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Effectiveness of Aloe Vera Extract (Lidah Buaya) To Bacterial Growth of Streptococcus Viridans on Dry Socket

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***Abstract**: The purposed of this research was to know the effectiveness of Aloe vera extract to bacterial growth of Streptococcus viridans on dry socket. This research was using experimental laboratory, start from production of Aloe vera extract on 8 concentrations followed by testing of bacterial growth using disk-diffusion method. Collecting the metadata was doing by measurement diameter zone of inhibition using caliper by the researcher. Using one way-ANOVA statistical test, the result was p=0,000 (p<0,05). This showed the Aloe vera extract was effective against inhibition of bacterial growth on Streptococcus viridans, the more concentration of Aloe vera extract will be more inhibition zone diameter were formed.*

***Keywords** : Aloe vera, Streptococcus viridans, inhibition zone*

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I. Introduction

Process of tooth extraction sometime can cause difficulties, it cause complication after the extraction. The most happened, most horrify, and painful complication after the extraction was *dry socket*.[1] *Dry socket* is a failure of keeping the blood clot on socket that marked by the sensation of painfully that increased over time between first to third day after extraction of permanent tooth.[2,3] Pedlar said, about 3% post extraction of the tooth caused *dry socket*. In Indonesia, the incidence level of *dry socket* reported have 0,5% to 5% post extraction of permanent tooth.[4,5]

Main etiology of *dry socket* was the missing of blood clot as the outcome of fibrinolysis where the bacteria play the important role on it.[6] Ingham et al: about 72% total bacteria that isolated on dry socket patient was group of anaerobic bacteria, among of it was *Enterococcus, Streptococcus viridans*, *Streptococcus*, *Bacillus coryneform*, Proteus vulgaris, *Pseudomonas aeruginosa*, *Citrobacterfreundii*, and *Escherichia coli*. Awang, on 1989, also have support the theory that anaerobic bacteria had the important role on dry socket progress. Anaerobic bacteria could change the blood clot formation process by the activation of phagocyte and inflammation mediator like TNF-α and interleukin-1. TNF-α and interleukin-1 increased action of urokinase type activator plasminogen and plasminogen activator inhibitor-1, where the both of it will decreased interaction between macrophages and fibrin matrix where it was the basis of transforming granulation tissue inside the alveolus, so that blood clots process would be disturbed (lysis).[7]

Based on research that was done in department of oral and maxillofacial surgery faculty of dentistry clinic and microbiology laboratory University of Hasanuddin, found that the result of cultivation of bacteria culture *Streptococcus sp* on case of *dry socket* was found 17,86%. Newest research by Rodrigues MT et all on research about alveolitis on mice, found a new bacteria *Streptococcus sanguis*, it was the group of *Streptococcus viridans*that potentially can caused spread of infection so then disturbed the process of alveolar bone healing.[2]

Generally, the antibiotic could be used to overcome it. Usually the antibiotic is a tetracycline, lincomycin, clindamycin, amoxicillin and metronidazole.[8] Usually, antibiotic prescription have a side effect and can caused damage to the body if not used the dosage wisely. Therefore, using alternative therapy that has same benefit as antibiotic from herbs plant is needed to solve this problem.[9]

Most widely herbs plant that used as a medication, among of it is an *Aloe vera*. *Aloe vera* was originally herbs plant from Africa and has been used on different medical condition without side effect. In vitro and in vivo research show that *Aloe vera* has an effect of anti-inflammatory, anti-arthritis, anti-oxidant, antiviral, analgesic and antibacterial.[6] *Aloe vera* contains 20 mineral, 12 vitamin, 18 amino acid, and 200 active component including enzyme, triterpenes, polysaccharide, flavonoid, and glycoside cluster. *Aloe vera* also contains compound that has play a role as antibacterial like as anthraquinone, saponins, tannin, and aminoglycoside.[14]

This article reported the result about effectiveness *Aloe vera* extract to bacterial growth of *Streptococcus viridans*.

II. Materials And Methods

Sample on this research is streptococcus viridans bacteria that has been isolated from *dry socket* patient then cultivated, *Aloe vera* extract in 8 times dilution, antibiotic disc (clindamycin) as positive control and DMSO as negative control.

Aloe vera extract was done using maceration method. 1000 gram of *Aloe vera*that has been cutting then blended with 1500 ml ethanol solvent 70%. *Aloe vera* extract were achieved after all ethanol 70% solvent are evaporated, dilution are made 1,5625%, 3,125%, 6,25%, 12,5%, 25%, 50%, 75% and 100% using DMSO.

Streptococcus viridans bacteria that has been isolated from *dry socket* patient were rejuvenated using laminar air flow. Growing this bacterial using Blood Agar Plate (BAP). Growth sample were taken by sterile inoculating loop three times followed inserting to test tube filled 5-10 ml distilled water then vortex processing, suspension absorbance are measured using spectrophotometer with wave length 600 nm until 0,5 absorbance was achieved. Dip sterile cotton bud into bacteria suspension, then rub it on surface of blood agar plate , put paper disc that has been soaked into extract concentration and control each sample for one hour. Put it on marked part matched with each extract concentration and control, followed by incubation for 24 hour with 37^0C inside incubator and measuring zone of inhibition around paper disc with caliper. Analyze was done using one way ANOVA test.

III. Result

After testing the inhibition zone, data were achieved from measuring inhibition zone (table 1), with concentration extract of aloe vera 1,5625%, 3,125%, 6,25%, 12,5% and negative control, diameter of inhibition zone were not formed. Could be seen concentration of *Aloe vera* extract from 25%, 50%, 75%, 100% and positive control show inhibition zone are more large followed higher concentration of extract *Aloe vera*.

Table 1. Result of measuring inhibition zone

	Group	Measuring replicate		
		I	II	III
1.	Concentration 1,5625%	0 mm	0 mm	0 mm
2.	Concentration3,125%	0 mm	0 mm	0 mm
3.	Concentration6,25%	0 mm	0 mm	0 mm
4.	Concentration12,5%	0 mm	0 mm	0 mm
5.	Concentration25%	8,8 mm	7,2 mm	7,8 mm
6.	Concentration50%	10,7 mm	10,0 mm	11,1 mm
7.	Concentration75%	13,4 mm	11,7 mm	11,4 mm
8.	Concentration100%	13,0 mm	12,2 mm	12,5 mm
9.	Positive control	31,8 mm	35,9 mm	34,1 mm
10.	Negative control	0 mm	0 mm	0 mm

From each group of each concentration we could see average of each group. On concentration of *Aloe vera* extract 1,5625%, 3,125%, 6,25% and 12,5%, average score for inhibition zone were 0 mm, also on negative control group DMSO. Average of inhibition zone can be seen starting from 25% concentration and keep increased to 100% concentration and positive control as i.e clindamycin (table 2).

Tabel 2.Inhibition zone score each concentration

	Group	Inhibition zone average score ± SD
1.	Concentration 1,5625%	0 mm
2.	Concentration 3,125%	0 mm
3.	Concentration 6,25%	0 mm
4.	Concentration 12,5%	0 mm
5.	Concentration 25%	7,93±0,80 mm
6.	Concentration 50%	10,60±0,55 mm
7.	Concentration 5%	12,16±1,07 mm
8.	Concentration 100%	12,56±0,40 mm
9.	Positive control	33,93±2,05 mm
10.	Negative control	0 mm

Based on Shapiro-wilk test, distribution data was normal, then using one way ANOVA test. From one way ANOVA test, the score of P = 0,000 where the score is smaller rather than 0,05 so there is effect of extract *Aloe vera* on each concentration to each group against bacterial growth of *Streptococcus viridans* on *dry socket* and show statistical significantly.

IV. Discussion

Inhibition zone is a clear area that could be seen on surface of agar plate after insertion of disc that contain antimicrobial or put it on top of agar. The clear area indicated there is inhibition zone of microorganism growth by antimicrobial agent on surface of agar plate.[11,12]

Based on research that has been done on aloe vera extract, it could inhibit the growth of *Streptococcus viridans* on 25% concentration, with smaller inhibition zone, 7,93±0,80 mm and improved to 100% concentration with the highest rate of inhibition zone 12,56±0,40 mm. This result show *Aloe vera* extract could inhibit bacterial *Streptococcus viridans* growth, while on 1,56225%, 3,125%, 6,25% and 12,5% *Aloe vera* concentration extract, show no inhibition on *Streptococcus viridans* growth because the concentration were too aqueous, it cause the active ingredients, antibacterial ingredients especially phenol is the least so *Streptococcus viridans* could be contrary to antibacterial substances, or it cannot inhibit bacterial growth.[13]

The result on this research corresponding to another research that has done by I Gusti, where the extract of *Aloe vera* known could inhibit *Streptococcus mutans* growth with the rate of inhibition zone 10 mm on 100% concentration.[14] Also found on Ni Kadek et all, reported the extract of *Aloe vera* on 100% concentration could inhibit *Staphylococcus aureus* growth with the inhibition zone 11,58 mm and 6,81 mm on *Eschericia coli*.[15]

Inhibition zone that formed caused by active ingredients specifically anthraquinone, aminoglycosides, phenol, saponin and tannin.[10,16,17]Inhibition on bacterial growth caused by interaction phenol and its substances with bacteria cell. On lowest concentration, formed weak bond between protein complex –phenol, and caused quickly disintegration, then damaging cytoplasm membrane causing leakage on cell so bacterial growth could be inhibited. On higher concentration, the substance coagulated with cellular protein and cytoplasm membrane will be lysis.[18] anthraquinone on *Aloe vera* extract caused bacterial protein become inactive and loss of function, and inhibit bacterial growth on agar plate that contain *Aloe vera* extract.[19] Saponin and tannin work together causing denaturation of protein cell and disturb stability of bacterial cell membrane then bacterial cell become lysis and perish.[16,17,19]

Aloe vera also contain growth factor that can binding IGF fibroblast receptor around wound area, then produce collagen and proteoglycan as the result will increase tensile strength the wound and increase wound healing rate, also prevent spread of infection. Acetylated glucomannan (acemannan) was a polysaccharide inside *Aloe vera* gel, could become bioactive molecule and play a role on bone formation, because *Aloe vera* would stimulate proliferation BMSC cell (Bone Marrow Stromal Cell), differentiation to osteoblast and potentially to become biomaterial substance for bone regeneration.[9]

The result on average inhibition zone is increasing on this research corresponding with research of Ariyanti et al that show every extract enhancement that has been tested would have average score of inhibition zone much larger.[18] Corresponding to Pelczar and Chan stated if more higher concentration antimicrobial substance would become more reactive to kill microorganism or the growth will be inhibit. Schelegel also stated the ability of antimicrobial substance to inhibit microorganism growth depend on concentration of antimicrobial.[19]

V. Conclusion

Conclusion from this research is the extract of *Aloe vera* could inhibit bacterial growth of *Streptococcus viridans* on *dry socket*, with minimal inhibition rate of extract *Aloe vera* on 25% concentration

SUGGESTION

After this research that could be expected there is furthermore research about aloe vera extract were testing in vivo.

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