

# Effect of Aloe vera extracts on the histological features of male mice testis

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## Abstract:

### Background

Among various natural therapeutic remedies, Aloe vera, a medical plant widely used in food supplements, beverages, pharmaceutical and cosmetics. Aloe vera has been widely reported for its numerous medicinal effects.

### Objectives

The present investigation was carried out to study the histological changes in the mice testis consumed low doses of Aloe vera leaf gel extracts

### Methods

Forty immature male Swiss Webster mice divided into two equal groups (experimental and control) (G and C respectively). The experimental group (G) was given 10 µl of Aloe vera extract orally for 21 days. While the control groups (C) were given by the same dose and rout of administration with normal saline only. After six weeks (around puberty) the male were sacrificed to get their testes; each testis was fixed. Then histological sections with a thickness of 5 microns were prepared.

### Results

Histological studies of mice testes from groups that consume low dose Aloe vera extracts showed enhanced the entire structure of spermatogenic layer of seminiferous tubules that composed of extensive normal arranged germ cells layer. A significant increase in the numbers of spermatogonia, primary spermatocytes and spermatids, rates of normal supporting (Sertoli cells) and Leydig's cells. A significant increase in the rate of height of epithelial cells, and rates of sperms concentration in the seminiferous tubules were observed too.

### Conclusion

Using low dose of Aloe vera extract enhanced the histological structure of male mice testis and may be useful to produce drugs to improve male fertility.

**Key words:** Aloe vera, testis, male reproductive system.

## Introduction

It is only in recent times that the renewed interests in natural products are being subjected to scientific method of testing. The use of Aloe vera cuts across barriers of time and culture in the treatment of a broad range of illnesses. The basis of its reputation resides mainly with steadfast belief in claims of its curative properties, but without hard scientific evidence [1]. 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 [2]. Studies on Aloe vera have largely upheld the therapeutic claims of anti-diabetic, anti-cancer and anti-biotic properties of this plant extract [3, 4]. Other uses for extracts of Aloe vera include the dilution of semen for the

artificial fertilization of sheep [5]. There is preliminary evidence that Aloe vera extracts may be useful in the treatment of diabetes [6]. These positive effects are thought to be due to the presence of compounds such as mannans, anthraquinones and lectins [6, 7, and 8]. It has also been linked with lower blood lipids in hyperlipidaemic patients [9] and with acute hepatitis [10]. In other diseases, preliminary studies have suggested oral Aloe vera gel may reduce symptoms and inflammation in patients with ulcerative colitis [11]. Aloe vera extracts might have antibacterial and antifungal activities, which possibly could help treat minor skin infections, such as boils and benign skin cysts and may inhibit

growth of fungi causing tinea [12]. For bacteria, inner-leaf gel from Aloe vera was shown in one study to inhibit growth of *Streptococcus* and *Shigella* species in vitro [13]. Aloe barbadensis is also among is used in various diseases as anti-inflammatory, antiulcer, antineoplastic and in wound healing [14]. It is known that it is activating macrophages and has also antiviral effect [15]. The medicinal properties were attributed to the active components in Aloe vera and its extracts, such as anthrone, chromone, aloe verasin, and hydroxyaloin separated and identified by high-performance liquid chromatography [16]. aloctin A is reported to have antitumor and antiulcer effects [17]. Glucmannan and acemannan can accelerate wound healing, activate macrophages, and demonstrate antineoplastic, antiviral effects [18]. Previous study of Jasem and Nasim [19] strongly proposes that Aloe vera specially its gel fortifies spermatogenesis and can be a good candidate for manufacturing fertility drugs. A 1999 review by Vogler and Ernst lists 75 potentially active constituents, including a wide variety of vitamins [20, 21 and 22], such as vitamin B1, B2, B6, and C; niacinamide and choline, several inorganic ingredients; enzymes such as acid phosphatase, alkaline phosphatase, amylase, lactic dehydrogenase, and lipase; and numerous organic compounds such as aloin, barbaloin, and Emodin [23]. Yamaguchi et al., 1993 reported the presence of aluminum, boron, barium, calcium, iron, magnesium, sodium, phosphorous, silicon, and strontium in Aloe vera gel [24]. It was of interest to determine effects of antioxidant activity in vitro and in vivo in whole Aloe vera leaf extracts and their physiological effects in biological systems. A potent antioxidative compound was isolated from a methanolic extract of Aloe vera barbardensis Miller [25]. There is however scanty information on its effects on the reproductive system.

### Materials and Method:

Forty immature Swiss Webster male mice (3 weeks old) were divided into two equal groups: experimental (G) and control (C), twenty animals each. Aloe vera juice is mechanically extracted from plant leaves. They are cut from the trunk and roots of the plant and the terminal tip and lateral thorns are eliminated. The gelatinous substance inside the leaves is separated from the protective external envelop. The obtained substance is then divided into different pieces, and then Aloe vera filters were obtained manually with care to avoid contamination of the gel, divided into 2 ml volume tubes, and stored for 3 days at -20°C before being used.

The experimental group (G1) was given 10 µl of stored Aloe vera extract orally for 21 days. While the parallel control group was given normal saline by the same rout and dose as that used in the experimental group. After six weeks (around

puberty) the male were sacrificed to get their testes. Each testis was fixed with 10% formalin, and histological sections with a thickness of 5 microns were prepared using the routine histological technique [26].

### Results:

#### Histological observations:

The histological observations of the testes of control group showed normal tissue structure, with the tunica albuginea at their periphery surrounds the well organized seminiferous tubule that composed of germinal epithelium with normal germ cells population layer thickness, a normal orderly arranged pattern up to mature spermatid and adequate supporting (Sertoli cells) population. Interstitial cells (Leydig cells), which are large polyhedral cells that have spherical nucleus were seen between seminiferous tubules Figure (1). While histological observations of the testes from groups that consume low dose Aloe vera extracts showed numerous, normal seminiferous tubules that composed of normal arranged germ cells layer Figure (2). In addition, the height of epithelial cells which are lining seminiferous tubule showed a significant increase, also a significant increase in the numbers of spermatogonia, primary spermatocytes and spermatids. As well as increase in normal supporting (Sertoli cells) and Leydig's cells numbers compared with the control group. Rates of sperms concentration in the seminiferous tubules have been revealed a significant increase compared with the control group Figure (3).

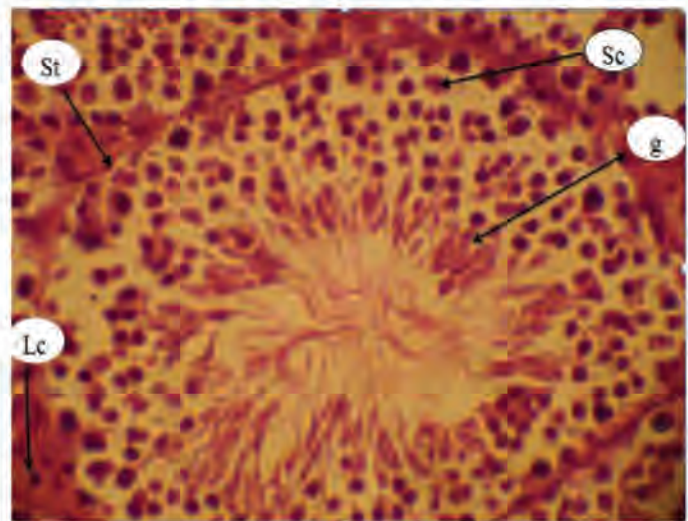


Figure 1: Histological section of mice testis from control group show normal tissue structure, well organized seminiferous tubule (st) that composed of germinal epithelium (g) (double arrow) with normal spermatogenic lineage cells (spermatogonia, spermatocytes, and spermatids) and supporting (Sertoli cells) (Sc). Interstitial cells (Leydig cells) (Lc), which are large polyhedral cells that have spherical nucleus were seen between seminiferous tubules. Stained by H&E (40X).

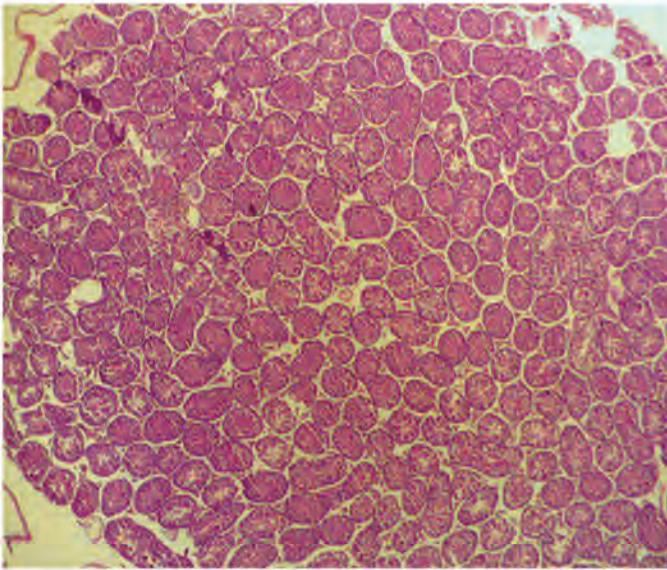


Figure 2: Histological section of mice testis from treated group show numerous, normal seminiferous tubules that composed of normal arranged germ cells layer. Stained by H&E (4x).

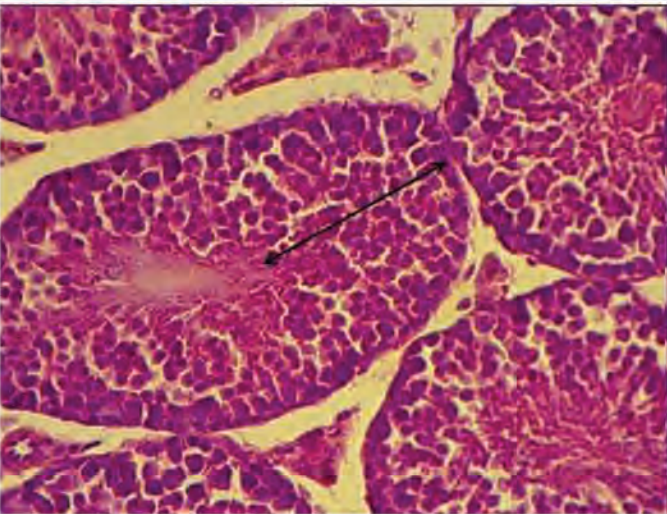


Figure 3: Histological section of mice testis from treated group show normal seminiferous tubules (st) that composed of extensive normal arranged germ cells layer (g) with normal spermatogenic lineage cells (spermatogonia, spermatocytes, and spermatid) and normal supporting (Sertoli cells) (Sc). Clearly observe the increase of the height of germinal epithelium (g) (double arrow) and increase numbers of sperms were seen inside lumen of seminiferous tubules (st). Stained by H&E (20X).

### Discussion

Aloe vera is used widely in the traditional herbal medicine for many purposes [27]. The histological observations of the testes of male mice consumption of low dose of Aloe vera leaf extract revealed numerous, normal seminiferous tubules that composed of extensive normal arranged germ cells layer with normal spermatogenic lineage cells (spermatogonia, spermatocytes, and spermatid) and normal

supporting (Sertoli cells) and clearly observe the increase of the height of germinal epithelium. These observations is agree with the work of Jafaribarmak and Khaksar [28] that cited Aloe vera extract can increase the seminiferous tubules diameter, spermatogonia, Leydig and Sertoli cells. This enhancement in testicular tissue may due to the role of antioxidative phenolic compound in Aloe vera and its effects on lipid peroxidation [29]. Oxidative stress in cells and tissues results from the increased generation of reactive oxygen species (ROS) and/or from decreases in antioxidant defense potential [30]. Besides elevated generation of free radicals may lead to disruption of cellular functions and oxidative damage to membranes and may enhance susceptibility to lipid peroxidation [31]. Under physiological conditions, a widespread antioxidant defense system protects the body against the adverse effects of free radical production [32]. Furthermore the antioxidant defense system represents a complex network with interactions, synergy and specific tasks for a given antioxidant [33]. Moreover the ineffective scavenging of free radicals may play a crucial role in determining tissue damage [34].

Antioxidant actions of some natural compounds such as vitamins and minerals, polyphenols, and other non-nutrient compounds of plants, which inhibit generation of ROS, or which scavenge free radicals, are therefore believed to be beneficial for human health [35, 36].

Aloe vera contains 75 potentially active constituents: vitamins, enzymes, minerals, sugars, lignin, saponins, salicylic acids and amino acids [20]. It contains vitamins A (beta-carotene), C and E, which are antioxidants. It also contains vitamin B12, folic acid, and choline. It also provides calcium, chromium, copper, selenium, magnesium, manganese, potassium, sodium and zinc. These elements are essential for the proper functioning of various enzyme systems in different metabolic pathways. Moreover it provides monosaccharide (glucose and fructose) and polysaccharides these are derived from the mucilage layer of the plant and are known as mucopolysaccharides [37]. Aloe vera contains at least seven super-oxide dismutase with antioxidant activity [38], which reduces lipid peroxidation and mops up free radicals [39]. The histological observations of the testes also revealed increase numbers of sperms inside lumen of seminiferous tubules. These finding is agree with work of Jasem and Nasim [19], who improve that treatment of rats with the extract of Aloe vera causes a significant increase in sperm count and motility, and decrease in sperm abnormalities in compare with control group, this extract also causes an increase in testes weight of rats. On the other hand the significant increase in sperm concentration recorded, may be due to increase in sperm production in testes since Aloe

vera extract has spermatogenic activity in adult male rats due to chemical compounds in it as mucopolysaccharides, enzymes, sterols, prostaglandins (PGs). Some of PGs (i.e. PGD<sub>2</sub>, PGE<sub>2</sub>, and PGF<sub>2a</sub>) participate in the regulation of testicular testosterone production. Suggesting that PGs might actually be of relevance in male fertility physiology and/or pathology. Moreover, Analysis of testosterone level between groups showed that the level of this hormone in the groups that treated with Aloe vera has increased remarkably [40]. Aloe vera may enhance male fertility by elevating sperm quality [19]. Maurice, 1993 [41] also reported that a dose of 60 mg/kg b.w. of Aloe vera powder increased both the fertility rate and the litter size of rabbits. This study proposes that Aloe vera specially its gel enhances spermatogenesis and can be use for improve fertility.

### Conclusion:

From results we can conclude that consumption of low dose of Aloe vera leaves extracts has been resulted in enhancement the histological structure of male mice testis and may be useful for fertility.

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