ABSTRACT

HERBAL MEDICINE FOR THE SKIN. THEIR CHEMISTRY AND EFFECTS ON SKIN AND MUCOUS MEMBRANES

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Abstract

The human skin can show conditions ranging from simple dryness to severe erythema and scaling. These indications are sometimes accompanied by pruritis, inflammation and also may exhibit an associated oedema that further increases the discomfort. Herbal materials have been selected by an untiring process of 'trial and error' to alleviate these symptoms. This is not a method considered to be at all scientific by today's exacting standards. However, scientific study shows that plants possess a vast complex arsenal of phytochemicals that not only calm, restore, and heal the skin, but also stand up to the scrutiny of clinical trial and pharmacology.

At the simplest level, soothing and emollient herbal remedies are found to contain mucilage, polysaccharides, complex sugars and starch derivatives that relieve dryness and provide a soothing membrane that covers the skin. Protection of the skin hydration is achieved using seed oils rich in fatty acids and triglycerides that reduce transepidermal water loss and so increase skin hydration.

It will be shown that those plants with anti-inflammatory properties often have a high level of flavonoids, those that are used to firm and tone the skin are rich in tannins and those that have cicatrising and vulnerary properties often have a high level of plant sterols.

Often skin healing is compromised by opportunistic infections and in these cases the use of plants can provide a complex array of antimicrobial and antifungal biocides.

In conclusion, whatever the indication, there is a plant containing the right chemical portfolio and proven ethnopharmaceutical history to meet the need.

Introduction

Our recorded knowledge in the care of the skin begins some 3,000 years before the birth of Christ, when the Egyptians recorded in hieroglyphic form the care of the skin on temple wall paintings. History has given us the writings of Pliny (*Historia Naturalis*), Pedanius Dioscorides (*De Materia Medica*), Claudius Galenus or Galen (*De Simplicibus*), Abbess Hildergarde von Bingen (numerous works). Theophrastus Bombastus von Hohenheim or Paracelsus (*The Doctrine of Signatures*) and many others like Gerard, Culpeper, Turner, and Carolus Linnaeus. Through these great herbalists we see a pattern emerging of plants that perform certain functions. Today we look at the chemical composition of these herbal remedies to try and ascertain what it is chemically and pharmacologically that might be responsible for these effects.

The next step has been to look at other cultural remedies and to dissect the ethnopharmacy of countries around the world and to use our knowledge to assign chemicals that might be responsible for the skin benefits. Many new active molecules have been discovered and there are many more to be discovered.

Anti-inflammatory and anti-erythema plants

A few examples will be given. The classic choice of herbalist may well be German Chamomile (*Matricaria recutita*) or Roman Chamomile (*Anthemis nobilis*) both from the family of Compositae or Daisy family. Surprisingly the plants share a similar spectrum of chemical components, though not in the same ratios, which helps to explain why many herbals talk of them synonymously (though technically they should not!). The essential oil of both plants contains α-bisabolol, azulene derivatives and their precursor matricin. The aqueous extracts contains a flavonoid called apigenin. All of these materials have anti-inflammatory and anti-erythema qualities, some may also add the term antiphlogistic (literally to take the heat away from the affected area). There is also good evidence to show that these materials are anti-pruritic and so reduce itching and improve the speed at which damaged skin heals.

One of the discoveries from the Far East would include Gotu kola or *Centella asiatica* which has at its heart a complex molecule called asiaticoside that in addition to its anti-inflammatory properties also improves wound healing and reduces oedema or swelling.

Another plant from the region, mainly China, is the Maidenhair Tree or *Ginkgo biloba* that has another complex molecule called Ginkgolide. This plant is also excellent for reducing oedema and also has antioxidant or free radical scavenging properties.

From the European herbals we find Self-Heal or *Prunella vulgaris*, which is also anti-haemorrhagic, excellent for cracked nipples and a remarkable vulnerary. The chemistry is complex and it would be difficult to assign any individual chemical to a specific property. Surprisingly this small plant has been neglected by the herbalists in recent times and yet the molecules are spectacular. It has a full range of flavonoids, namely quercetin, kaempferol, and delphinidin to name a few. It also has esculin, an anti-oedema molecule found in *Aesculus hippocastanum* or horse chestnut. We see aucubin, which appears in a number of other herbal plants, but which has not been assigned any particular property, although it appears in so many beneficial plants that it would be hard to believe it is ineffective. It also contains hyperocide an active found in St. John's Wort or *Hypericum perforatum* and is probably in part responsible for the healing attributes of the plant.

Some plants are specifically for the care of the eye area and range from conditions like blepharitis and conjunctivitis. The favourite of many European Herbals is Cornflower or *Centaurea cyanus*, which amongst its portfolio of ingredients includes centaurine (a molecule identical to cnicine that is found in Blessed Thistle of *Cnicus benedictus*) and is likely responsible for the skin calming and soothing effects.

Another traditional plant is Eyebright, mentioned by Paracelsus in the "Doctrine of Signatures" because of the fine red lines on the corolla that were reminiscent of the fractured capillaries that can occur in the whites of the eye (especially after an

overdose of alcohol refreshment the night before!). Once again the molecule aucubin is present, but interestingly there is also ferulic acid (found in rice bran *Oryza sativa*) which has calming, UV absorbing and free-radical scavenging properties.

There is no doubt that the skin is very fond of sugars and there could be no better source than honey. These sugars can provide not only antibacterial skin protection, but also have been proven to have exceptional skin healing and repairing properties. The use of honey on burns has shown exceptional promise.

Skin dryness, desquamatory skin conditions and dry eczematous conditions

The binding of water in the stratum corneum can become compromised and ineffective. In the cases it is helpful to reduce the transepidermal water loss by applying occlusive films. There is no reason why one should not use mineral oil or petrolatum, however, the benefits of a natural vegetable oil may be preferred.

Castor oil (*Ricinus communis*) has been the choice of paediatricians for more than a century in nappy rash creams and topical preparation where a high degree of water repellency is required. The ricinoleic acid and its many derivatives give skin smoothing and moisturising qualities that are unsurpassed.

Vegetable oils provide a broad spectrum of fascinating fatty acids like oleic, linoleic, linolenic, arachidonic and erucic – to name but a few.

In addition these oils provide triglycerides, which have good compatibility with the natural sebum in the skin, probably none better is jojoba oil (*Buxus chinensis* or *Simmondsia chinensis*), which is a liquid wax.

Evening Primrose oil (*Oenothera biennis*) has a great deal of research to show that it is effective in cases of mastalgia and atopic dermatitis internally, but there is also indication that topically it can contribute to solution to these problems as γ-linolenic acid (GLA) is a crucial part of the prostaglandin synthesis responsible for the inflammatory conditions of the skin.

Other oils include Brazil nut oil or *Bertholettia excelsa,* Sunflower oil or *Helianthus annuus,* Babassu oil or *Orbignya oleifera,* Sesame oil or *Sesamum indicum* and Rosehip seed oil or *Rosa rubignosa*. This oil in particular has created great interest and there are numerous clinical studies on this oil from South America that demonstrate that it has cicatrising activity and solutions to hyperpigmentation. The debate on whether or not the oil contains a source of retinoic acid is still in progress, but it would certainly help to explain some of the excellent reported properties if a modern analysis could detect this molecule.

Oedema and swelling

There are many plants that can help to reduce oedema, but none better than horse chestnut or *Aesculus hippocastanum,* which contains escin or aescin. This plant is excellent for conditions like leg ulcers and varicose veins. The chemistry is complex and varied.

Oedema is a critical component of cellulitis and in Germany the plant of choice would be butcher's broom or *Rucus aculeatus*, which contains an active molecule called ruscogenin or hydroxyl diosgenin. This is a really fascinating molecule, since diosgenin was used as the precursor to may steroidal preparations such as hydrocortisone and corticosteroids. It was also the precursor to the female birth control pill. Diosgenin was originally extracted from the wild yam or *Dioscorea villosa*, but later from fenugreek (*Trigonella foenum-graecum*). The discussion on plant sterols is a worthy debate, especially for mature skins or menopausal skin types and the sterols from soya or *Glycine max* are becoming available.

In Europe we have our own plant solution to oedema and cellulite and this would be ivy or *Hedera helix*, which contains hederagenin. It has always been a great disappointment to the author that hederagenin and ruscogenin were not more similar chemically.

Finally, the use of witch hazel or *Hamamelis virginiana* from the North American herbals, should not be excluded from the discussion on oedema. This material, which is pharmaceutically licensed for the treatment of haemorrhoids, is also excellent for contusions, bruises and other swellings. The most likely chemical responsible for this effect is the hamamelitannin present, though the plant contains a wealth of other components.

Wound and skin protecting

The worst nightmare of any physician treating skin injuries or damage to the skin is the possibility of skin infection. This can turn even the simplest wound into a life-threatening scenario. Fortunately, there are a number of materials that can provide antibacterial and antifungal support.

The use of lichen as a medium to staunch the flow of blood from wounds has been a traditional remedy wherever the plant is found. The usnic acid present in the plant is a proven antifungal. Other plants (and there are too many to mention) contain materials like hesperidin and naringenin, the balsamic resins contain benzoic acid and benzyl alcohol, nature is rich in plants that contain paraben-like derivatives such as honeysuckle or *Lonicera japonica*. It is not too difficult to find a source of antifungal gallate in plants like Leadwort or *Plumbago zeylanica*, to find anisic acid in aniseed or *Pimpinella anisum* or other active antibacterials from essential oils and resins.

Skin hydrating and soothing

We briefly mentioned the role of sugars in the care of the skin, but this is only a part of the story. Nature has sugar derivatives and starches that also contribute to the repair and well-being of the skin. These mucopolysaccharides are frequently referred to as mucilage or mucilaginous gums. The plantains or *Plantago* spp are classic examples and contain this mucilage in high quantity (they also contain aucubin, which as was reported keeps turning up in skin-helpful plants). Other plants include the seed mucilage of quince or *Cydonia oblonga*, sea fringe plants like Iceland moss (*Cetraria islandica*), Irish moss (*Chondrus crispus*) and seaweeds like *Fucus vesiculosus, Ulva lactuca* and *Laminaria digitata*. The plant needs to be fresh, since you will not

reconstitute this mucilage very successfully from some dried up, scratchy, old and dessicated material left rotting in a warehouse.

Other fascinating materials include the reputable Aloe vera or *Aloe barbadensis*, which has been scientifically proven for all forms of burn, be it radiation, thermal or solar. It has also been demonstrated that it has a prophylactic effect if used before, during and after these skin damaging events. Clearly the plant is mainly used for its soothing and cooling effect, however, the plant is useless if used at less than 50% and it is recommended that it is used at 100% to be sure of any beneficial effect (it is after all 99.5% water!). The polysaccharides, mannose-6-phosphate and complex anthroquinones all contribute synergistically to the benefits of this material.

Conclusions

It is impossible to give a full treatise on the herbal use of medicinal plants in a single paper. However, it can be demonstrated that when used at a reasonable level, that plants can and do contribute to the care and repair of the skin. It can also be argued scientifically that the plant chemistry contributes significantly to their benefits and that we can make logical conclusions from this type of study.