Effect Of Orally Consumed Aloe Vera Juice

On Gastrointestinal Function In Normal Humans

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Abstract

This study evaluated the effect of oral Aloe vera juice supplementation on gastric pH, stool specific gravity, protein digestion/absorption, and stool microbiology. Results indicate that supplemental oral Aloe vera juice is well tolerated by most individuals and has favorable effects upon a number of gastrointestinal parameters. A discussion of the potential role of Aloe vera juice on inflammatory bowel disorders based upon this work is presented.

Introduction

Members of the genus Aloe Barbadensis and Aloe vera have been used historically for medical purposes. Going back to ancient Phoenician literature, historical records chronicle the application of internal contents of the leaves of the Aloe plant for the treatment of burns, wounds, and other dermatological conditions. The pharmacological principle(s) in Aloe has been the subject of great controversy throughout this history. In recent years, individuals have extracted the Aloe plant looking for specific nutritional agents, alkaloids, sapponins, fatty acid materials, glycoproteins, or terpenoid substances that may account for its unique ability to promote healing of the dermis. This research has uniformly resulted in failure to identify the active principle in Aloe. It has been suggested that the extract of the Aloe plant promotes tissue reparation through the complex synergistic interaction of many substances, including vitamins, mineral amino acids, and other small constituent molecules that are members of the terpenoid family. Substances such as Aloe-Emodin or Aloe Resin-A have been evaluated recently from Aloe extraction concentrates as being terpenoids, characteristic of Aloe potency.

A great challenge still exists to phytochemists to try to better define what the physiochemical agents in Aloe are that demonstrate activity. The clinical evidence mounts, however, that topical application of Aloe extracts or the excised phloem material of the Aloe plant itself has repeatedly been demonstrated to have significant ability in promotion

vascularizing, reducing edema and inflammation, while promoting epidermal growth and differentiation.

Recent studies of Cera, Heggers, and Hagstrom in animals have indicated that the topical administration of Aloe extract to dogs with certain forms of dermatitis can result in significant improvement of the dermatological condition when contrasted to control animal. They postulate that Aloe vera has both bacteriostatic and prostaglandin-suppressor activity when applied to the dermis.

Concomitant with these observations of the abilities of the extract of the Aloe plant as a bacteriostatic substance when administered topically are the historical reports that Aloe vera, when ingested orally, also has a systemic influence both on improvement of gastrointestinal function and possibly even other important physiological relationships. Individuals who have suffered from indigestion, irritable bowel syndrome, colitis, and excess acid stomach, have reported relief from these conditions by the oral administration of Aloe vera juice. The physiological effects of orally administered Aloe vera juice on gastrointestinal function has not been studied under controlled conditions. Such a study is essential to establish the role that orally administered Aloe vera juice plays in imparting favorable gastrointestinal functional changes.

To address this particular question, the following study was designed. This study evaluates the impact of orally consumed Aloe vera juice on gastrointestinal function by evaluation of colonic bacterial activity, gastrointestinal pH, impact upon stool specific gravity, and gastrointestinal motility in normal subjects.

Study Design

This study involved ten healthy subjects - five men (median age: 42; standard deviation: 14 years), and five women (median age: 32; standard deviation: 5 years) - engaged in a semicontrolled Aloe vera juice oral supplementation study protocol. During the course of this study, they were not asked to eat any special foods nor to engage in an alternative scheduling of their time, but rather maintain their normal diets and lifestyles.

The subjects' initiated entry into the study by reporting after fasting overnight for an evaluation of their gastric acid secretion by the Heidelberg radiotelemetry procedure. This procedure involves the swallowing of a small pH sensitive capsule, which then transmits back to a receiver worn around the waist the internal pH of the stomach and duodenum. This procedure allows for in vivo quantification of gastrointestinal pH with position of the capsule in the gastrointestinal tract and also after the challenge with various foods.

After time was allowed for the capsule to equilibrate in the stomach, a meal replacement

bar was consumed to stimulate hydrochloric acid output. This meal replacement bar contained 40% of its calories as protein, 50% of its calories as carbohydrate, and 10% of its calories as fat with RDA levels of vitamins and minerals. After one hour, six ounces of water was consumed and the patient asked to sit upright to allow the capsule to travel into the duodenum where the pH was monitored for another two and one-half hours. A stool sample and a morning urine sample were also taken after the completion of the Heidelberg gastrogram.

The urine was analyzed for the presence of indoxyl-sulfate, a metabolite of tryptophan produced in the bowel by the action of gastrointestinal bacteria on unabsorbed dietary protein. Indoxyl-sulfate in the urine is indicative of the degree to which either dietary protein is being malabsorbed or intestinal colonic bacteria are engaged in a putrefactive process. The stool sample had its specific gravity measured and was assayed for microbiota by a stool culture with specific focus on pathogenic bacteria.

After completion of these first battery of tests, each subject was then asked to consume six ounces of Aloe vera juice (concentrate juice) taken in two-ounce increments three times daily each day for seven days. After seven days on an ad lib diet with Aloe vera juice supplementation, each subject was then evaluated by the identical procedure to that in the initial phase of the experiment. The only modification of the program was the addition of six ounces of Aloe juice at the first hour of the Heidelberg gastrogram rather than six ounces of water.

Comparison of the post-Aloe vera supplementation stool culture, urinary indican, and Heidelberg gastrogram to that of the pre-Aloe vera challenge allowed for the determination of the impact that Aloe vera juice supplementation has upon gastrointestinal function as measured through bacterial activity of the colon, bowel transmit time, gastric pH, and stool density.

Results

Evaluation of the data collected on each subject before and after Aloe vera juice supplementation produced information on the average changes in urinary indican, stool specific gravity, gastric pH, and bowel motility.

As can be seen from Table 1, urinary indican values were seen to decrease on the average, one full unit after the Aloe vera juice intake for one week. This is indicative of lowered bowel bacterial conversion of tryptophan and possibly improved protein digestion and absorption after the Aloe vera juice treatment.

TABLE 1
Urinary Indican Levels
Before & After Aloe Vera Trial

Subject	Sex	Before*	After*
N.M.	F	Trace	Trace
P.S.	F	2	Negative
L.Z.	F	Trace	Trace
S.G.	F	4	1
S.M.	F	3	2
L.B.	M	1	2
P.M.	M	4	1
M.A.	M	1	Trace
J.B.	M	3	2
J.F.	M	3	3

Average change - 1.0 indican units

*Values rated from zero to 4: highest indican = 4

Increased urinary indican is reflective of reduced protein digestion and absorption and increased bowel putrification of the amino acid tryptophan, and the lower value of urinary indican seen after the Aloe vera juice supplementation trial, suggests improved protein digestion assimilation with reduced bacterial putrefaction.

Table 2 displays the stool's specific gravity data before and after the week's supplementation with Aloe vera juice. It can be seen that stool specific gravity is reduced on the average 0.37 units, suggesting improved water holding characteristics of the stool and decreased bowel transit time. It is important to note that none of the subjects in the study complained of diarrhea or loose stools while taking Aloe vera, but rather specific gravity of the stool was reduced more toward what would be considered as ideal value.

TABLE 2
Stool Specific Gravity
Before & After Aloe Vera Trial

Subject	Sex	Before*	After*
N.M.	F	0.92	0.92
P.S.	F	1.27	1.00
L.Z.	F	1.50	1.25
S.G.	F	1.43	1.07
S.M.	F	2.70	1.30
L.B.	M	2.20	1.70
P.M.	M	1.44	1.08
M.A.	M	1.18	1.00
J.B.	M	1.12	1.10
J.F.	M		

Average change - 0.3 after Aloe treatment

Table 3 displays the gastric pH one hour after administration of the meal replacement bar and right after oral supplementation of either water or Aloe vera juice. It can be seen that the effect of Aloe vera juice administration is to increase the pH of the intestinal contents by, on the average, 1.88 units. Aloe vera juice, therefore, participates as a buffering agent in the gut which has its optimal pH range above pH5 and, therefore, may be viewed as an alkalizing substance.

Table 4 indicates that the time for the capsule to be transferred to the duodenum after Aloe supplementation was prolonged by approximately 1.2 hours. Table 4 also confirms that out of ten subjects in the study, six had markedly altered stool cultures by microbiological assay and four of these six who had indications of yeast overgrowth in their stools prior to Aloe, had reduction in yeast abundance after Aloe vera supplementation. This indicates that orally administered Aloe vera juice may have some bacteriostatic or fungostatic activity in the digestive tract and aid in the promotion of favorable balance of gastrointestinal symbiotic bacteria. These observations are consistent with the previously acknowledged bacteriostatic properties of Aloe vera juice applied topically.

TABLE 3
Gastric pH One Hour After The Administration Of The Meal Replacement Bar

Subject	Sex	Before*	After*
N.M.	F	1.4	3.4
P.S.	F	3.2	4.1
L.Z.	F	3.2	4.0
S.G.	F	3.1	5.4
S.M.	F	3.2	5.3
L.B.	M	2.7	4.0
P.M.	M	1.6	4.7
M.A.	M	4.2	4.5
J.B.	M	3.2	4.1
J.F.	M	4.1	4.7

Average change after Aloe vera administration +1.88 pH units

TABLE 4
Time Of Capsule Transfer To Duodenum & Stool Culture Effects Of Aloe Vera

Subject	Sex	Change In Time Of Capsule To duodenum (hrs)	Qualitative Effect Of Aloe On Stool Culture
N.M.	F	-1	No difference
P.S.	F	0	Lowered yeast
L.Z.	F	0	Lowered bacteria
S.G.	F	+1	No difference
S.M.	F	-2	Lowered bacteria
L.B.	M	0	Lowered yeast
P.M.	M	-2	Lowered yeast
M.A.	M	-1	No difference
J.B.	M	0	No difference
J.F.	M	0	Markedly lower yeast

Discussion

The tolerance of the subjects to Aloe vera juice supplementation was in general, quite good. One subject complained of gas and another of transient gut pain, which after continued supplementation throughout the week diminished. The other eight subjects were asymptomatic with no diarrhea, nausea, intestinal bloating, or distress.

Four of the subjects noted an improved bowel regularity with greater gastrointestinal comfort after eating. Three of the

subjects indicated that they felt some enhancement of energy and a sense of well-being, although this could not be confirmed quantitatively due to the protocol not being blinded or placebo-controlled.

The most marked objective difference between the pre-Aloe and post-Aloe supplementation periods in the various subjects, was the decrease in stool specific gravity indicating a greater water-holding characteristic of the stool and improved gastrointestinal motility with reduced bowel transit time. This would indicate that the Aloe vera supplementation had a tonic effect on the intestinal tract, thereby promoting a reduced transit time with decreased residence of fecal material in the colon. This mild tonic effect was not accompanied by any diarrhea and, therefore, would not be considered operating as a true laxative.

Secondarily, the effect of Aloe vera juice supplementation appeared to be that of altering colonic biota. Those subjects that had heavy overgrowth of fecal bacteria and some yeast infection, were found to have improved fecal colonization and decreased yeast after the Aloe vera juice supplementation. This may indicate that the Aloe vera contains an agent or agents which are mycostatic or bacteriostatic or that the improved gastrointestinal function and altered pH of the bowel as it relates to Aloe vera juice supplementation sets the stage for different populations of bacteria to flourish in the gut. The alkalizing effect of Aloe vera juice was also quite apparent in that the average gastrointestinal pH after Aloe supplementation was found to increase 1.86 units, indicating a more alkaline buffer capacity of the Aloe vera juice supplemented intestinal contents. This would support the hypothesis that Aloe vera juice supplementation may act also as a mild antacid in that its pH is 8.6 with a reasonably good buffering capacity.

Lastly, the reduction in urinary indican after Aloe vera juice supplementation indicates that the improvement in colonic bacterial activity or protein digestion / absorption after juice supplementation is seen as lowered bowel putrefaction. The indication that dietary protein is better absorbed and less available for putrefaction may also indicate why some individuals have in the past found Aloe vera to be helpful in the management of various food allergic symptoms or arthritis-like pain. It is known from the work of Dr. Hemmings that incomplete protein breakdown products from such reactive foods as gluten from wheat or casein from milk can be transported through the “leaky” gastrointestinal mucosa into systemic circulation and initiate either antibody-antigen reactions in systemic circulation which can aggravate the symptoms of arthritis or may participate in direct antigen assault upon the gastrointestinal mucosa increasing the risk to inflammatory bowel disorders.

It has also been suggested that some of these incomplete protein breakdown products may have chemical reactivity similar to that of the endorphins and, if absorbed into systemic circulation, may actually initiate brain biochemical changes associated with what has been termed “cerebral allergy”. When these incomplete protein breakdown products, through poor protein digestion / absorption, are delivered to the bloodstream and initiate, antigen-antibody complexes. These complexes can be trapped in the liver or in joint spaces and

initiate inflammatory processes that have the clinical manifestations of pain and edema. This may explain why Rasmussen and his colleagues have found that a dietary fast can be helpful in reducing the symptoms of rheumatoid arthritis in stricken patients. They found that while on a dietary fast rheumatoid arthritic patients had significant reduction in morning stiffness, in pain score, improvement in hand-grip force, improvement in joint index, and a reduction of the biochemical signs of active disease. This may have resulted from decreased load of incomplete protein breakdown products in the blood which reduces antigen-antibody complex formation and degranulation of neutriphiles with accompanying inflammatory process associated with arthritis. Agents which would promote proper integrity of the gastrointestinal mucus and aid in the digestion and assimilation of dietary protein as amino acids rather than as oligopeptides would be substances that would reduce the relative load of dietary antigens on the blood as agents which exacerbate arthritic symptoms.

Recently, it has been found that in individuals who suffer from caeliac disease, which is associated with wheat sensitivity, that wheat protein contains a dietary antigen, alpha-gliaden, which can activate T-suppressor cell activity and reduce the body's immunity. This may account for why celiac disease is often associated with the symptoms of inflammatory bowel disease. Improved digestion and management of these dietary protein antigens would facilitate an improved immunological status of the gut with reduced inflammatory activity. It has also been found that non-steroidal anti-inflammatory drugs that are commonly used to treat the symptoms of arthritis actually increase the permeability of the gut to antigens and may increase the antigen-antibody complex formation and increase the long-term progression of the disease. It is also known that alcohol abuse can also lead to a "leaky" gut with increasing risk of exposure to dietary antigens.

The function of Aloe vera juice in promoting, proper gastrointestinal function, based upon the information from this preliminary study, may be to regulate gastrointestinal pH while improving gastrointestinal motility, increasing stool specific gravity, and reducing populations of certain fecal micro-organisms, including yeast. This could have significant advantage to some individuals by promoting proper dietary protein digestion and absorption and reducing bowel putrifactive processes in the colon.

This study sets the stage for a more detailed evaluation of the effect of Aloe vera juice on gastrointestinal function in patients with active inflammatory disease including inflammatory bowel disorders, colitis, and potentially forms of autoimmune disease, including rheumatoid arthritis. The impact of Aloe vera juice supplementation in these patients under controlled conditions, should allow for evaluation as to the effectiveness of this complex mixture as contributors in improved gastrointestinal function. The beneficial effect of Aloe juice supplementation could also be due to the reduction in the delivery of antigens to the gut mucosa which, if uncontrolled, are associated with inflammatory bowel disease or the absorption of these antigens into the systemic circulation through a permeable mucosa thus initiating antigen-antibody complex formation.

From this study, it can be confirmed that Aloe vera juice supplementation in normal

individuals is well tolerated and did not produce any covert or overt adverse effects on gastrointestinal physiology. Oral supplementation resulted in improved bowel motility, increased stool specific gravity, and reduced indication of protein putrefaction in the colon. Clinical improvements in intestinal function while supplementing with Aloe included reduced bloating after meals and reduced flatulence, indicating improved colonic bacterial function.

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