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ALOE VERA
INFORMATION SERVICE

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Aloe Against Infections

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Aloe vera has been tested against a variety of infections, viral, bacterial and fungal. The exudate of Aloe (aloin) has been confirmed again and again as having direct anti-microbial effects, killing invading pathological organisms. However the principal benefits of Aloe with regard to infective agents comes from aloin-free or de-aloinized extracts, which work by strengthening the body's own defences. This newsletter closely examines these functions of Aloe.

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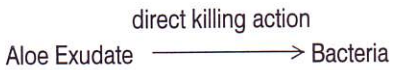
Aloe Against Infections

Introduction

The point has already been made in Newsletter No1 that Aloe, by supporting and stimulating the immune system, greatly augments the ability of the body to resist bacterial and viral infections. This point was made in relation to such Aloe products as Gel and Whole Leaf Extract which contain the glucomannan of Aloe and in which the exudate fraction of Aloe ("Aloin", or "Phenolic" fraction) is only present in very low concentrations or has been removed in processing. It must be emphasized that when Aloe is used in this way, the effect being exerted upon the invading organisms is indirect. The glucomannan is, in itself, by no means capable of killing micro-organisms and can only produce an indirect effect by stimulating the immune system to destroy them. Indeed, glucomannan is almost certainly vulnerable to bacterial degradation itself and will not survive a bacterial fermentation of the Aloe extract containing it.

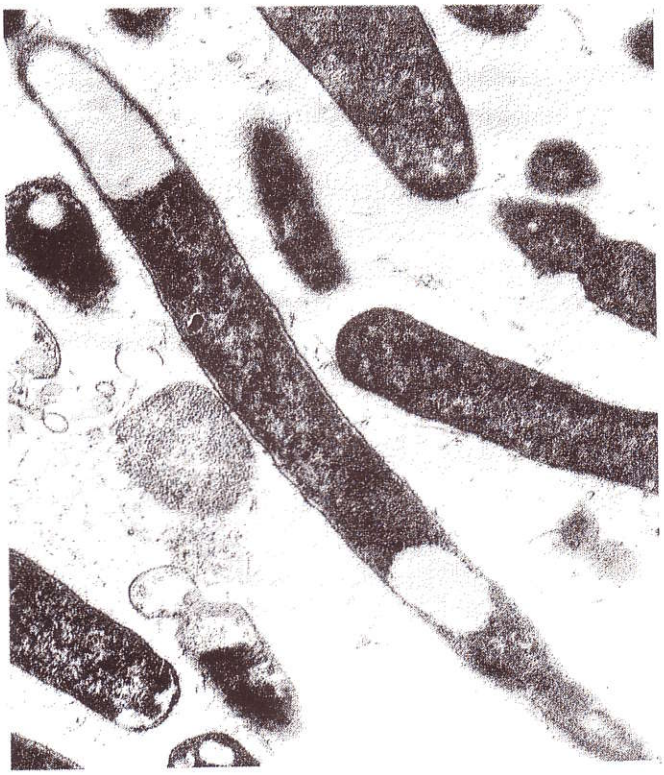
On the other hand, the components of the "Aloin", or "Phenolic" fraction have been shown, through quite a number of studies, to have a direct destructive action upon bacteria. We therefore have two ways in which these differing components of Aloe may act against bacteria and as it is important for the reader to draw this distinction clearly in the mind, this is represented diagrammatically below.

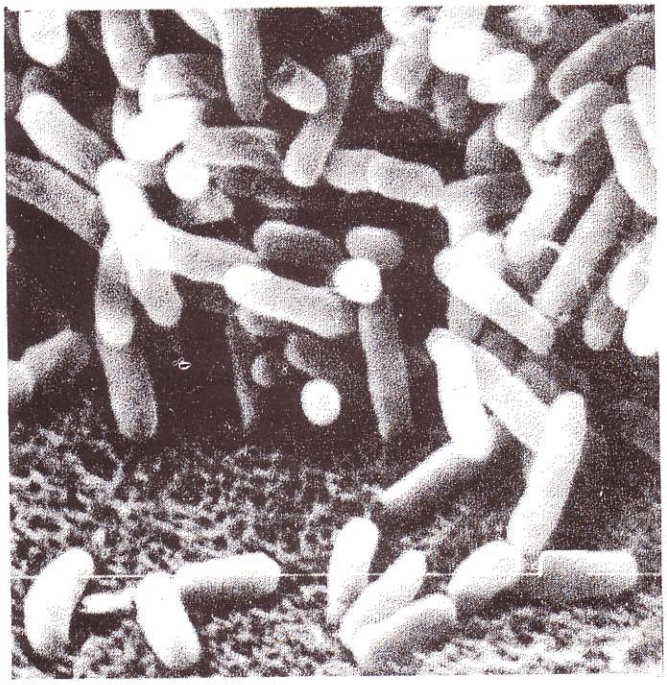


One can only distinguish between these two effect in studies in which the Exudate compounds and the glucomannan components of Aloe have been effectively separated. In any studies with *Aloe arborescens* the Whole Leaf Extract is usually used, and similarly, if *Aloe vera* Whole Leaf Extract is used without carbon filtration, both the Exudate materials and the glucomannan are present together and their actions cannot be distinguished. This seems to be most often the case with Japanese work on the anti-bacterial effects of Aloe are investigated, where species other than *vera* are usually employed, especially Whole Leaf Extracts of *Aloe arborescens*.

Some work reported in the literature omits to make it perfectly clear whether the Aloe preparations being studied contain Exudate or glucomannan or both. This is true of the work of Heggers et al (1979), in which clear anti-microbial effects are reported.

To help the reader conceptualize the microorganisms involved in infections, suitable illustrations of bacteria and viruses are provided amongst the text.

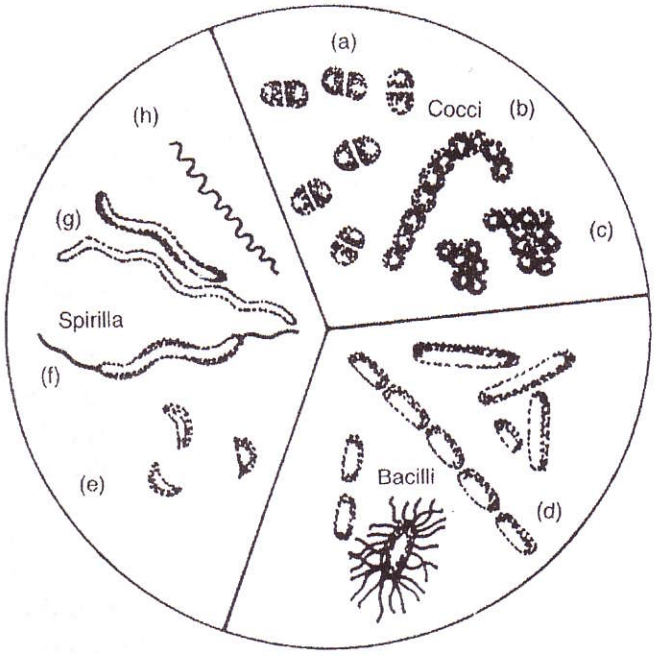




Pictures of typical Bacillus type, rod-shaped bacteria.

The Bacteriostatic / Bacteriocidal effects of *Aloe* Exudate

Lorenzetti et al, in 1964, tested leaves of *Aloe vera* for activity against several bacterial types. The material used was the Exudate fraction, that is to say, they cut the leaves and allowed the juice to drain out. This material was effective against *Staphylococcus aureus* - an organism present in purulent discharges - but only when it was quite fresh, or when steps were taken to preserve it by heating (presumably to inactivate enzymes that were destroying the activity) followed by freeze-drying. Some species of the bacterial genera *Salmonella, Streptococcus, Staphylococcus* and *Corynebacterium* were inhibited by these freeze-dried extracts, though some other species of the same genera were not inhibited.



A variety of different bacterial types.

Bruce, in 1967, also did tests for anti-bacterial activity on the Exudate of *Aloe vera*. The results showed considerable activity against gram-positive bacteria and against human tubercle bacillus - the organism of tuberculosis. The results with *Aloe vera* showed more anti-bacterial activity than with other species of Aloe and was detectable even when the juice was diluted 1,600 fold. This work appeared to show, not surprisingly, that the anthraquinone compounds in the juice had the greatest anti-bacterial activity.

Haraguchi et al (1992), in a paper entitled "Action-mode of Anti-microbial Altersolanol A on *Pseudomonas aeruginosa*", demonstrated that an anthraquinone-type antibiotic interferes with the respiratory chain of the bacterium causing its death by the disruption of its energy sources.

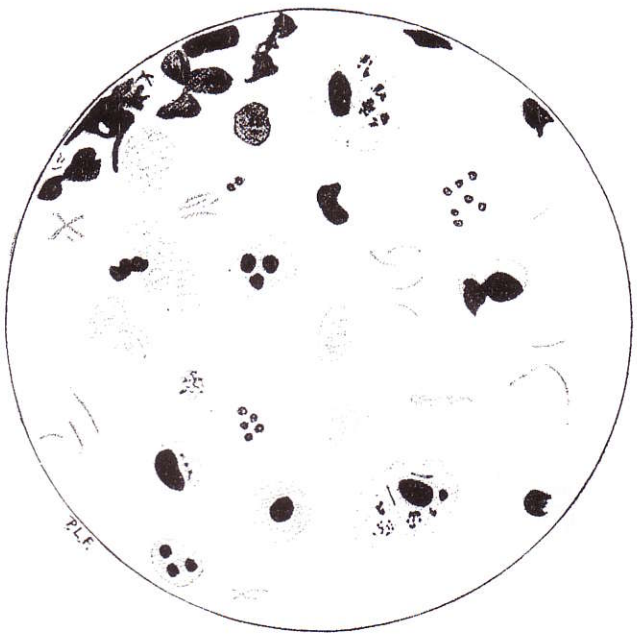
This seems to have been the first clear indication of just how the Aloe Exudate materials may work on the bacteria.

Anti-fungal effects of *Aloe vera* Exudate

Work such as that of Soeda, in two papers, both dated 1966, clearly indicates that the Exudate fraction of Aloe, or Leaf Extracts containing the Exudate materials, also have anti-fungal action.

Increased Resistance to Bacterial Infections after treatment with Aloe Gel or Whole Leaf

Most of the work on this subject has been done using *Aloe vera* Gel, since that has been most widely available in the recent past until Whole Leaf became available. Some of the work did not draw a clear distinction between direct bacteriocidal effect on the one hand and the immune-mediated effect on the other. This was possibly true with the work of Cheney in 1970 and of Robson et al in 1980.

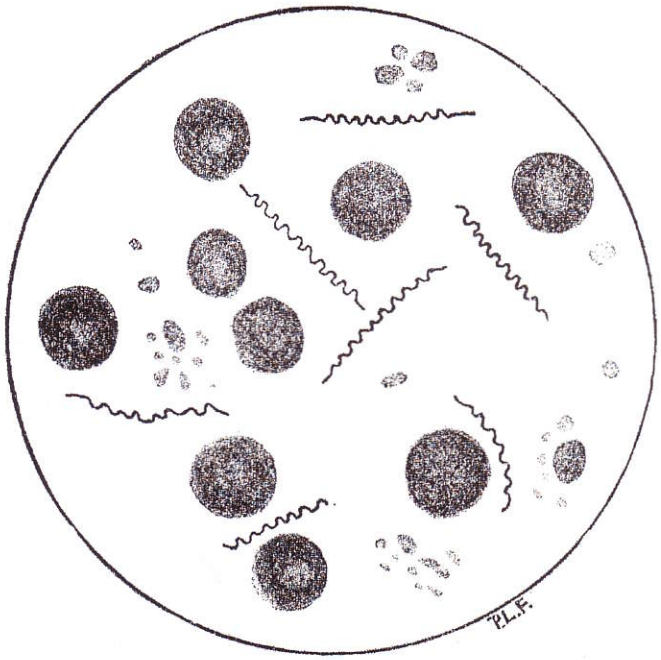


Tubercle bacilli in sputum from pulmonary tuberculosis (stained by the Ziehl-Neelsen method). x 1000

This was concerned with putting Aloe Gel onto burns and studying whether the organism which most often infects burn tissues, *Pseudomonas aeruginosa*, was inhibited. Cheney's results were

negative and those of Robson were positive, but in this particular situation there is no way to distinguish between a direct bacteriocidal action and an immune mediated response. Cera et al (1980) also found that there was inhibition of *Pseudomonas aeruginosa* in the burn tissues of the skin of dogs

Based upon other studies with *Aloe vera* Gel, and the fact that the Gel is readily fermented and spoiled by bacterial growth if not Pasteurized and treated with preservatives, its direct bacteriocidal properties do not appear at all strong. Most of the other work with Gel or Whole Leaf Extract makes it clear that an immune mediated is usually involved.



Trep. pallidum *in tissue (stained by Levaditi's method). x 1000*

Northway, in 1975, used a commercial extract of *Aloe vera* Gel in his veterinary practice to treat a number of external conditions in a total of 67 animals. Part of his conclusion was that there was excellent response in the case of fungal infections and also "in the treatment of mixed bacterial infections".

Solar et al. (1979), of l'Institut Pasteur de Madagascar, wrote a paper entitled "Mise en evidence étude proprietes immunostimulantes d'un extrait isole et partiellement purifie a partir d'Aloe vahombe". The extract, obtained from a species of Aloe other than *Aloe vera*, markedly increased the resistance of mice to *Klebsiella pneumoniae,* apparently through the effects on host physiology (by inference, the immune system), rather than an antibiotic or anti-septic effect.

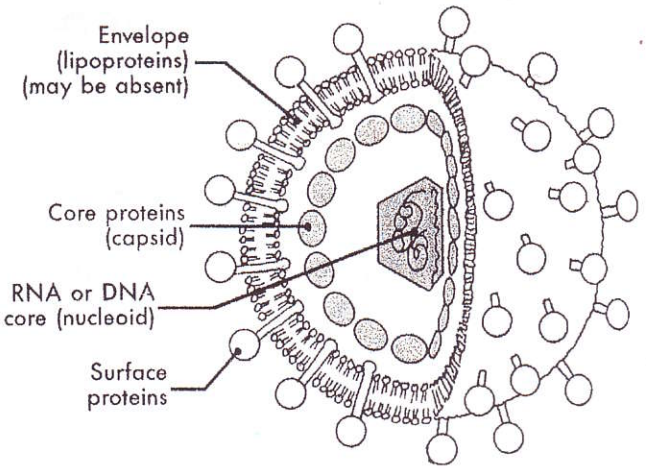
Increased Resistance to Viral Infections after treatment with Aloe Gel or Whole Leaf Extract

There is no doubt that some of the most interesting work in this whole area relates to the way in which use of Aloe augments the body's resistance to viral infections. Only a small amount of such work has been reported and, as is so often the case, it leaves one wishing that a great deal more work of this type could be done. The available reports relate to work on cats with the Feline Leukemia Virus (FeLV) and to human infection with AIDS. In some of this work the material used is referred to as "acemannan". The reader is asked to accept this as a synonym for "glucomannan". Really it is a trade name for isolated and dried glucomannan from Aloe.

Feline Leukemia Virus

The work with cats is that by Sheets et al (1991) entitled "Studies On The Effect Of Acemannan On Retrovirus Infections: Clinical Stabilization Of Feline Leukemia Virus-Infected Cats." It ranks as a very important paper amongst the whole of the Aloe literature. This virus is connected with quite a variety of disease symptoms in cats. These include lymphoproliferative diseases, such as leukemia and lymphosarcoma. In other words, they are neoplasms related to the lymphatic system of the body, or the white cells of the blood. They are also connected with diseases in which cell reproduction and activity levels are adversely affected, for example, immunodeficiency disease in cats and aplastic anaemia. Enteritis may also be involved. In America it is reckoned that about one third of cancer deaths in cats are related to (FeLV). Whilst only about 30% of cats which become infected actually develop clinical disease, this is presumed to be on account of effective immune response. Those cats which develop clinical disease and become viraemic (viruses in the blood) virtually all die from the infection. It is estimated that 40% die within 4 weeks of infection and 70% die within eight weeks. Therefore most infected animals are "put down" to save unnecessary suffering. Therefore, if one is looking for a form of infection that will be a good test of Aloe's immunostimulant powers, then FeLV is quite a severe test.

In the study 44 cats were treated. None of the owners would permit their animals to become controls, due to the hope that Aloe acemannan would save them. The dose was administered intraperitoneally weekly at a level of 2mg of the dry solid per kilo of the animal's body weight. The study



The essential components of a single virus particle.

was continued for 12 weeks. At the end of that time 29 cats (71% of those that completed the study) were alive. Five (12.2%) had died very soon after the beginning of the study and were considered to have been terminal (untreatable by any known therapy) even when they were first selected. After these were excluded, the loss rate was therefore 16.8%. Follow-up 39 weeks after the beginning of the study showed that owners of the surviving cats reported them as being "healthy and happy" pets with a normal state of activity. The conclusion of the authors was that "The significant improvement in viability as well as the overall health of the treated cats suggests that acemannan is an effective treatment of FeLV infection".

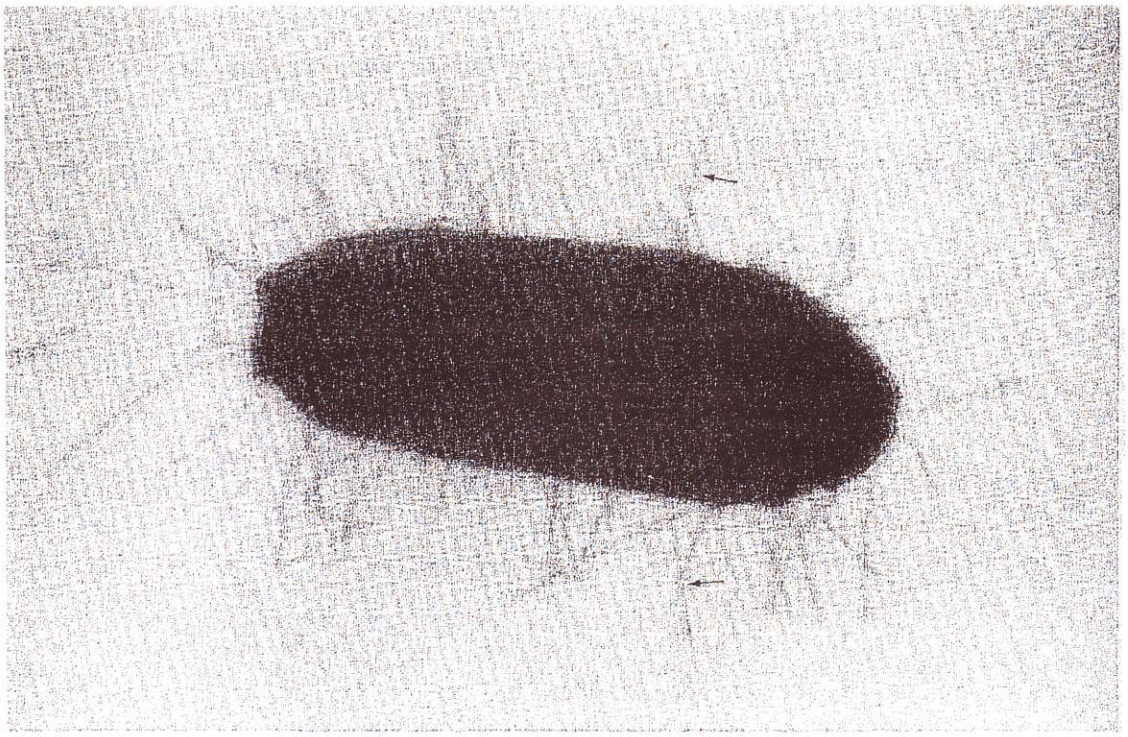
Sheets and co-authors make a number of observations about the mechanisms by which the acemannan is likely to act against viruses. Firstly, they point to work done by Borecky et al in 1967 entitled "An Interferon-Like Substance Induced By Mannans". Interferon is an antiviral substance normally produced in the human body. It is of interest to note that a mannan polysaccharide had this effect on interferon production even though it was obtained, not from Aloe, but from the fungus *Candida albicans*. Then, these authors recognised the importance of the immuno-stimulant effects which have been reported in NewsLetter No 1. Lastly, they point out that, according to Kemp et al (1990), the acemannan does have some direct antiviral properties, demonstrated against HIV, Newcastle disease virus and influenza. This was attributed by Kahlon et al (1990), to an interference with the normal interactions of the virus with carbohydrates (glycosylation). Seen in this light, this aspect of the antiviral action has to be classed as an interference in the usual interactions taking place during infectivity between the virus and the host.

A year after the study by Sheets et al there was a further study on cats by Yates et al (1992), entitled "A Pilot Study of the Effects of Acemannan with Feline Immuno-deficiency Virus". Like the study by Sheets et al, this showed improved survival rates from the use of Acemannan.

The AIDS Virus

The work of Pulse & Uhlig, 1990, entitled "A Significant Improvement In A Clinical Pilot Utilizing Nutritional Supplements, Essential Fatty Acids And Stabilized *Aloe vera* Juice In 29 HIV Seropositive, ARC And AIDS Patients." has shown that Aloe, together with the nutrients cited in the study, can be effective in improving the general health and immune status of AIDS patients. The trial lasted for 180 days and the 29 patients were assessed by medical examination and laboratory studies at 30, 60, 90 and 180 days after the start of the programme. They were also assessed by a Modified Walter Reed Clinical Evaluation. This showed that, according to that evaluation, all 29 patients improved by 90 days and 27 of them made further improvement by 180 days. The mean value decreased by two units from a starting value of 5.39, a considerable improvement. They were also assessed by the Karnofsky Quality of Life Assessment, in which the scores rose in 90 days from a mean of 78.97% at the start to 92.41% at the end (these results show improvement as they rise). It is noteworthy that by 180 days, not only had the mean values improved but 100% of the patients individually, had shown improvements. Clearly, it is not possible to separate out the effects due to the Aloe from the effects of the essential fatty acids and other nutrients employed in the study. However, Practitioners will be quick to note that the use of Aloe *along with nutritional supplementation* is exactly what should be recommended, since Aloe itself is *not primarily taken for its nutrient content* and its use, logically, should never exclude or diminish the simultaneous use of nutritional supplements.

This very positive result is not unexpected in view of Aloe's proven powers of general enhancement of the immune system. The use of natural immuno-stimulants for this purpose, rather than synthetic drugs, has long seemed obvious to wholistic practitioners. Clearly, much more work needs to be done. In this connection it is good to note from an Editorial in "Inside Aloe" that a moderate-sized organised trial of *Aloe vera* against AIDS is planned at The South West College of Naturopathic Medicine and Health Sciences in Arizona, U.S.A. A paper was presented on this at the July 1996



Picture of the bacterium Escherichia coli, taken under the electron microscope, showing some strands (called "pili") projecting from the surface.

Meeting of the International Aloe Science Council by Dr. A. Schauss and Dr. I. Bier and it does appear that there is a real opportunity here to obtain better and fuller information about the effects of Aloe upon AIDS. There is certainly a fair amount of testimonial evidence in favour of the use of *Aloe vera* in AIDS, especially that offered by Ritter, 1991, Ritter, 1993.

These findings are backed up by some *in vitro* work (i.e. work on surviving tissues cells outside of the body in tissue culture) by Kahlon et al, 1991, entitled "Inhibition Of Aids Virus Replication By Acemannan In Vitro". White blood cells (mononuclear cells and T4 lymphocytes) were used in the experiment as "targets" for the virus attack. Exposure to the glucomannan of Aloe showed that it offered a degree of protection to the blood cells from attack. The replication of the virus was slowed down and there was a decrease in the infectivity of the viral progeny. The same thing was observed with Newcastle disease virus and the Herpes simplex virus.

Viral Inhibition by Mannans and Glucomannans from other Sources

It is clear from the literature that viruses are inhibited by biologically active carbohydrates other than Aloe glucomannan. This rather more general phenomenon is of considerable interest, since by studying it, a fuller explanation of just how Aloe glucomannan exerts its effects, may well evolve. Sheets et al considered that *Aloe vera* glucomannan possesses a combination of antiviral, immunostimulant and bone marrow stimulating activity that was ideal for treatment of FeLV infections. However, biological activities have also been found in yeast mannan and in mannans from the fungi *Microellobosporia grisea* and *Candida albicans* and from the plant *Amorphophallus konyac*, used in Japan as a foodstuff. Aloe glucomannan has a group of the type known as an acetyl group attached to its terminal mannose sugar (i.e. the mannose sugar at the end of each chain) while yeast mannan does not. This difference of structure may be important in connection with their different biological effects. There are also other polysaccharides, like glucans (polymers of glucose), having chemical linkages between the sugars other than the 1:4α linkages which are common in starches, which may have biological activity. Biological activity has also been found in polysaccharides containing the sugar rhamnose, or derivatives of the sugar galactose. All this means that the biological activity of the Aloe polysaccharide fraction can be viewed within the context of the much wider field of polysaccharide biological activity generally and, perhaps, understood within that wider context. Both Aloe glucomannan and also *Amorphophallus konyac* glucomannan contain 1:4b linkages between the mannose sugar units, and this, together with an acetyl group on the last sugar in the chain, may prove to be most important in determining Aloe's special activity and properties.

How Should Practitioners Proceed ?

There is sufficient evidence of *Aloe vera*'s effectiveness against infections to regard it as a potentially powerful aid in both fighting established infections and in providing protection against infections not yet encountered. There may be no evidence in the literature about the use of Aloe against the particular infection that you have to deal with, but its use seems clearly supported by its established antiviral, immunostimulant and bone marrow stimulating activities. Whilst it may, indeed, as Sheets et al said, have some direct inhibiting effect upon the viruses, its main impact seems to be upon host physiology. The improvement of resistance in this way should be of benefit to the host (the infected or potentially infected individual), whatever the identity of the virus. One can look to an expected major benefit being obtained in those cases where the immune system has been badly prejudiced, for example by the use / abuse of antibiotics, and / or by the surgical removal of tonsils, adenoids or appendix. People like this can become so prone to infection that they cannot lead normal lives through being laid low by repeated infections. Every Wholistic Practitioner knows that repeated use or - worse still - constant use, of antibiotics is absolutely no answer in such cases since it undermines the functions of intestines, liver and immune system more or less simultaneously. Aloe seems to offer an answer to this problem. It is wise, however, to remember that Aloe is not of much importance as a source of nutrition and that nutritional treatment for the support of the immune system should be maintained at the same time. There is also no reason why other immune-supportive herbs should not also be used in difficult cases when required.

References on the Use of *Aloe vera* and related substances for their anti-bacterial and anti-viral properties.

No.	Title Or Subject	Authors	Date	Topic	Reference
1	"Bacteriostatic Properties Of *Aloe Vera*"	Lorenzetti, L., Salisbury, R., Beal, J., & Baldwin, J.	1964	Anti-bacterial	Journal of Pharm. Science. 53 1287.
2	Anti-microbial Activity, Fungal Included	Soeda, M., Otomo, M., Ome, M., & Kawashima, K.	1966	Anti-bacterial Anti-fungal	Nippon Saikingaku Zasshi, 21 609-614
3	"Investigations Of The Anti-bacterial Activity In The Aloe."	Bruce WGG	1967	Anti-bacterial	South African Medical Journal 41 984
4	"An Interferon-Like Substance Induced By Mannans"	Borecky, L., Lackovic, V. & Blaskovic, D.	1967	Antiviral Mannans General	Acta Virol. 11 264-266
5	"Stimulation Of Interferon Production By Mannans"	Lackovic, V. Borecky, L & Sikl, D.	1970	Antiviral Interferon	Proc. Soc. Exp. Biol. & Med. 62 343-352
6	Anti-Microbial & Anti-Fungal Properties of Aloe	Fujita, K., Yamada, Y., Azuma, K., & Hirozawa, S.	1978	Anti-bacterial Anti-fungal	Agents Chemother. 14 132 Chem Abs. 89 141102j.
7	"Dermaide / *Aloe Vera* Gel: Comparison Of The Effects"	Heggers, J., Pineless, G., Robson, M.	1979	Anti-bacterial Anti-Microbial	J. Amer. Med. Technol. 41 293-294.
8	"Anti-fungal Substances From *Sophora Flavescens*".	Yagi, A., Fukunaga, M., Okuzaco, N., Mifuchi, I., & Kawamoto, F.	1989	Anti-bacterial	Shoyakugaku Zahasi, 43 (4) 343-347.
9	"A Significant Improvement In A Clinical Pilot Utilizing Nutritional Supplements, Essential Fatty Acids And Stabilized Aloe Vera Juice In 29 HIV Seropositive, ARC And AIDS Patients."	Pulse TL & Uhlig E	1990	Anti-viral - AIDS	J Adv Med 3 (4) 209-30
10	In Vitro Evaluation Of The Antiviral Effects Of Acemannan On The Replication And Pathogenesis Of HIV - 1 And Other Enveloped Viruses: Modification Of The Processing Of Glycoprotein Precursors.	Kemp, M.C., Kahlon JB, Chinnah, JM	1990	Anti-viral - AIDS	Third Internatl. Conference on Anti-viral Research, Brussels, Brussels,April 22-27th Abstract #84
11	"Use of acemannan in treatment of feline immunodeficiency virus disease"	Yates KM, Carpenter RH, Harris CK, Bronstad DC, Biehle GA, Walker BW, King GK. Harris CK, Bronstad DC, Biehle GA, Walker BW, King GK.	1991 Oct	Anti-viral	Abstr presented at Veterinary Cancer Society 11th Annual Conference, Minneapolis, Minnesota
12	"Effect of acemannan in treatment of feline immunodeficiency virus-infected cats." University of California, Davis, California	Carpenter RH, Harris CK, Bronstad DC, King G, Bichle GA, Walker BW, Yates KM, Tizard IR.	1991 Sept	Anti-viral	Abstract presented at First International Conference of Feline Immunodeficiency Virus Researchers.
13	"Studies On The Effect Of Acemannan On Retrovirus Infections: Clinical Stabilization Of Feline Virus-Infected Cats."	Sheets, M.A. et al.	1991	Immuno-stimulant Anti-viral	Mol. Biother. 3 41-45
14	"Aids And Aloe Vera."	Ritter L	1991	AIDS	Health Conscious Aug 12 (4) 33
15	"Studies On The Effect Of Acemannan On Retrovirus Infections: Clinical Stabilization Of Feline Virus-Infected Cats."	Sheets, M.A. et al.	1991	Anti-viral	Mol. Biother. 3 41-45
16	"Inhibition Of Aids Virus Replication By Acemannan In Vitro"	Kahlon, J.B. Kemp, MC, Carpenter, RH	1991	Anti-viral AIDS	Antimicrob. Agents Chemother. (submitted for publication)
17	"A Pilot Study of the Effects of Acemannan with Feline Immuno-deficiency Virus".	Yates KM, Rosenberg LJ Harris, CK et al	1992	Antiviral	Vet. Imm. Immunopath. 35, 177-189.
18	"Aids and Aloe Vera Extract."	Priestley JC & Kupsinel RB	1992	AIDS	Health Conscoius 13 (1) 40-1
19	"Action-Mode Of Anti-Microbial Altersolanol A On *Pseudomonas Aeruginosa*".	Haraguchi, H., Takahiro, A, Hashimoto, K., Yagi, A.	1992	Anti-bacterial	Biosci. Biotech. Biochem., 56 (8) 1221-1224.
20	"Aloe Vera To Be Tried As Aids Treatment"	Loddeke L.	1992	Anti-viral AIDS	The Houston Post October 4:1
21	"Pilot study of the effect of acemannan in cats infected with feline immunodeficiency virus."	Yates KM, Raboud J, Tizard I.	1992 ?	Anti-viral AIDS	Poster presented at 2nd Annual Canadian National Conference on HIV/AIDS Res.
22	"Antifungal Ptero-Carpan Derivatives"	Yagi, A et al,	1993	Anti-fungal	Shoyakugaku Zahasi 47 (2) 105-110
23	"Aloe Vera - A Mission Discovered".	Ritter L.	1993	Anti-viral AIDS	Book Published by Triputic, Utah, USA.
24	"A comparison of the effects of acemannan (ACM) given by three routes of administration to feline immunodeficiency virus (FIV) - infected cats."	Yates KM, Kemp MC, Ni Y, Raboud J, Ford CR, Tizard IR.	Jan. 1993	Anti-viral	IXth International Conference on AIDS/IVth STD World Congress,
25	"Study to Measure Effects of Aloe On AIDS Seeks Funding"	Editorial contribution	1996	Anti-viral AIDS	"Inside Aloe"