Immunomodulatory and Protective Action of Aloe arborescens and Aloe barbadensis (Aloe vera)

Throughout a lifetime, each of us will experience a number of illnesses caused by infectious organisms or exposure to chemical agents that cause allergic responses. These reactions are initiated and usually carried through to healing by the immune system. The immune system is the major entity that protects the body against potentially harmful foreign substances and the multiplicity of potentially infectious agents.

Immunity may be either natural or acquired. Natural immunity is species specific, which is why humans do not contract various animal diseases. Acquired immunity is that protection a person acquires through active or passive means.

Active immunity is acquired through immunization or actually having a disease. It is long-lived immunity developed by the body’s own immune system. Active immunity does not provide immediate protection upon first exposure to an invading agent or vaccine. It takes a few days to weeks before the immune response is sufficiently developed to contribute to the destruction of the pathogen. With subsequent exposure to the same agent, however, the immune system is usually able to react within minutes to hours.

Passive immunity is temporary immunity transmitted or borrowed from another source. An infant receives passive immunity from its mother in utero and from antibodies it receives from its mother’s breast milk. Passive immunity can also be transferred through injection of antiserum that contains the antibodies for a number of diseases. Both antiserum and gamma globulin are obtained from blood plasma.

Aloe arborescens and Aloe vera and Anticancer Activity

Aloe is a genus of plants with a notable history of various medical uses. Basic research studies over the past couple of decades have revealed the growing extent of pharmaceutical potential, particularly against neoplastic diseases. The two mostly used aloe species are Aloe arborescens and Aloe barbadensis (Aloe vera).

These aloe species contain several very large polysaccharides (many sugars) consisting of glucose (blood sugar) and mannose (various plants) which, when administered to animals and humans, cause the release of substances from certain white blood cells that form and activate natural killer cells (NKC) that attack cancer cells and cause their demise (death).

(1) Natural killer cells are part of the natural immune system and they kill tumor cells and cells infected by viruses.

(2) Natural killer cells do not require programming by prior contact with antigens.

(3) Natural killer cells attach to a cancer cell and inject chemicals that can kill the cancer cell in less than five minutes.

One of the great advantages of such a system for destroying cancer cells is that it can destroy every last cancer cell, something none of the other modes of treatment can accomplish.

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Unlike chemotherapy (destruction of cancer cells by chemicals) and radiotherapy (destruction by irradiation), stimulation of natural killer cells does not destroy normal cells in the body as the only targets are cancer cells.


The large polysaccharides are found in the central portion of the aloe leaf called the fillet.

A fillet freshly removed from its green rind.

A second group of aloe constituents contain the laxative anthraquinones found in the yellow sap that comes from small tubules in the thick green rind. The yellow sap consists of several potent laxative agents including: Atoin A (barbaloin); Aloin B (isobarbaloin); Aloe-emodin; and Emodin.

Yellow sap or latex streaming out of the pericyclic tubes immediately after sectioning of a leaf

These constituents are chemically known as anthraquinones and have potent anti-cancer activities in addition to their laxative actions.

### Aloe-emodin


This compound was found to show significant anti-leukemic activity against P-388, L-1210, HCT-15, SK-HeP-G-1 mouse splenocytic and lymphocytic leukemia in mice.

Aloe emodin (0.25 mg/ml 1.25 mg/ml 2.5 mg/mL and 5.0 mg/ml showed dose-dependent cytotoxicity against cancer cell lines, while the aloe extract stimulated the growth and proliferation of normal mouse splenocytes.


### DEHP- (diethylhexylphthalate)

Tests were performed on three human leukemic cell lines - K562, HL60 and U937 - exposing the cancer cells to various concentrations of DEHP.

<table>
<thead>
<tr>
<th>DEHP Concentration</th>
<th>Cell Lines</th>
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<tbody>
<tr>
<td>1 ug/mL.</td>
<td>50% 51% 52%</td>
</tr>
<tr>
<td>10 ug/mL.</td>
<td>74% 83% 81%</td>
</tr>
<tr>
<td>100 ug/mL.</td>
<td>95% 97% 95%</td>
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### The Italian Experience

For several decades in Italy and other parts of Europe, health practitioners have been using a mixture of the juice from Aloe arborescens, a cousin of Aloe vera and honey to treat a very large number of patients with all varieties of malignant diseases with extraordinary success.
This Brazilian immune health formula was published by Brazilian scholar Father Romano Zago and was used in clinical studies in collaboration with Paolo Lissoni, Oncologist at the Division of Radiation Oncology, St. Gerardo hospital, Monza, Milan, Italy.

More recently, a study on Wistar rats was performed using the Aloe vera/honey preparation. Tumor growth, tumor size, and apoptosis (cell death) were evaluated.

Cell proliferation rate (Ki67-L1) and BaxBcl2 expression were determined at 7, 14 and 20 days after Walker 256 carcinoma cells were implanted in the Wistar rats. Control rats were given 0.9% sodium chloride (table salt) by gavage (stomach tube) while the experimental animals were given the Aloe vera/honey mixture.

The tumor growth in the Aloe vera/honey animals compared with the control animals was reduced as was the relative weight of Ki67-L1 tumors compared with the control group. Aloe vera/honey modulated tumor growth by reducing cell proliferation and increasing susceptibility to apoptosis (cell death).

Honey has also been shown to have anticancer properties, including inhibition of tumor cell transformation and proliferation and induction of apoptosis. Based on ethnopharmalogical studies, the combination of honey and Aloe arborescens or Aloe vera is a common practice in alternative medicine, especially used in Brazil and South America.


Giuppe Naci, M.D. of Trieste, Italy, in his book - “Mille Piante Per Guarire Dal Cancro Senza Chemio” - (Thousand Plants to Recover from Cancer Without Chemotherapy), 1700 Official Scientific Publications with 1750 Various Bibliographic References published in 2007, recommends using the liquid formula of whole leaf of Aloe arborescens plant juice plus raw organic honey with the proportions consisting of two volumes of honey to each volume of plant liquid. Honey protects the active ingredients of the plant extract and acts as a powerful antiseptic agent by inactivating potentially injurious micro-organisms. (many sugars). One of the earliest research reports providing this information comes from Dr. Akira Yagi and his collaborators in Japan. These early studies were accomplished nearly thirty years ago.


II. Aloe juices contain about 300 different substances with molecular weights less than 100 and up to 10,000,000 Daltons. One of the smaller molecules in Aloctin-A a glycoprotein that possesses a variety of chemical and pharmacological activities including inhibition of gastric acid (HCl-hydrochloric acid) secretion and potent anti-tumor effects.


III. Aloe has been used as a folk medicine for centuries all over the world. Among the many components of aloe, low molecular weight components have been used as laxative agents both in humans and animals. High molecular weight components have been successfully used in skin injuries and thermal burns and, in addition, as a potent inflammatory agent. This article describes the antitumor activity of Aloctin-A in mice with malignant fibrosarcoma tumors. Complete anti-tumor inhibition of the sarcoma was demonstrated in 65% of the mice.


IV. Four-week old rats were fed a control diet or experimental diets containing 1% or 5% Aloe for five weeks. One week later, the animals were injected with a chemical that causes cancerous changes in colon and rectal cells. In the animals fed the aloe diets, no abnormal colorectal cells were observed as were seen in the control specimens. In addition, liver enzyme functions were protected against the abnormal changes seen in the control animals.


V. Modification effects of freeze-dried aloe (Aloe Arborescens) whole leaf powder was given to female Syrian hamsters...
given 0, 1 or 5% aloe in the diet for five weeks. At week five of the experiment, all surviving animals were sacrificed and the development of pancreatic cancer or precancer changes were assessed histopathologically. The incidences of precancerous cells and pancreatic cancer cells were significantly decreased in the group fed the 5% aloe, and reduced in the group fed the 1% aloe. In a satellite experiment, pretreatment with aloe significantly reduced precancerous cancerous changes in pancreatic duct cells.


VI. A study was planned to include 240 patients with metastatic solid tumors who were randomized to receive chemotherapy with or without Aloe. According to tumor histotype and clinical status, lung patients were treated with cisplatin and ectoside or weekly vinoselbine, colorectal patients received oxaliplatic plus 5-fluorouracil (5-FU), gastric cancer patients received weekly germcitobine. Aloe arborescens was given orally at a dose 10 ml thrice daily of a mixture consisting of 300 g of aloe fresh leaves in 500 g of honey plus 40 ml of 40% alcohol, every day without interruption, either during or after chemotherapy, until the progression of disease, starting six days prior to the onset of chemotherapy. Aloe mixture was supplied by Deca (Isernia, Italy). The percentage of both objective tumor regression and disease control was significantly higher in patients concomitantly treated alone, as well as the percent of 3-year survival patients.

The study suggests that aloe may be successfely associated with chemotherapy to increase its efficacy in terms of both tumor regression rate and survival time.


VII. A chemical investigation of arborescent aloe (Aloe arborescens Miller) in order to determine the characteristics of the accumulation of carotenoids, chlorophylls, carbohydrates and phenolic compounds in different parts of the leaf, as well as depending on the age of leaves, were realized.

- photosynthetic pigment
- carotenoids
- chlorophylls
- free carbohydrates -glucose, sucrose, fructose; only glucose in inner gel
- pectin substances and glucanes
- phenolic compounds - aloenin, aloins, aloe-emodin
- No anthraquinones in inner part of leaves (gels)


VIII. Aloe constituents possess free radical scavengers, antiproliferatives, and immunostimulating properties preventing and treating cancer.

Aloctin-A induced antitumor effects in murine fibrosarcoma and lymphatic leukemia in mice. Showed anti-tumor activity against implanted sarcoma 180 in mice, exhibited resistance against liver cell cancer cell proliferation.


Tumorlytic Diversity of Aloe arborescens and Aloe barbadensis

(312) Sarcoma-180


Sarcoma-180, implanted in mice-15,000 MW, tumor growth inhibited by 38.1% at 5 mg/kg x 10 days and 48.1% at 200 mg/kg x 10 days.

(808) Lip, anus, breast, larynx, nose, prepuce, stomach, uterus, skin


(446) Mammary carcinoma; Erlich carcinoma; Melanoma


(581) Acute lymphytic leukemia

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(582) Methyl cholantheme-induced fibrosarcoma

(2000) (OEHP) Antileukemia


(2000) (OEHP) Antileukemia


(2006-28) Human bladder cancer


(2006-60) Breast, ovarian cancer


(2007-15) Human lung nonsmall carcinoma


(2007-19) Cervical Carcinoma


(2007-47) Aloe-emodin for cancer


(2007-48) Aloe-emodin and gastric cancer


(1-19) Aloe-emodin induces cell cycle arrest and apoptosis in human colon cancer cells


(I -30) Aloe-emodin inhibits colon cancer


(11-8) Aloe-emodin exerts an anti-cancer effect in hepatic hepatocellular carcinoma cells


(11-9) A rhein-aloe-emodin hybrid molecule showed a better in vitro anti-tumor effect than rhein and aloe-emodin alone.

\{11-24\} \textit{Aloe-emodin} can promote macrophage differentiation as a selective agent for treatment of leukemia.


\{11-42\} Dietary aloin, aloesin, or \textit{aloë-gel} exerts anti-inflammatory activity activity in a rat colitis model.


\{11-24\} Rhein showed an important role in apoptotic induction of human breast cancer cells.


\{11-85\} \textit{Emodin} induces apoptosis against neuroectodermal tumor cells.


\{IV-62\} \textit{Aloe-emodin} has been shown to have anticancer activity in various human cell lines including monoblastic leukemia.


\textbf{IX.} An evaluation of antimitastic properties of succus Aloes was carried out using three types of experimental tumors of rice and rats. It was found that succus Aloes treatment contributes to reductions of tumor mass, metastatic foci and metastasis frequency at different stages of tumor progress without affecting major tumor growth. Succus Aloes potentiates the antitumor effect of 5-fluorouracil and cyclophosphamide as components of combination chemotherapy.

Gribel NV, Pashinskii VG. PMID: 3798837 [PubMed - indexed for MEDLINE].