SOAP PERFUMERY AND COSMETICS

Natural solutions to Cellulite

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Introduction

A comprehensive and detailed paper on the cause and mechanisms of cellulite was given by Prof. Sergio Curri (co-author E. Bombardelli)[1] at the Advanced Technology Conference, Barcelona, Spain, in March 1994.

The problem of cellulite affects most women to varying degrees and can equally affect fat, normal and thin builds.

It is often attributed to a progressive case of oedema, a condition of water of fluid retention within cavities of the skin. The lymph nodes are particular cavities, and thus subject to oedema or lymphoedema.

Cellulitis formation is due to a microcirculation failure, which can be caused by hereditary factors, lack of exercise, hormone dysfunction, blood circulation problems, connective tissue weakness, premature skin ageing, poor nutrition, excessive alcohol consumption, etc.

The first sign of cellulitis is usually in the form of an "orange peel" appearance to the affected tissue, and it is at this stage that any treatment is likely to be effective. Established striations or gross fatty agglomerates are unlikely to be totally reversible.

Cellulitis treatment

There are reported laser treatments, liposuction methods, enzyme therapies, oral drugs, Ultrasound treatment, and electrical treatments that can be used.

The simplest solution most likely consists of a combined treatment of controlled diet, improved exercise, massage and cosmetic treatments applied topically. It is the treatment and control of cellulite using plant materials that will be considered. The most frequently asked question concerns whether it is the product or the massage that has the benefit - the answer is not clear, but both are beneficial and the data would suggest that the action is synergistic.

Function requirements

As oedema is a critical factor in cellulitis, the product must contain active materials that will help to reabsorb this oedema, Steroidal saponins are traditionally used to prevent and reduce oedema.

Cellulitis is also affected by a deficient blood circulation and materials that improve circulation must also be included. Quaternary alkaloids of plant origin (chemicals derived from a purine base, such as caffeine, theophylline and theobromine).

Reducing capillary permeability can reduce capillary fragility. Plant flavonoids are used to reduce prostaglandin activity, which is a contributory factor in inflammation and increased capillary permeability. Similar effect is achieved by the modification of the hyaluronidase activity.

The final product could also have lipolytic action to stop accumulation of fat at the adipocytes, a function which is usually regulated by an enzyme called lipase. Iodine (either free or associated) has been proved to be able to activate lipase and so help to eliminate fat retention. Seaweed can provide iodine and certain *Laminaria* spp and *Fucus* spp are rich in this element.

The inclusion of an enzyme containing plant may also help to tenderise and soften the skin, allowing better penetration of the other actives and encourage better tissue drainage.

The most commonly used plants

There are too many plants to deal with them all in detail, but we will consider the most popular ingredients currently used and examine whether their use is justified.

BUTCHER'S BROOM
Ruscus aculeatus

In the Lawrence Review of Natural Products[2], we read that early investigations in the 1950's indicated that extracts of the rhizomes of Butcher's Broom could induce vasoconstriction and therefore may have a clinical use in the treatment of certain circulatory diseases.

A variety of compounds have been isolated from Butcher's Broom. A mixture of steroidal saponins have been identified. The two primary compounds are ruscogenin and neuroscogenin. There are also a variety of flavonoids, a fatty acid mixture composed primarily of tetracosanoic acid and related compounds, chrysophanic acid, sitosterol, campesterol and stigmasterol, have been isolated from the roots. Extracts of Rucus have been included in commercial phytotherapeutic agents designed for the management of venous insufficiency.

Trease and Evans[3] say that the rhizomes of this plant contain saponins related to those of Dioscorea; thus, one sapogenin is 1ß-hydroxydiosgenin(ruscogenin). Both the alcoholic extract of the roots and the ruscogenins themselves have anti-inflammatory activity, produce diminished capillary permeability and exert a vasoconstrictor effect in the peripheral blood vessels.

The Council of Europe[4] classify the rhizome and root as possibly having anti-irritant, astringent, vasoprotective and anti-oedema effects. A conclusion that is backed by Tyler, Brady and Robbers[5].

Weiss[6] states that the plant may be considered a specific for veins. They cause a reduction in the swelling of varices, and have a tonic effect on the blood vessels.

There are numerous clinical trials that have been carried out, but space only permits a few examples of those studies.

Carini, Maffei Facino, Brambilla, Stefani and Scesa[7] reported that the ruscogenins exhibit remarkable anti-elastase activity. Tarayre and Lauressergues[8] reported on the anti-oedema properties.

Berg[9] examined the venoconstrictive action of the topical application of Ruscus extract in a randomised, double-blind study and found within 2 1/2 hours of the application of 4 to 6 g of a cream containing 64 to 96 mg Ruscus extract, the diameter of the femoral vein decreased by an average (median) of 1.25 mm, while placebo (base of the cream) was associated with a diameter increase of 0.5 mm. The decrease in venous diameter reflects good percutaneous absorption of the active substance.

Rubanyi, Marcelon,and Vanhoutte[10] demonstrated that temperature affects the venoconstriction induced by Ruscus in an opposite fashion as that to sympathetic nerve activation, presumably because the alpha 1-adrenergic component of the response to Ruscus predominates.

Bouskela, Cyrino, Marcelon[11,12] demonstrated that the venular constriction elicited by Ruscus extract in vivo, at the microcirculatory level, is mediated by calcium and by alpha-adrenoceptors and further support data previously reported on larger vessels and on patients with venous insufficiency. Ruscus extract applied topically dose-dependently inhibited the macromolecular permeability-increasing effect of histamine.

IVY
Hedera helix

Ivy extracts are major constituents in slimming products, especially those which combat cellulitis. They are found in most of the compositions offered by well established cosmetic houses. It has vasoconstrictor and antiexudative properties, and reduces capillary permeability - an action attributed to rutin and the flavonoids present. It is also reported to be an effective moderator of peripheral sensitivity and can improve tolerance to skin massage.

It is also noted that Ivy extracts activate the circulation, allow drainage of infiltrated tissue and thereby reduce local inflammation, exerting an antiedematous effect and lowering tissue sensitivity.

The Council of Europe[4] give the chemical composition as saponins (α-, ß-, and gamma-hederin, hederacoside A), flavonoids (rutin, quercetin), phenol acids (caffeic and chlorogenic acids), carotenoids, α-tocopherol etc. It has possible effects as an astringent, microvessel protector, anti-oedema, antiseptic.

Carini, Maffei Facino, Brambilla, Stefani and Scesa[7] reported that the *Hedera helix*, the sapogenins only non-competitively inhibit hyaluronidase activity in a dose dependent fashion

and both the saponins hederacoside C and α-hederin are weak inhibitors. The glycosides are devoid of inhibitory action, while the genins are potent competitive inhibitors.

All these findings provide a biochemical support for the efficacy of these extracts in the treatment of liposclerosis, since the recovery of the integrity of hyaluronic acid and elastin (and of their functional interactions with proteoglycans) might lead to a reconstruction of the extracellular matrix in which the peryadipocyte microvascular system is embedded.

GUARANA, BRAZILIAN COCOA, ZOOM
Paullinia cupana
Paullinia sorbilis

Paullinia cupana Mill. fruit is used and contains the active caffeine, which provides it with stimulant and tonic properties for the skin. Moreover, it has been demonstrated that caffeine neutralises the adenosine effect in the metabolism of adipocites by strongly inhibiting the lipogenesis and having lipolytic action. For this reason it is very useful in anti-cellulitis products.

In the Lawrence review of natural products we read that the stems, leaves and roots contain caffeine (3-5%), alkaloids theophylline and theobromine, it is high in tannins (primarily catechutannic acid and catechol). Used in commercial slimming products.

HORSE CHESTNUT
Aesculus hippocastanum

According to Fluck[13] the parts of horse chestnut used are the fresh seeds, freed from the seed coat, more rarely the bark from the branches or the fruit walls.

Constituents are described as the saponin aescin (which is the major principle), flavones, coumarin and tannins. Their action is to strengthen the blood vessels, to prevent thrombosis and to strengthen the veins. Like all saponins aescin has haemolytic properties, though this in minimal with therapeutic doses, when it does not interfere. The special characteristic of aescin is its effect on capillary permeability.

Hoffmann[14] includes in the constituents the glycosides aesculin (a coumarin derivative) and fraxin. He recommends horse chestnut as an astringent and circulatory tonic and describes its action as unique on the vessels of the circulatory system. It seems to increase the strength and tone of the veins in particular.

Weiss[6] adds that the extracts from the seed of the horse chestnut act on the connective tissue barrier between blood vessels and tissue, where nutrients and gases diffuse, inhibiting exudation and the development of oedema and reducing vascular fragility. The wall of the vein becomes less permeable, and this inhibits oedema.

The number and diameter of the small pores in the capillary membranes is reduced, making them less permeable to fluids. In animal experiments, the anti-oedematous activity of aescin was found to be six hundred times that of the classical drug rutin. An important second effect is an improvement of the tone in the walls of the vein.

Aescin has a wetting or detergent effect which can act on the vascular walls, increasing the wettability of the inner walls. This makes it easier for tissue fluids to drain into the capillaries. Increased oncotic (or colloid-osmotic) pressure causes perivascular oedema to be sucked into the capillaries at the same time. This anti-oedematous effect is very useful in a whole range of conditions, especially to reduce swelling within bruises and other oedematous conditions.

The preparation must not be massaged on, but applied gently to avoid inflammation of the vein.

Kay van Rietschoten[15] confirms the benefits on the circulatory system and quotes research that aescin has an anti-exudative property that it increases the tone of isolated veins. It is active in the first phase of inflammation, which is characterised by an increased vascular permeability of the venous side of the circulation. Further experiments showed that aescin has some 'sealing' effect on the walls of the capillaries. It was able to antagonise the effect of bradykinin (a potent increase of vascular permeability) by normalising the permeability of the plasma/lymph barrier dose-dependency. Aescin stimulates the production and release of prostaglandins (of the F-alpha type), which induce contraction of veins. This contraction is antagonised or reduced by the inhibition of cyclooxygenase, the enzyme responsible for prostaglandin formation from arachidonic acid.

The Council of Europe[4] lists the plant as "anticouperose", for cellulitis, for anti-oedema, as vasoprotective and periferic vasoconstrictor.

Morelli, Bonari, Pagni and Tomei et al.[16] report that it is a dermatological agent, peripheral vasodilator and topical vulnerary. It is very active in venous insufficiency, on the collagen synthesis, ulcers and slow-healing wounds. It is particularly used in skin diseases and for cicatrisation after surgery.

PINEAPPLE
Ananas sativus
Ananas comosus

Leung[17] refers to Pineapple as a source of Bromelain, bromelin and plant protease concentrate. Bromelains are sulphhydryl proteolytic enzymes obtained from the pineapple plant. Two kinds of bromelain are known: stem bromelain and fruit bromelain; they are derived from the juices of the stem and fruit respectively. It is a mixture of several proteases (including carboxy peptidase) and small amounts of nonproteolytic enzymes such as acid phosphatase, peroxidase and cellulase as well as several protease inhibitors that are polypeptides.

Stem bromolain has been reported to exert a wide variety of pharmacological effects, including burn debridement, anti-inflammatory action, prevention of epinephrine-induced pulmonary edema, smooth muscle relaxation, stimulation of muscle contractions, inhibition of blood platelet aggregation, enhanced antibiotic absorption and enhanced excretion of fat. The precise nature of these effects is not fully known.

Carle[18] reports that on the Hawaiian islands, in the Philippines and in South American folk medicine, pineapple is used against inflammation, feverish diseases, oedema, indigestion and as an anthelmintic.

Bromelin has been introduced into therapy as an antiphlogistic only since the 60s. The areas of indication for Bromelin include inflammatory oedemas, post-operative conditions, thrombophlebitis (in support of fibrinolytic treatment).

Kay van Rietschoten[15] report on a number of clinical references which found that bromelain was the most potent anti-inflammatory among the nine tested drugs, including aspirin for reducing oedema induced in rats. It was also found that the reduction of inflammation and platelet aggregation are related. Researchers obtained the same anti-inflammatory effect with the corticosteroid prednisone but at 10 times higher dose, an important advantage of bromelain, considering the severe side effects of steroids.

The Lawrence[19] review of natural products (July 1993) refers to *Ananas comosus* (L.) Merr. which has an anti-oedemic substance present in the rhizome. Bromelain has been used for burn debridement and to reduce soft tissue inflammation and irritation. It lowers kininogen and bradykinin serum tissue levels and has an influence on prostaglandin synthesis.

Topical application of pineapple-derived enzymes have been shown to enhance wound healing in animal models[20,21,22,23,24] and reduce induced oedema.

There are a large number of clinical papers relating to the benefit of bromolain in post surgical oedema[25,26,27,28,29,30].

Examination of the literature for papain, the enzyme from papaya (*Carica papaya*) shows similar effects.

Further medicinal plants that might be worthy of investigation

The major plants cited for the treatment of cellulite are Gotu kola or *Centella asiatica*, *Hydrocotyle asiatica*, Cypress or *Cupresses sempervirens*, Seaweed or *Laminaria digitata*, *Fucus vesiculosus* and Kola nut or *Cola acuminata*.

Conclusions

From our brief study of the commonly used plants, we can quite confidently predict that the materials examined should have a beneficial effect on oedema and subsequently would be helpful in preventing and treating the early stages of cellulitis.

There are more than another hundred plants, which are specific for oedema and which could be used for the management of tissue fluid retention. Oedema in patients poses many serious problems for workers and carers in the medical profession, particularly those involved in post-operative patient care. The future for plant based therapies is promising.

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