INTERNAL USES OF *ALOE VERA*

Submitted By:

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Historical evidence encompassing more than 4,000 years testifies to the high regard of ancient peoples to the benefits of *Aloe vera*. *Aloe vera*, also known as *Aloe barbadensis*, is a succulent of the Liliaceae Family, which is particularly well adapted to growth in arid and semi-arid regions. Among the Family are the commonly known foods - asparagus, garlic, onion, turnip, etc.

The leaves of a mature three to four year old plant may be 30 inches or more in length, with a 5 inch wide base, 1½ inches in thickness, and tapering to a fine point. This species has thorns projecting from the lateral leaf margins.

The leaf is comprised of three mechanically separable fractions: (1) the thick outer rind consisting of 15 to 18 layers of cells reinforced at its outer limit by strong xylans covered with a substantial layer of wax; (2) an internal gel consisting of hexagonal cellulose structures which enclose polysaccharides, glycoproteins, and other constituents in aqueous solution; the cellulosic structure creates a gel fillet which possesses structural integrity; the gel serves as a water/nutrient storage organ for the plant; (3) a thin, slimy, unstructured mucilage layer deployed between the thick outer rind and the internal gel; projecting into this layer from the rind are the vascular bundles comprised of xylem (water transport), phloem (nutrient transport), and pericyclic cells (containing the laxative anthraquinones which serve an ultraviolet absorptive function in the plant) all surrounded by a layer of encompassing sheath cells.

From the 16th through the early 19th centuries the yellow sap in the pericyclic cells was commercially collected, heated, the liquid evaporated, and the material sold world-wide as a potent cathartic agent. Today, aloin,

the major anthraquinone laxative, has been replaced by laxative agents having less violent cathartic actions.

In the 1930's interest in the internal gel was enhanced when the material was found to be remarkably effective in treating radiation-induced dermatitis. Since that time a number of external and internal uses for the internal gel of aloe have been reported in the literature, some of which are truly remarkable. Owing to increasing anecdotal reports purporting to corroborate beneficial effects of drinking the ground, preserved, internal gel of aloe, a number of scientific investigations have been undertaken to evaluate the validity of the anecdotal reports.

As the internal gel is 99+% water, the notion comes to mind that the 1% or so of solids, being divided amongst 200 different constituents, is not sufficient an amount of any one constituent to do anything at all on a rational basis. Thus, if there is a subjective benefit, it must be entirely psychological. Thus, one must rely on scientifically sound investigations to give any credence to the validity of the anecdotal reports.

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A few of the scientifically documented beneficial uses of drinking aloe beverages will be delineated in contradistinction to untold numbers of anecdotal reports which represent subjective impressions or appraisals.

Gastrointestinal Disorders

For over 300 years the curanderos and curanderas in the Rio Grande Valley of Texas and the northern states of Mexico have recommended internal aloe gel for "las enferemedades del estomago y los intestinos, pero especialmente para las ulceras." (the diseases of the stomach and

intestines, but especially for ulcers). As a result of these anecdotal reports, scientific investigations have been undertaken in animal models (laboratory rats) which have shown that if aloe gel is administered prior to the ulcer-inducing stress (immobilization), there is an 80% decrease in the number of ulcers formed compared with the control animals given saline instead of the aloe gel. Similarly, if the aloe gel was given after the ulcers were formed, healing was three times as fast compared to the healing in the control animals. (Galal et al, 1975)

In a second laboratory investigation, aloe gel pretreatment was 85% effective in preventing stomach lesions, and 50% better than the controls in healing the gastric ulcerations. (Kandil and Gobran, 1979)

Additional studies showed that a common group of plant constituents, the triterpenes, including lupeol, possess ulcero-protective activity against the formation of gastric ulcerations in albino rats induced by immobilization restraint. (Gupta et al, 1981) Other investigations have shown that aloe gel preparations contain lupeol as well as other triterpenoids. (Suga and Hirata, 1983)

Aloe gel mixed with heavy liquid petrolatum (2:1) was given to 12 patients, 7 males and 5 females, ages 24 to 84 years, with definitive x-ray evidence of duodenal ulcers. All 12 patients showed complete recovery with no recurrence for at least a year after ulcer healing. This study suffers, however, from the fact that (1) duodenal ulcers are often self-healing without any treatment, and (2) there was no control group of patients treated in a similar manner without the administration of aloe. Nonetheless, the physicians who conducted the study represent trained, clinically-experienced observers, and thus even these uncontrolled observations have some scientific merit. (Blitz et al, 1963)

Atherosclerosis and Coronary Heart Disease

Coronary heart disease associated with the accumulation of blood fats (lipids) in the lining of the arteries is still one of the major causes of death in the Western world. Several studies in animal models as well as in human subjects have suggested that the ingestion of aloe gel may have a beneficial effect by lowering serum cholesterol, serum triglycerides, and serum phospholipids, which, when elevated, seem to accelerate the deposition of fatty materials in the large and medium-sized arteries, including the coronary arteries of the heart.

In one study albino laboratory rats were fed high cholesterol diets with the experimental group fed the polysaccharide (glucomannan) from aloe. Compared with the control animals, the group fed the aloe fraction showed:

a. Decreased total cholesterol levels
b. Decreased triglyceride levels
c. Decreased phospholipid levels
d. Decreased nonesterified fatty acid levels
e. Increased HDL cholesterol (the "good" cholesterol) levels
f. Markedly increased HDL/Total Cholesterol ratios

The evidence suggests that the ingestion of aloe gel may have a salubrious effect on fat (lipid) metabolism, which, if active in human subjects, would tend to decrease the risk of coronary artery disease in people. (Joshi and Dixit, 1986)

Monkeys given Triton, which causes marked increases in blood lipids, were divided into two groups. The first group was given aloe, while the second group received the drug, clofibrate, which is used clinically to lower serum cholesterol and triglyceride levels. The following data show the reduction in the various parameters compared with the control animals.

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Aloe-Treated Monkeys	PARAMETER	Clofibrate-Treated Monkeys
61.7%	Total Cholesterol	47.6%
37.8%	Triglycerides	50.0%
51.2%	Phospholipids	41.7%
45.5%	Non-esterified Fatty Acids	23.9%

There was a marked in the beneficial HDL/Total Cholesterol ratios. (Dixit and Joshi, 1983)

A third investigation was performed studying 5,000 patients who were fed the husks of a local Indian plant, *isabgal*, which provided fiber, and aloe gel as a beverage. There were some remarkable effects in three important areas:

1. Lipid Metabolism
   a. Decreased total cholesterol
   b. Decreased triglycerides
   c. Increased HDL cholesterol
2. Carbohydrate Metabolism
   a. Decreased fasting blood sugar levels in diabetic patients
   b. Decreased post-prandial (after a meal) elevation in blood sugar levels in diabetic patients
3. Angina pectoris (chest pain from insufficient delivery of oxygen to the heart)
   a. Decreased frequency of anginal attacks

These data in the human study suggest that the benefit from the regimen, at least in part attributable to the ingested aloe beverage, may have salubrious effects on several systems in the body. (Agarwal, 1985)

Anti-Cancer Actions

One of the common experimental cancer models is sarcoma-180. When aloe was administered to mice bearing S-180 tumors, the tumor growth was

inhibited. (Soeda, 1969; Suzuki, 1979)

Similarly, Alexin B, a specific molecule species derived from aloe, was shown to possess anti-cancer activity against lymphocytic leukemia. (Suzuki, 1979a) Additional investigations revealed that another molecular species derived from aloe, Aloctin-A, had anti-tumor activity, but the action was to bolster the immune system rather than a direct anti-tumor activity. (Imanishi et al, 1981)

Immunity

There are several mechanisms which contribute to the immunological protection enjoyed by normal persons. Among these mechanisms the ingestion of bacteria and other potentially harmful agents by certain white blood cells (a process termed phagocytosis) and the formation of antibodies (formed by another group of white cells, the beta-lymphocytes) are probably the most important. Scientific evidence suggests that aloe gel contain substances which are active both in stimulating phagocytosis as well as stimulating the formation of antibodies.

In one study the aloe fractions were shown to increase phagocytosis when injected into guinea pigs. (Stepanova et al, 1977) In another study mice were injected intraperitoneally with *Escherichia coli*, which caused a serious infection to develop in the abdominal cavity, namely, peritonitis. Injects of materials from two species of aloe (*Aloe barteri* and *Aloe ferox*) both stimulated phagocytic activity in the animals. (Delaveau et al, 1980) It was demonstrated that phagocytic activity was depressed in adult patients with bronchial asthma. A mixture of amino acids derived from aloe enhanced the depressed phagocytic function of the white blood cells in these asthma patients. (Yagi et al, 1987) In an additional study when certain materials

(lectins) purified from aloe were added to human lymphocytes raised in tissue cultures, the human white cells were stimulated to produce antibodies. (Suzuki et al, 1979)

Perhaps the most remarkable studies concern the effect of aloe fractions on the status of patients with HIV which causes AIDS. The polysaccharide fraction of aloe was shown to exhibit antiviral activity and enhance immune cell function. The polysaccharide was given orally, 250 milligrams four times a day, to 8 patients with ARC (AIDS Related Complex), with Walter Reed staging from 3 to 6. Eight of eight patients showed improvement within 90 days of therapy with an average reduction of 2 Walter Reed stages. Fever and night sweats were eliminated in all patients; diarrhea was alleviated in two of three patients, and opportunistic infections (which are usually responsible for the death of the AIDS patient) were controlled or eliminated in six of eight patients. Two patients, unemployable because of the intensity of their symptoms, returned to full employment. Three of three patients showed a decline in HIV core antigen (P-24). Initially positive HIV cultures became negative in three patients. Clinical toxicity and side-effects were entirely absent. Acute toxicity studies in animals showed no toxicity whatever at dosages 100 times those used in the pilot human experiments. (McDaniel and McAnalley, 1988) These experiments, however, were uncontrolled, and additional studies, utilizing appropriate scientific study design would need to be done before the data would be acceptable to the scientific community.

In plasma there are four interacting systems which serve vital protective functions. These include the following:

(1) Intrinsic coagulation (blood clotting)

(2) Plasminogen (prevention and dissolving of intravascular clots)

(3) Kinninogen (inflammation)

(4) Complement (destruction of intravascular bacteria)

The latter system, the complement system, consists of a series of proteins which require activation. When activated these proteins interact sequentially - a cascade phenomenon - and form circular, doughnut-shaped proteins, which are inserted into the surface membranes of bacteria, literally causing "holes" which permit the interior of the bacterium to become exposed to the environment, causing the death of the organism. Normally this complement system is stimulated by the presence of polysaccharides on the surface of the invading organism. Studies have shown that the polysaccharides (glucomannans) of aloe can perform this function. (t'Hart et al, 1988; t'Hart et al, 1989)

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There are several additional beneficial actions of ingested aloe presented in the literature. True, many of the anecdotal reports have been studied in animal models, giving credence to the anecdotal information. Other reported benefits in human subjects have yet to be documented by scientific investigations. A number of studies are currently underway in various laboratories across the country and in other countries as well.

Three salient points are of vital significance in providing credibility to scientific studies: (1) How are the polysaccharides handled in the digestive tract?; (2) As the juice is so "dilute" is there really sufficient material absorbed to account for the reported benefits?; (3) What amount of juice would be required orally, on the average, to provide a beneficial effect?

The answers are:

* The polysaccharides are not digested by the enzyme systems in the human digestive tract; these mannose-containing molecules

are absorbed by endocytosis, i.e., they are taken up into the cell intact.

* Apparently, from the animal experiments, very small amounts of aloe constituents are required to produce a beneficial effect.
* In human subjects, beneficial actions are readily apparent with the ingestion of 2 ounces twice daily.

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