



Anti-Leishmanial Activity of Aloe Vera Leaf Exudate in Vivo

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Abstract: The study examined the efficacy of aloe extract in the topical application of zoonotic leishmaniasis. To date, specific drug prevention of leishmaniasis has not been developed.

Due to drug trial and side effects of leishmaniasis treatments, achieving treatment efficacy through unique side effects and greater benefits is of paramount importance. The present study was aimed at a retrospective analysis of aloe vera leaf exudate for *Leishmania major* in in vivo models on patients with different wound sizes.

There are certain difficulties in the treatment of leishmaniasis, such as drug resistance and side effects of standard drugs.

Key words: aloe vera leaf exudate; in vivo; *leishmania major*.

Relevance.

Leishmaniasis is a public health problem in the Middle East, Central Asia, Africa and many tropical and subtropical regions of the world (3,4,20). According to reports from the World Health Organization (WHO), it is among the six most important tropical diseases (6).

In terms of adverse side effects, resistance to commonly used anti-leishmaniasis drugs, toxicity and cost, the achievement of a naturally occurring bioactive compound with less toxicity and high efficacy has recently received much attention and increased interest in medicinal plants (19,23). According to a WHO report, about 80% of the world's population uses traditional medicine (1,2). Cutaneous leishmaniasis is endemic in parts of Uzbekistan. At present, anti-leishmaniasis drugs are either toxic or too expensive for routine use in developing countries, where the disease is most common (24).

In this regard, the results of some studies suggest the use of herbal medicines in the treatment of certain skin diseases (3,25). The treatment of this disease can be effectively done with the help of herbal preparations. Some studies have successfully reported finding plant products and used them against *Leishmania*, some have not shown a therapeutic effect on cutaneous leishmaniasis (4,5).

Patients with leishmaniasis should be monitored because sometimes the treatment does not give satisfactory results, especially in immunodeficient cases. Like other opportunistic parasites such as *Leishmania* (6,7,8), disease reactivation and atypical clinical manifestations may occur and easily lead to its widening of wounds.

Aloe vera is widely used in health products, and despite several reports of whole growth and fiber gel, little has been done with leaf exudate (20). Our aim was to evaluate the *in vivo* efficacy of aloe vera leaf exudate (AVL) in leishmaniasis. Regardless of disease manifestation, promastigotes from the strains responsible for cutaneous, mucocutaneous, and visceral leishmaniasis were sensitive to aloe vera leaf exudates.

Aloe vera extract causes macro-activation of host phages, as evidenced by increased release of reactive oxygen species, which was attenuated by pre-incubation with high radical scavengers(3).

Aloe vera (AV) is among the herbal disinfectants with a long history of medicinal properties(21). AV has a variety of biological activities, including laxative, antimicrobial and antifungal, immunostimulatory, anti-inflammatory, antitumor, antidiabetic, and wound healing activities. Moreover, some studies have reported AV as a powerful agent against leishmaniasis (10,11). AV has a direct parasitocidal effect on all forms of *Leishmania*, enhances activated macrophages and leads to an increase in TNF- α , which is the main mediator of acute inflammation (26). Therefore, it may have a positive effect on the antigen process and induce resistance against infection. Moreover, some studies have shown that AB has no adverse effect on the host cell (6,9) and has antimicrobial activity when extracted with acetone (17,18).

In addition to the direct parasitocidal effect of AVL on *Leishmania*, it had immunomodulatory activity and contained two low molecular weight and high molecular weight constituents (25). The low molecular weight component has anti-inflammatory and immunosuppressive properties, but the high molecular weight component has immunostimulatory properties, increases activated macrophages, and enhances reactive oxygen species (ROS) and reactive nitrogen species (RNS) in macrophages, which lead to increased secretion of IL12, IL1, IL6, and TNF - α (12,13,14,15). This result is in line with the results of the *in vivo* model currently being studied.

Locals in the Somali region of Ethiopia use Aloe vera leaves to treat malaria, jaundice and skin conditions (22). In a constant search for new, effective and safe antileishmanial drugs, we investigated Aloe vera leaf exudate and its acid-hydrolyzed product against promastigotes and amastigotes found in the wounds of patients. An activity study was performed based on the fluorescence characterization of resazurin added to drug-treated cultures.

Some studies (3,16) have used the plant's internal gel and have shown that emodin compounds can effectively reduce ulcer size in cutaneous leishmaniasis, but in the present study we used the plant leaf instead of our gel.

Purpose of the study. In the present study, the antileishmanial activity of Aloe vera was evaluated *in vivo* in patients.

To evaluate clinical and laboratory changes in the topical treatment of zoonotic leishmaniasis with aloe extract in combination with a mixture of ointments.

Material and research methods. A study was made on 30 sick children, men and women with zoonotic leishmaniasis for 20 days, average age from 3 to 50 years. Patients complained of necrotic foci, leishmaniomas accompanied by an increase in regional lymph nodes and lymphangitis (usually painless) and wounds with complications of purulent infection with the development of phlegmon, erysipelas. A microscopic examination of the material from the wound was carried out in order to diagnose the Borovsky body. All patients had positive parasitological parameters.

Due to drug trial and side effects of leishmaniasis treatments, achieving treatment efficacy through unique side effects and greater benefits is of paramount importance. Moreover, in the treatment of complex cases of cutaneous leishmaniasis, the use of AV will be suggested as an adjunctive treatment.

The present study was aimed at a retrospective analysis of aloe vera leaf exudate for *Leishmania major* in in vivo models on patients: various exudates of aloe vera origin (AV) and standard preparations, a mixture of Levomekol, Vishnevsky and Ichthyol ointments, were prepared. Measurement of wound area after 24, 48 and 72 hours.

A total of 30 patients with cutaneous leishmaniasis were divided into three groups for in vivo models:

1: Main group, Patients of group 1 (main group) To study the effect of aloe extract with 4 times topical application for 20 days.

2: Patients of the 2nd group (main group). To study the effect of aloe extract with 8 times topical application for 20 days.

3: Patients of the 3rd group (patients of the control group) who received conventional therapy.

1 and 2: experimental groups (treatment with aloe vera extract 4 times and aloe vera extract 8 times, respectively). Ulcer size was recorded at the beginning of the experiment weekly for 3 weeks.

Results and discussions. In the 1st group (14 people) with a wound size of 0.5-2 cm. In the 2nd group (21 people) with a wound size of more than 2 cm and with complications in the regional lymph nodes.

The remaining patients of the 3rd group, regardless of the wound, received traditional therapy.

A decrease in the size of wounds with almost perfect smooth scars in the 1st group occurred in 7 people (50%), already for 1 week. In group 2, in 3 people (14%) for 3 weeks, the disease did not turn into a complicated form. In Patients of the 3rd group, 1 person experienced epithelialization at the 4th week, in the remaining patients of the 3rd group, recovery up to 4 weeks was still not observed.

Conclusions:

Results from an in vivo model showed that both aloe vera extract and ointment mixture reduced promastigotes and AV at 8 times use and the ointment mixture significantly reduced ulcer size more than 4 times AV. For the in vivo study, the ointment was in the ratio of AB mixture as herbal medicine and ointment mixture as standard treatment had similar results.

These data are supported by some studies (13,15) which reported that AV can heal skin ulcers and repair some skin damage. AVL has a direct leishmanicidal effect.

Treatment of promastigotes with AVs has demonstrated dose- and time-dependent inhibition of parasite growth such that reduction in promastigotes increases AV concentration and AV exposure time.

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