anti-hyaluronidase activity which is directly related to dose [11]. Because of this activity it is a safe and potent ingredient for use in skin anti-aging and anti-wrinkles cosmetics. Tea is easy to use also, good in taste and even on high use it is non-toxic.

Japanese red pine

Japanese red pine (*Pinus densiflora*) belongs to family pinaceae. Its stem bark is used. It is commonly found in Japan, Korea and North America. *Pinus densiflora* has strong antioxidant properties, it has ability to scavenge free radicals effectively. A very important constituent known as catechin present in the bark of *Pinus densiflora* possesses the brilliant antioxidant potential and maintains the elasticity of skin [12]. Catechin is commonly used in cosmetics as an important antiphototoaging component.

Nardostachys jatamansi

Jatamansi is a very important herb regarding its skin care properties. It triggers fibroblasts to increase the synthesis of collagen and elastin fibres [13]. Due to which skin elasticity increases and wrinkles formation (aging) decreases.

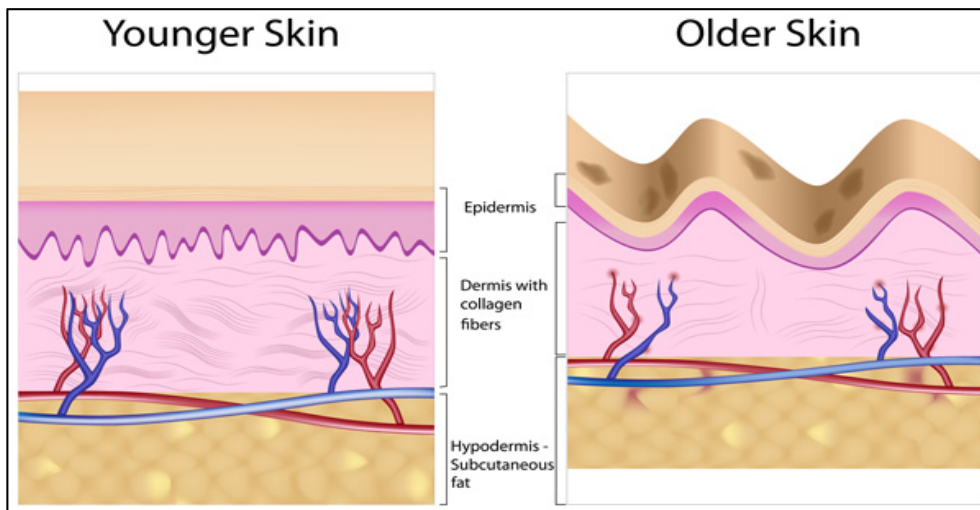


Fig 1: Showing collagen changes during aging

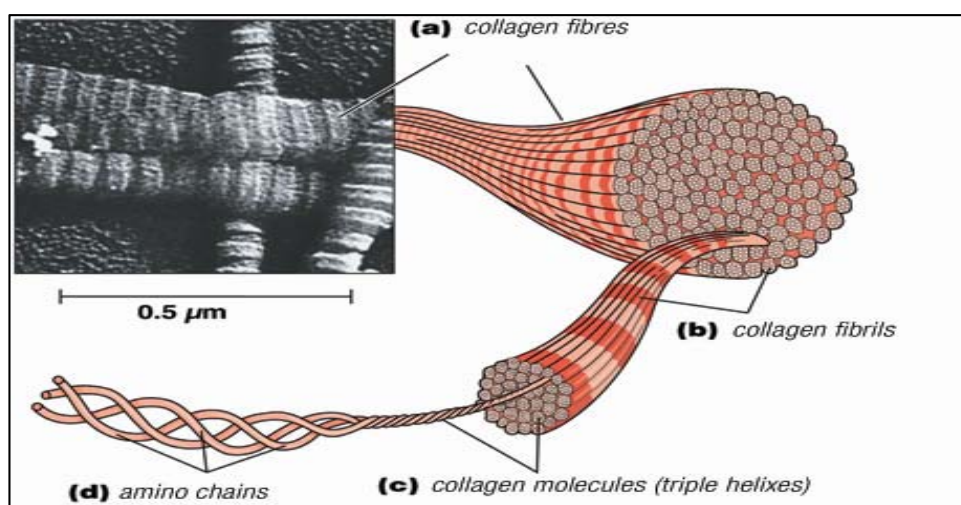


Fig 2: Structure of collagen fibres

Panax ginseng

Ginsenosides are the chemical constituents found in different varieties of ginseng. Ginsenosides show various medicinal properties, recently during an in-vitro model data it has been found that ginsenosides have antiaging and antiwrinkles effects^[14]. Antiaging capacity of ginseng is responsible for its use in many skin care cosmetics.

Citrus sinensis

It is used in the form of fruits, candies or wine. It is a rich source of vitamin C. It has property to inhibit the expression of metalloproteinase^[15]. Skin wrinkles appear due to the depletion of collagen fibres and appearance of matrix metalloproteinase.

Piper betel

Piper betel, a herb belongs to family piperaceae rich in antioxidant properties, it also possesses anticancer and neuroprotective properties. It acts as an antiaging agent by neutralizing free radicals, used in the treatment of wrinkles, aging, diabetes mellitus, kidney problems and cancer. The phenolic constituent allylpyrocatechol from the leaves showed activity against obligate oral anaerobes responsible for halitosis and antioxidant activity^[16].

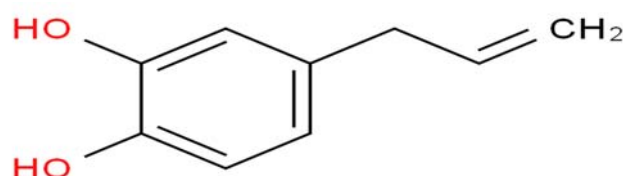


Fig 3: Structure of Allylpyrocatechol

Rosemary

Rosemary (*Rosmarinus officinalis*) belongs to family. There are different enzymes in our body which react with free radical species and neutralize them, superoxide dismutase is one of them which causes conversion of free radicals into hydrogen peroxide and oxygen. Hydrogen peroxide (H₂O₂) is then converted into water and oxygen^[17]. Rosemary extract used to mimic the activity of superoxide dismutase to neutralize free radicals and protects us from aging and wrinkles.

Liquorice

Liquorice (*Glycyrrhiza glabra*) belongs to family fabaceae. Various medicinal herbs were examined for antiaging effect including *G. glabra*. The extract at the dose of 150mg/kg/day given to healthy male mice. At the end of the experiment the total antioxidant power of *G. glabra* has been proved and helps

in recovery of changes that occurred during aging such as wrinkles, fine lines, loss of elasticity etc ^[18].

Boerhavia diffusa

According to ayurveda, It is a plant from rasayana category. It is antioxidant in nature and possess antiaging property ^[19].

Glycine max

Soyabean (*Glycine max*) is a rich source of hyaluronic acid. During an experiment in which filling effect of a cosmetic treatment was demonstrated. It contains six types of hyaluronic acid obtained from soybean. In the end of the treatment it has been observed that the depth and volume of wrinkles decreased ^[20]. The mechanism of action was that hyaluronic acid maintains the hydration of stratum corneum as dryness of stratum corneum plays an important role in wrinkles development.

Coriandrum sativum

Exposure to UV radiations causes damage to the skin which leads to degradation of extracellular matrix of dermis. Coriander leaves show antiwrinkle and antiaging effect, the main constituent of coriander leaf is linolenic acid which increases collagen synthesis in normal human dermal fibroblasts (NHDF) and also decreases the expressions of matrix metalloproteinases ^[21].

Tamarindus indica

Aging and wrinkles are damaging actions on skin, results due to harmful UV radiations. Extract of tamarind seed coat was prepared using alcohol which shown stronger antioxidant activity ^[22]. When skin damaged expressions of matrix metalloproteinases increases by fibroblasts, and it has been noticed that the damage rate of skin cells caused by UV radiations decreased from 25% to 10% in presence of tamarind extract.

Terminalia arjuna

Aging occurs due to decrease in the collagen production. Collagen synthesis and epidermal barrier function is improved by pentacyclic triterpenoids found in *Terminalia arjuna* ^[23]. It also increases skin moisturization and decreased scaliness.

Daucus carota

Carrot glycoprotein is used to promote the synthesis of collagen type-1 which breakdown on continuous exposure of skin to harmful UV radiations ^[24] and it also inhibits the expression rate of matrix metalloproteinases.

Miscellaneous

Bacteriochlorophyll

Bacteriochlorophyll possess antiaging skin effects, obtained from *Rhodobacter sphaeroides* bacteria. An experiment was performed in which the production of procollagen from normal human dermal fibroblast cells noticed and it has been found that in presence of bacteriochlorophyll production was higher than control. Additionally, it also regulated the expression of genes associated to skin antiaging by upto 4-15 times those of the control. It is very effective in treatment of wrinkles and aging.

Microneedle therapy system

MTS or Microneedle Therapy System is involved using a micro needle to make small incisions in the dermis of skin to enhance collagen and elastin synthesis, in some cases acupuncture therapy is also used to make incisions. Due to increment in collagen production, wrinkles and aging automatically reduced.

Patchouli oil

Pogostemon cablin is very frequently used traditional Chinese medicine. Patchouli oil isolated from *Pogostemon cablin* was used to treat photodamaged skin of mice. Results show that the topical application of patchouli oil significantly reduced wrinkle formation, enhanced skin elasticity and increased collagen content.

Hochuekkito

Hochuekkito (HET) is a Kampo prescription, which has been used to treat skin disorders. HET possess very strong free radical scavenging activity and acts as a strong antioxidant agent. It also maintains the skin hydration and used in the treatment of wrinkle and aging.

Aureobasidium pullulans

Aureobasidium pullulans possesses antioxidant effects which were determined by using free radical scavenging capacity of *A. pullulans*. Later on it has been found that pullulans (Natural sugar from fungus *A. pullulans*) has capacity to inhibit hyaluronidase, elastase, collagenase, the enzymes which degrade collagen and elastin fibres. So pullulans is an effective treatment for wrinkles and aging.

Conclusion

The skin is the largest organ of the human body and represents the main barrier to the external environment. Collagen, elastin and hyaluronic acid are the skin main components and have an important role in maintaining its structure and hydration. The collagen family consists of 28 different proteins, which account for 25% -35% of the total protein mass in mammals. Type I collagen is the most abundant in human skin (80%) with type III collagen making up the remainder of skin collagen (15%). The collagen in the skin is mainly produced by fibroblasts. Hydrolysed collagen consists of small peptides with low molecular weight, enriched in specific amino acids: glycine, proline and hydroxy proline. Due to its low molecular weight, hydrolysed collagen is highly digestible, absorbed and distributed in the different tissues of the human body. Several experiments have shown that collagen peptides can be efficiently absorbed and distributed to the dermis, the deepest layer of the skin, where they can stimulate the proliferation and motility of fibroblasts; induce an increase in the density and diameter of collagen fibres; increase hyaluronic acid production and activate protection against UVA radiation. So it is essential to maintain skin elasticity and to prevent wrinkles we need to focus on herbs.

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