Preparations of Aloe Vera have long been used to ease inflammatory processes originating from a wide variety of triggering causes. This leaflet sets out the nature of inflammation, how Aloe Vera works to influence it, and what clinical problems can be helped as a result.
Introduction

Both in Folk Medicine and also general home medicine in recent times, a very common use of Aloe vera has been as a healing balm for cuts, wounds, burns and abrasions - or anything which has involved penetration or breakage of the skin surface. For example, among home remedies, the slit leaf was strapped onto the affected part to expose the surface tissue of the patient to the inner gel of the leaf. Two separate actions of Aloe are involved here. One is the alleviation of the painful inflammation which accompanies injuries and the other is the healing of the injury. In this article it is the alleviation of the inflammation which will be reviewed. However, the power of Aloe to alleviate the effects of cuts, wounds, burns and abrasions does not restrict its anti-inflammatory powers just to those particular uses. A very great range of internal illnesses also involve inflammatory processes and we can expect Aloe to alleviate these also.

The Nature of Acute Inflammation

Inflammation is the body's first reaction to damage by whatever means, physical, bacterial, chemical, or damage of an internal sort known as "auto-immunity". Whatever its cause, inflammation is a complex physiological process with several components to it, all of them aimed at dealing with a possible invasion by foreign organisms or substances and preparing the way for healing afterwards. It is accompanied by four particularly obvious effects which everyone has experienced when they are hurt. These are redness, heat, swelling and pain, often referred to by the rather similar-sounding quartet of their names in Latin, i.e. they are respectively, rubor, calor, tumor and dolor. These effects are basically brought about by chemical messengers released from the damaged cells. The immediate action is that these bring about an increase in the diameter of the blood vessels traversing the area, thus increasing the blood supply. Pathologists prefer to use medical terms derived from Greek or Latin and hence the increased blood supply gets the name "hyperaemia". The redness and the heat largely come from the high blood supply, although heightened tissue activity probably adds to the generation of heat. The next stage is "exudation", in which there is an increased passage of protein-rich fluid through the blood vessel walls into the spaces between the cells. This naturally causes swelling of the tissues in and around the area of the damage, i.e. tumor. At the same time, the increase in the volume of fluid in the area dilutes any toxins and the lymph flow is increased, carrying toxins away from the area. The extra proteins which have been brought to the area include immune antibodies and also fibrin - the main protein of clots - which will tend to precipitate out of solution and solidify in the area and form a barrier to bacterial spread. The next stage is that certain types of white blood cells - which are cells of the immune system - migrate out from the smaller blood vessels passing through the area into the tissue spaces between the cells, where they will now be ready to attack bacteria and mop up damaged cells and debris. For this to happen, these white blood cells migrate through the tissue spaces towards the exact site of damage or infection. They do this in response to further chemical messenger substances called "complement", "leukotrienes", "lymphokines" and certain other substances released from bacteria. These are in highest concentration at the site of damage and the cells migrate towards the highest concentrations.

On arrival at the scene some important types of white blood cells begin to engulf the bacteria, debris and effete cells by a process called "phagocytosis". This process was described in Issue I as one in which the white cells surround the offending item and draw it into their own cell substance. Thereafter they digest and oxidize it with powerful chemicals, like nitric oxide and hydrogen peroxide, so as to effectively destroy it. In this way, one's white cells mount a very potent chemical attack - it is almost like a chemical "incinerator" to get rid of rubbish including cells and pieces of cells which have been killed by toxins. However, these potent chemicals can also become detrimental to the body, if they "escape" from the white cells and attack previously healthy tissue cells.

Bacteria resist this attack by varying degrees. When they are successful, the white cell itself dies, releasing live bacteria which can infect other cells and tissues. The ability of the white cells to carry out this work and to overcome the bacteria appears to depend upon their vitality and activity levels, much of which may depend upon nutrition, dietary stimulants and a relative lack of long term toxins in the body as a whole.

In addition to chemical messenger substances mentioned above, histamine, serotonin, kallikrein and bradykinin are other chemical messengers involved in orchestrating the processes of inflammation. All the above processes that have been described are characteristic of "acute inflammation", which is a sudden strong reaction to damage which takes effect quite suddenly. It is followed by another slower sequence of processes known as "resolution" by which the area of tissue...
is gradually returned to normal. Where there is rather more difficulty in overcoming an infection, suppuration may occur, i.e. the formation of pus within an abscess. This may be accompanied by more extensive tissue damage locally, which demands more in the way of rebuilding and repair.

The anti-inflammatory action of Aloe in acute inflammation is one of the best-known actions. It is clearly responsible for all the early benefits from applying Aloe Gel or Whole Leaf Extract, or various preparations and ointments and creams of Aloe to wounds, cuts and abrasions of all kinds. It must also be responsible for the early benefits in sports injuries, frost-bite, burns and radiation burns, in the tissue-damage applications associated with dentistry and otolaryngology, as well as its earliest effects upon arthritis and upon infections. Many kinds of beneficial action which Aloe has been noted to have upon other conditions which are primarily inflammatory in nature, would also be examples of this same basis of action, including insect bites and stings of all kinds and also jelly-fish stings. Much skin disease also is associated with a lot of inflammation, and clearly benefits from the same action. It is certainly reasonable to list the anti-inflammatory action as being one of the fundamental beneficial actions of Aloe - and as one of those actions which has favourable knock-on consequences.

Quite a significant number of papers have been published which clearly report that Aloe vera, or other Aloe, has a notable anti-inflammatory effect in acute inflammation. For example, “Tissue response to Aloe vera gel following periodontal surgery”, by Payne in 1970, “Topical anti-inflammatory activity of Aloe vera as measured by ear swelling,” by Davis, Leitner & Russo, 1987, “Processed Aloe vera Administered Topically Inhibits Inflammation”, by Davis, Roenthal, Cesario & Rouw, (1989) and “Aloe vera and the inflamed synovial pouch model.” by Davis, Stewart & Bregman, 1992. However, there are by now been so many publications confirming anti-inflammatory activity that the existence of such activity is in no doubt whatever. The discussion which continues is about the mechanism of the anti-inflammatory effect and which chemical components of Aloe vera are involved in this.

How Exactly does Aloe vera Reduce Inflammation?

Steroids

Aloe vera contains plant steroids and it is well known that steroids exert an anti-inflammatory effect and are widely used for this in orthodox medicine in the form of steroid drugs. One theory was that the natural plant steroids which Aloe vera contains were capable of acting rather like steroid drugs. This has been investigated by Dr R.H. Davis and his team of Pennsylvania. Several of their papers have enquired into the mechanism of anti-inflammatory effect. Of special importance is “Aloe Vera, Hydrocortisone, and Sterol Influence on Wound Tensile Strength and Anti-Inflammation,” Davis, Didonato, Johnson, & Stewart, (1994). This paper highlights the fact that steroids exert their well-known anti-inflammatory effect at the expense of partially inhibiting the wound-healing powers of the tissues. Moreover, Aloe contains other anti-inflammatory ingredients as well, not just the steroids, so the actual contribution made by steroids to Aloe’s anti-inflammatory action could be quite small, but this has not yet been clearly quantified. The fact that Aloe vera at one and the same time both alleviates inflammation and also promotes healing is due to the fact that Aloe vera also contains...
very powerful promoters of healing, far stronger and more effective than the inhibitory effect of the steroids. The principal steroids of Aloe vera are called Lupeol, β-Sitosterol and Campesterol.

**Bradykininase**

Again, these same authors also say that Aloe has the enzyme activity called bradykininase. Bradykinin is a peptide substance which causes increased vascular permeability to stimulate inflammation. Bradykininase breaks down bradykinin, reducing inflammation. Aloe possesses bradykininase activity and also decreases inflammation in this way. Other papers confirm the presence of bradykininase enzyme in Aloe. These are “Bradykininase activity in Aloe extract” by Fujita, Terada & Nagatsu, 1976, “Anti-Bradykinin Active Material in Aloe saponaria” by Yagi, A., Harada, N., Iwadare, S & Nishio, K., 1982 and “Bradykinin-Degrading Glycoprotein in Aloe arborescens var. natalensis” by Yagi, A., Harada, N., Shimomura, K. & Nishio, K., 1986.

**Salicylic Acid and Salicylates**

Another theory about anti-inflammatory action was that the aromatic acid salicylic acid, and its salts, the salicylates, make an important contribution. Salicylic acid is closely related to aspirin, which does reduce inflammation by inhibiting the production of some hormones called “prostaglandins”. Whilst this is entirely possible, it has yet to be shown whether Aloe contains salicylates in the appropriate concentrations to have such a significant effect, and whether the salicylates in Aloe are any higher than their concentrations in numerous other plants which also contain them. Cherries, currants, dates, prunes and raspberries are among the common foods which contain quite high levels of salicylates. Most users of Aloe products would be inclined to assert very strongly, surely, that the benefits they enjoy from Aloe are far more, and are different from, the mere taking of an aspirin or the eating of prunes.

**Anti-Histamine Effect**

*It has also been suggested in literature that Aloe vera exerts an effect inhibiting the production of histamine - one of the important chemical messengers in inflammation. In one paper the magnesium content of Aloe was ascribed to this role, though this seems unlikely because of the low delivery of magnesium in Aloe compared to other sources.*

**The Nature of Chronic Inflammation**

Where the cause of the inflammation is continuously applied, a type of inflammation known as “chronic inflammation” is set up. This may come about by repeated environmental exposure to an irritant, by a foreign body within the tissue, by bacteria which resist removal, by internal toxins which the body lacks the enzymes or the vitality to remove (or which enter continuously while also being removed), or by a disordered immune system attacking the body’s own tissues (auto-immunity). The tissue changes in chronic inflammation consist of (1) changes in the relative numbers of the different types of white cell population in the inflamed area (2) formation of new blood capillaries in the inflamed area (3) proliferation of connective tissue cells of a type which produce protein fibres (fibroblasts) and (4) the laying down of fibrous connective tissue in amongst the functional tissue, or in place of it - in a process referred to as “fibrosis”.

![Figure 3: Tissue Appearance in Chronic Inflammation](image)

This is akin to the laying down of scar tissue in a successfully healed wound, but in the case of chronic inflammation it is clear that this “scarring” or fibrosis can go on while in other areas very close by, the processes of rather more active damage and inflammation continue - though at a much slower rate than in acute inflammation. The overall effect of persistant chronic inflammation, is that tissue damage occurs in the area, which may be slight at first but which becomes more extensive with time. The oxidizing chemicals escaping from phagocytosing white cells are an important cause of such damage to surrounding tissues, while the fibrosis occurring in the area results in new structural tissue which is tough, but otherwise non-functional, and whose lay-out and structure do not correspond to the original structure of that area of the body. Obviously, therefore, structural and physiological misfunction, and the consequences of misfunction, then appear. Worse still, much of the damage which
occurs in the more advanced stages of this process is irreversible.

When one analyses the meaning and implications of chronic inflammation from a naturopathic standpoint the results are interesting and very important. The present author has written an account of this elsewhere. Inflammation is really an inherently acute process. Naturopathically when the term "acute" is used to describe a process, this means that it is accompanied by heightened tissue activity and high vitality. From the standpoint of toxic status, it is a process which is likely to include the shedding of some toxins through these high tissue activities. However, "chronic inflammation", which may appear to be a contradiction in terms, is what happens when the active acute processes run up against the obstacle of entrenched and obstinate chronicity. As we have seen, this may, for example, consist of a toxic burden which the tissue activities fail to remove. Chronic inflammation, seen in this light, therefore, is the battleground where acute processes run into the chronic and get ground down by chronic processes, or a chronic condition too entrenched to shift. What then ensues is a war of attrition between the chronic and acute states which, over a long period of time, fails to resolve. Seen in more mechanistic terms, it is a war of attrition between the body's immune defence system and the causes of disease states, in which neither can fully overcome the other. Within the naturopathic diagnostic art of iridology, a chronically inflamed area of the body appears white, denoting inflammation, but nowhere near as white as does acute inflammation, indicating that the vital energies which fire up the inflammatory processes are being progressively exhausted. Moreover, the whiteness of the chronically inflamed area is typically tinged with yellow or yellow-brown pigment, a feature which indicates that heavy intoxication is present and is opposing the vital and "live" forces of the body which are attempting to remove them. Chronic inflammation therefore represents the enigma of a process (inflammation) which is inherently active and live - in terms of the vital energies - and whose very nature is to get things over and done with - faced with the impossibility of accomplishing the task which it set out to do. Here, indeed, we have vital energy which has become bogged down by throwing itself against an unmovable wall of toxicity. The present author has called this, again in naturopathic terms, the "chronically acute" state - an expression which does, indeed, sound like a contradiction in terms, but which expresses the true condition of stalemate described above.

The fact is that chronic inflammation lies at the root of a great many pathological processes and is associated with a considerable number of named chronic illnesses. Therefore, it is a very fundamental process of tissue damage within the science of pathology, which needs to be understood and countered by Practitioners. It means that a very wide range of chronic illnesses can be alleviated or cured by a non-toxic, non-suppressive medicine which can overcome chronic inflammation. That is to say, that by exerting one medical effect, that one medicine can have enormous ramifications and implications across the broad spectrum of chronic illness. That does not go so far as to make it a panacea - and yet one can understand people using that term because of the sheer breadth of the medical consequences involved. That medicine is Aloe vera. It is not the only natural medicine which can relieve inflammation - but it may well be the best - because of the way it combines powerful anti-inflammatory properties with healing and immuno-stimulant benefits.

Complaints which may benefit from Aloe by relief of Chronic Inflammation

This is a relatively little researched area and the tendency has been to investigate the performance of Aloe against named illnesses without seeking to ascribe the positive results to the exact mechanism of Aloe's actions. It can be observed, however, that the following conditions, which have been demonstrated to benefit from Aloe, do involve chronic inflammation, i.e. peptic ulcer, leg ulcers, arthritis, Type II diabetes. These conditions most probably do benefit from relief of the chronic inflammation component which is part of them. Other illnesses with a chronic inflammation component are longer term inflammatory digestive system complaints e.g. intestinal, such as Crohn's disease, Type I diabetes, psoriasis, eczema, bursitis, tendinitis, lupus erythematosus, gout, complications of diabetes, myositis (prolonged muscle inflammations), hyperthyroidism and multiple sclerosis. Some of these illnesses are the subject of anecdotal reports about the efficacy of Aloe but they do not appear to have been investigated with regard to their response to Aloe. Nonetheless, Inherently, because of their chronic inflammation component, one might well expect them to respond. In fact, chronic inflammation is such a fundamental process occurring in pathology, that a high proportion of all the chronic illnesses known to medicine will have such a component, and therefore might well be expected to respond in respect of their chronic inflammation component.
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References on Use of Aloe as an Anti-Inflammatory

**TITLE OR SUBJECT**

“TISSUE RESPONSE TO ALOE VERA GEL FOLLOWING PERIODONTAL SURGERY”

“BRADYKINASE ACTIVITY IN ALOE EXTRACT”

“ANTI-PROSTAGLANDINS & ANTI-THROMBOXANES FOR TREATMENT OF FROSTbite”

“ANTI-BRADYKININ ACTIVE MATERIAL IN ALOE SAPONARIA”

“INHIBITION OF ARACHIDONIC ACID OXIDATION IN VITRO BY VEHICLE COMPONENTS”

“PROSTAGLANDINS AND THROMBOXANES”

“BRADYKININ-DEGRADING GLYCOPROTEIN IN ALOE ARBORESCENS VAR. NATALENSIS”

“TOPICAL ANTI-INFLAMMATORY ACTIVITY OF ALOE VERA AS MEASURED BY EAR SWELLING.”

“EXPERIMENTAL AND CLINICAL OBSERVATIONS ON FROSTbite.”

“PROCESSED ALOE VERA ADMINISTERED TOPICALLY HIBITS INFLAMMATION”

“AN ANTI-COMPLEMENTARY POLYSACCHARIDE WITH IMMUNOLOGICAL ADJUVANT ACTIVITY FROM THE LEAF PARENCHYMA GEL OF ALOE VERA.”

“ANTI-INFLAMMATORY ACTIVITY OF ALOE VERA AGAINST A SPECTRUM OF IRRITANTS.”

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“IDENTIFICATION OF SOME PROSTANOIDs IN ALOE VERA EXTRACTS”

“ALOE VERA AS A BIOLOGICALLY ACTIVE VEHICLE FOR HYDRO-CORTISONE ACETATE.”

“ALOE VERA AS A BIOLOGICALLY ACTIVE VEHICLE FOR HYDROCORTISONE ACETATE.”

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