

Investigation impacts of Aloe Vera medicinal products on cancer patients

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Abstract: The plant *Aloe vera* is used in Ayurvedic, Homoeopathic and Allopathic streams of medicine, and not only tribal community but also most of the people for food and medicine. Aloe Vera has been widely reported for its numerous medicinal effects but little is known of its effects on the reproductive organs. When Aloe was administered to mice bearing S-180 tumors, the tumor growth was inhibited. Aloe Vera is a dietary supplement and not a regulated drug. There is no guarantee of strength, purity, or safety of these products. Aloe Vera is approved by the Food and Drug Administration as a food additive for flavor.

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1. Introduction

Aloe Vera extract was prepared from *Aloe Vera* leaf gel with slight modifications of the procedure by Grieve (2013). Mature, healthy and fresh leaves of *Aloe Vera* having a length of approximately 25 to 50 cm were washed with fresh water. The leaves were cut transversely into pieces. The thick epidermis was selectively removed. The solid gel in the center of the leaf was homogenized. The crude extracts were prepared freshly each time and administered orally. The dosing schedule used was once daily.

Studies on *Aloe Vera* have largely upheld the therapeutic claims of anti-diabetic, anti-cancer and anti-biotic properties of this plant extract (Hu *et al.*, 2003; Kosif *et al.*, 2013). A study by Atherton (1998), showed that topically and orally administered *Aloe Vera* preparations to patients with chronic venous leg ulcers aid healing. It has also been reported that many diabetic subjects take the *Aloe Vera* gel because of its hypoglycaemic properties (Okyar *et al.*, 2011). However, it does not only possess hypoglycaemic properties but also has hypotensive, hepatoprotective and blood purifying properties (Tiwari, 2012). The antihypertensive effect of chemical constituents from *Aloe Vera* was also reported to cause 26 %, 52 % and 79 % reduction in mean arterial blood pressure at corresponding doses of 0.5, 1.0 and 3.0 mg/kg *Aloe Vera* in rats (Saleem *et al.*, 2011).

In Nigeria, the Yoruba's call the *Aloe Vera* plant "Ahon- Erin". It is one of the best medicinal plants used in ancient times. It was seen as a "magic plant" because it had a potential cure for all incurable disease (Olowokudejo *et al.*, 2008).

Aloe vera seems to ameliorate the body's physiology. However, Atherton (2008) cautions against generalisation of complimentary treatment with *Aloe Vera*. It has been shown to be harmful

during pregnancy due to the purgative effect of its constituent glycoide (Lullmann *et al.*, 2015).

Aloe (often called *aloe vera*) produces two substances, gel and latex, which are used for medicines. *Aloe* gel is the clear, jelly-like substance found in the inner part of the *aloe* plant leaf. *Aloe* latex comes from just under the plant's skin and is yellow in color. Some *aloe* products are made from the whole crushed leaf, so they contain both gel and latex. The *aloe* that is mentioned in the Bible is an unrelated fragrant wood used as incense.

Aloe medications can be taken by mouth or applied to the skin. *Aloe* gel is taken by mouth for osteoarthritis, bowel diseases including ulcerative colitis, fever, itching and inflammation, and as a general tonic. It is also used for stomach ulcers, diabetes, asthma, and for treating some side effects of radiation treatment.

But most people use *aloe* gel topically, as a remedy for skin conditions including burns, sunburn, frostbite, psoriasis, and cold sores. Some people also use *aloe* gel to help surgical wounds and bedsores heal faster. There is some science supporting these uses. Some chemicals in *aloe* gel seem to be able to increase circulation in the tiny blood vessels in the skin, as well as kill bacteria. Together, these effects suggest that *aloe* gel might be effective in speeding wound healing. But it's too early to come to that conclusion. Evidence is contradictory. One study suggests that *aloe* gel may actually delay wound healing.

Some people take *aloe* latex by mouth, usually for constipation. Less often, *aloe* latex is used orally for epilepsy, asthma, colds, bleeding, absence of menstrual periods, colitis, depression, diabetes, multiple sclerosis, hemorrhoids, varicose veins, bursitis, osteoarthritis, and glaucoma and other vision problems.

But taking aloe latex by mouth is likely unsafe, especially at high doses. There is some concern that some of the chemicals found in aloe latex might cause cancer. Additionally, aloe latex is hard on the kidneys and could lead to serious kidney disease and even death.

A number of years ago, the FDA became concerned about the safety of aloe latex, which was an ingredient in many laxatives. The FDA's concern was heightened by the fact that people develop a kind of "tolerance" to aloe latex. They have to take more and more of it to get a laxative effect. That means they are likely to increase their dose -- and their risk. The FDA requested safety data from the makers of laxatives that contained aloe latex, but they didn't comply, possibly because of the expense involved in doing safety studies. In the absence of safety data, the FDA required manufacturers to remove or reformulate all over-the-counter (OTC) laxative products in the U.S. market that contained aloe. The deadline for compliance was November 5, 2002.

How does it work?

The useful parts of aloe are the gel and latex. The gel is obtained from the cells in the center of the leaf; and the latex is obtained from the cells just beneath the leaf skin.

Aloe gel might cause changes in the skin that might help diseases like psoriasis.

Aloe seems to be able to speed wound healing by improving blood circulation through the area and preventing cell death around a wound.

It also appears that aloe gel has properties that are harmful to certain types of bacteria and fungi.

Aloe latex contains chemicals that work as a laxative.

Studies have found that there are 75 ingredients contained in the Aloe leaf. These ingredients have a variety of medical benefits. They are divided into the following categories:

- **Ligin** – This cellulose substance is found in the gel has no known medical properties except it possesses the property of penetrating the human skin.

- **Saponins** – These form soapy lathers when mixed and agitated with water. They have been used in detergents, foaming agents and contain antiseptic properties.

- **Anthraquinones** – There are 12 of these contained in the sap of Aloe Vera: Aloin, Isobarbaloin, Anthracene, Emodin, Ester of Cinnamonic acid, Chrysophanic acid, Barbaloin, Anthranol, Aloetic acid, Aloe Emodin, Ethereal oil and Resistannol. These act as natural laxatives, painkillers and analgesics, and they contain powerful antibacterial, antifungal and virucidal properties.

- **Minerals** – Aloe Vera contains the following minerals:

- Calcium (essential for proper bone and teeth density)

- Manganese (a component of enzymes necessary for the activation of other enzymes)

- Sodium (ensures that the body fluids do not become too acidic or too alkaline)

- Copper (enables iron to work as oxygen carriers in the red blood cells)

- Magnesium (used by nerves and muscle membranes to help conduct electrical impulses)

- Potassium (regulates the acidic or alkaline levels of body fluid)

- Zinc (contributes to the metabolism of proteins, carbohydrates and fats)

- Chromium (necessary for the proper function of insulin, which in turn controls the sugar levels in the blood)

- Iron (controls the transportation of oxygen around the body via the red blood cells)

- **Vitamins** – Aloe Vera contains numerous vitamins:

- Vitamins A, C, & E (crucial antioxidants that combat dangerous free radicals in the body)

- Vitamin B & Choline (concerned with the production of energy, amino acid metabolism and developing muscle mass)

- Vitamin B12 (responsible for the production of red blood cells)

- Folic acid (helps develop new blood cells)

- **Amino Acids** – Amino Acids are the building blocks of protein, which manufacture and repair muscle tissue. The human body requires 22 amino acids and needs 8 essential ones. Aloe Vera provides 20 of 22 required amino acids and 7 of 8 essential ones.

- **Enzymes** – Some of the most important enzymes in Aloe Vera are: Peroxidase, Aliiase, Catalase, Lipase, Cellulase, Carboxypeptidase, Amylase and Alkaline Phosphatase. Enzymes help to break down food and assist in digestion. Some enzymes help break down fats while others break down starches and sugars.

- **Sugars** – Aloe Vera contains both monosaccharides, such as glucose and fructose, and polysaccharides.

Polysaccharides are the most important types of sugars. They aid in proper digestion, maintain cholesterol levels, improve liver functions and promote the strengthening of bones.

- **Sterols** – Sterols are important anti-inflammatory agents. The ones found in Aloe Vera are: Cholesterol,

Sitosterol, Campesterol and Lupeol. These sterols contain antiseptic and analgesic properties. They also have pain killing properties similar to aspirin. As Aloe Vera is comprised of approximately

99% water, all of these chemicals are contained in the remaining 1% of the plant. Although this may seem like a small percentage to contain so many ingredients, its helpfulness has been proven to be significant. Dr. Atherton claims that this is due to synergistic actions. He writes, "Synergism is defined as, 'the working together of two or more drugs, muscles, etc., to produce an effect greater than the sum of their individual effects.'"

Aloe Vera has the ability to provide essential nutrients, kill bacteria, viruses, fungi, yeasts and reduce inflammation. Dr. Atherton claims, "Tissues that die and are renewed rapidly such as the lining of the gut, which renews itself about every four days, and the skin every 21 to 28 days or so, need a rich and ready supply of building materials to produce and

maintain healthy, efficient cells." A proper diet supplemented with Aloe Vera is an effective way to get these essential nutrients. Aloe Vera can also reduce inflammation to injured tissue. Inflammation occurs when healthy tissue is injured and blood begins to clot around the tissue to repair the injured tissue. Aloe Vera is a natural anti-inflammatory that is much more delicate on the human body. The benefits of Aloe Vera have long been tested throughout history. It is only in recent years that studies have scientifically proven many of the medicinal benefits of Aloe Vera.

Perhaps the longer that scientist and botanists study the benefits of Aloe Vera, the more improvements it will create to human health and well-being.

Table 1. Chemical composition and properties of *Aloe vera*

Constituents	Number and identification	Properties and activity
Amino acids	Provides 20 of the 22 required amino acids and 7 of the 8 essential ones	Basic building blocks of proteins in the body and muscle tissues
Anthraquinones	Provides Aloe emodin, Aloetic acid, alovin, anthracine	Analgesic, antibacterial
Enzymes	Anthranol, barbaloin, chrysophanic acid, smodin, ethereal oil, ester of cinnamonic acid, isobarbaloin, resistannol	Antifungal and antiviral activity but toxic at high concentrations
Hormones	Auxins and gibberellins	Wound healing and anti-inflammatory
Minerals	Calcium, chromium, copper, iron, manganese, potassium, sodium and zinc	Essential for good health
Salicyclic acid	Aspirin like compounds	Analgesic
Saponins	Glycosides	Cleansing and antiseptic
Steroids	Cholesterol, campesterol, lupeol, sistosterol	Anti-inflammatory agents, lupeol has Antiseptic and analgesic properties
Sugars	Monosaccharides: Glucose and Fructose Polysaccharides: Glucmannans/polymannose	Anti-viral, immune modulating activity of acemannan
Vitamins	A, B, C, E, choline, B12, folic acid	Antioxidant (A, C, E), neutralises free radicals

Internal Uses Of Aloe Vera

Historical evidence encompassing more than 4,000 years testifies to the high regard of ancient peoples to the benefits of Aloe vera. 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. A few of the scientifically documented beneficial uses of drinking Aloe beverages will be delineated in Contradistinction.

Research into aloe in cancer

Aloe contains many different chemicals and compounds. This section has information on research

into using aloe for cancer and the side effects of cancer treatment.

Controlling the side effects of cancer treatment

Several trials have looked at using aloe vera gel directly on the skin to help prevent and lessen skin reactions from radiotherapy. A 2005 review of 7 trials found that they were of poor quality and did not show that aloe gel was better than standard treatments. You can read the review of studies of aloe for skin reactions on the Centre for Reviews and Dissemination website.

However, in 2013 a small clinical study of 60 patients tested aloe for skin reactions after radiotherapy. The patients used aloe vera lotion on one half of the radiotherapy treatment area and nothing on the other half. The aloe vera reduced the intensity of the skin reaction and the researchers felt it is a helpful treatment for radiotherapy skin reactions.

In 2011 researchers carried out a review of studies that have used aloe vera gel to prevent mouth

soreness (mucositis) in people having treatment for cancer. They found there was no evidence to suggest that aloe vera works. But many patients say that they have found aloe helpful. You can read the review of studies of aloe for sore mouth on the Cochrane Library website. We need further research to find out whether aloe vera can help.

Aloe vera can help to soften skin around wounds and prevent dryness as they heal. Some early research seems to suggest that it may help wounds to heal. But always check with your doctor or specialist nurse before using it.

Treating, preventing and curing cancer

Some people claim that aloe vera can balance the immune system or even treat and cure cancer. Studies have been carried out into this and some laboratory studies and early studies on animals seem to show that extracts from aloe may be helpful in boosting the immune system to attack cancer cells. But the safety of these chemicals has not been tested in humans and we don't know whether they may work. There is currently no evidence that aloe can treat cancer in humans.

One study showed that an aloe extract called aloe emodin can block the growth of head and neck cancer cells in test tubes. Emodin can also stop liver cancer cells growing in test tubes.

Acemannan is a substance taken from the aloe vera leaf and it can stimulate mouse immune cells to make cancer killing chemicals (cytokines). One test tube study has shown that aloeride (a starch compound found in aloe juice) can stimulate the immune system to produce cancer killing chemicals.

Another compound made from aloe vera, di 2-ethyl hexyl phthalate (DEHP), has been found to stop the development of leukaemia cells in test tubes.

Early studies of aloe substances in laboratory animals seem to suggest that some of the chemicals found in aloe may have helpful effects on the immune system and can shrink some cancers. Two studies were published in 2010 looking into the effects of aloe on skin cancer in mice. In one study aloe products applied to the skin and taken by mouth reduced the number of skin cancers. But in the other study, certain aloe products increased the number of skin cancers (especially in female mice) caused by ultraviolet light.

One study in Italy of 240 patients reported in 2009. It tested aloe vera alongside chemotherapy for people with lung cancer, bowel cancer, or stomach cancer that had spread. Half the patients took aloe arborescens as a liquid 3 times a day during standard chemotherapy treatment. In this study the cancer was controlled or shrank for a time in 67% of patients who had the combined aloe and chemotherapy treatment and in 50% of patients who had chemotherapy alone. In this study the researchers said that patients taking

the aloe vera had a better quality of life and that they had fewer chemotherapy side effects such as numb fingers and fatigue.

The researchers also said that there were no ill effects from the aloe vera. More patients who had the aloe vera survived for 3 years than patients who just had chemotherapy. Although this research seems positive the researchers said that there are some concerns about the study. The researchers knew which patients were receiving aloe vera and they may have influenced the results. The study also involved patients who were quite ill with metastatic cancer. It is not clear how well aloe vera would work in patients with earlier stage cancer. The researchers recommend further research to confirm or disprove these findings.

A US company produced an aloe vera product called T-UP that you can drink or inject into your bloodstream. It is promoted by some people as an alternative cancer cure. This product hasn't been proven in clinical trials to help treat or cure cancer and in the USA it is illegal to inject aloe vera. Using it in this way can cause very serious side effects and some people have died from it. The injection is not available in the UK or USA but is used by clinics in some other countries.

Taxonomic Treatment

This succulent perennial herb has triangular, sessile stem, shallow root system, and fleshy serrated leaves arranged in rosette having 30 - 50 cm length and 10 cm breadth at the base; colour pea-green. The bright yellow tubular flowers, length 25 - 35 cm, axillary spike and stamens are frequently projected beyond the perianth tube and fruits contain many seeds.

Antitumor Activity

A number of glycoproteins present in Aloe vera gel have been reported to have antitumor and antiulcer effects and to increase proliferation of normal human dermal cells. However, statistically significant clinical studies on the efficacy of Aloe vera gel on human health are very limited and often inconclusive. In recent studies, a polysaccharide fraction has shown to inhibit the binding of benzopyrene to primary rat hepatocytes, thereby preventing the formation of potentially cancer-initiating benzopyrene-DNA adducts. An induction of glutathione S-transferase and an inhibition of the tumor-promoting effects of phorbol myristic acetate has also been reported which suggest a possible benefit of using aloe gel in cancer chemoprevention.

Effects on the Immune System

Alprogen inhibit calcium influx into mast cells, thereby inhibiting the antigen-antibody-mediated release of histamine and leukotriene from mast cells. In a study on mice that had previously been implanted with murine sarcoma cells, acemannan stimulates the

synthesis and release of interleukin-1 (IL-1) and tumor necrosis factor from macrophages in mice, which in turn initiated an immune attack that resulted in necrosis and regression of the cancerous cells. Several low-molecular-weight compounds are also capable of inhibiting the release of reactive oxygen free radicals from activated human neutrophils.

Medicinal Uses

Aloe vera is anthelmintic, aperients, carminative, deobstruent, depurative, diuretic, stomachic and emmenagogue. Juice is used in skin care medicine, dyspepsia, amenorrhea, burns, colic, hyperadenosis, hepatopathy, splenopathy, constipation, spanmenorrhea, abdominal tumors, dropsy carbuncles, sciatica, lumbago and flatulence. The elio, a product made by juice of this plant, is used for helminthiasis in children and is a purgative, anthelmintic & emmenagogue. A number of glycoprotein present in Aloe vera gel has been reported to have anti-tumor and antiulcer effects and to increase proliferation of normal human dermal cells. Gel is useful in ulcerative colitis and pressure ulcers, respectively. Traditionally, Aloe vera gel is used both, topically (treatment of wounds, minor burns, and skin irritations) and internally to treat constipation, coughs, ulcers, diabetes, headaches, arthritis, immune-system deficiencies.

Aloe vera has been used for medicinal purposes in several cultures for millennia: Greece, Egypt, India, Mexico, Japan, and China. The Egyptians used the Aloe vera to make papyrus like scrolls as well as for treatment of tuberculosis. Nadkerni stated various preparations of Aloe barbadensis like confection, lotion and juice, useful remedies for curing various diseases. Aloe contains mixture of glucosides collectively called aloin which is the active constituent of various drugs. Traditionally Aloe is extensively used in treating urine related problems, pimples and ulcers etc. It is also used in gerontology and rejuvenation of aging skin. The juice of Aloe vera leaves is used as stomachic tonic and purgative. Scientific evidence for the cosmetic and therapeutic effectiveness of Aloe vera is limited and when present is frequently contradictory. Despite this, the cosmetic and alternative medicine industries regularly make claims regarding the soothing, moisturizing, and healing properties of Aloe vera, especially via internet advertising. The bioactive compounds are used as astringent, haemostatic, antidiabetic, antiulcer, antiseptic, antibacterial, anti-inflammatory, antioxidant and anticancer agent also, effective in treating stomach ailments, gastrointestinal problems, skin diseases, constipation, radiation injury, wound healing, burns, dysentery, diarrhoea and in the treatment of skin diseases (represents in Graph 1). It is used in ayurvedic formulations as appetite-stimulant,

purgative, emmenagogue and antihelminthic, for treating cough, colds, piles, debility, dyspnoea, asthma and jaundice.

Conclusion

The active ingredients hidden in its succulent leaves have the power to soothe human life and health in a myriad ways. The plant has importance in everyday life to soothe a variety of skin ailments such as mild cuts, antitoxin for insect stings, bruises, poison ivy and eczema along with skin moisturizing and anti-ageing, digestive tract health, blood and lymphatic circulation and functioning of kidney, liver and gall bladder makes it a boon to human kind. *Aloe vera* as the “wonder plant” is multiple from being an antiseptic, anti-inflammatory agent, helps in relieving like cancer and diabetes, and being a cosmetic field. The plant is in need to a greater research emphasis for better utilization of this plant for human kind. *Aloe vera* is undoubtedly, the nature’s gift to humanity for cosmetic, burn and medicinal application and it remains for us to introduce it to ourselves and thank the nature for its never-ending gift.

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