Wild honey 50% inhibits growth of *streptococcus viridans* in vitro

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**Abstract.** Honey has peroxide hydrogen and flavonoid as an anti-bacterial activity. *Streptococcus viridans* is known as a normal flora in the mouth cavity furthermore it can become a pathogen. Several *Streptococcus viridans* make an important role in forming a caries teeth. The objective of this study is to determine a comparative the inhibition power of wild honey 50% with chlorhexidine gluconate 0.2% against the growth of *Streptococcus viridans* bacteria. This research is an experimental posttest only with control group design. *Streptococcus viridans* was taken from the Regional Health Laboratory. The groups are wild honey 50%, chlorhexidine gluconate 0.2%, and aquadest. The study was conducted at the Laboratory Health Center of North Sumatra Province. Antibacterial activity of wild honey 50% against *Streptococcus viridans* in vitro shows that honey has antibacterial inhibitory power. Mann Whitney test results for each wild honey 50% group with chlorhexidine gluconate 0.2% group obtained a significant P value of 0.007 (α <0.05). Wild honey 50% group with negative aquadest control group obtained a significant p-value of 0.000 (α <0.05). Wild honey 50% can inhibit the growth of *Streptococcus viridans*, though still has a significant difference (p <0.05) compared to chlorhexidine gluconate 0.2%.

1. **Introduction**

Dental plaque plays an important role in causing dental and oral health problems. Dental plaque is firmly attached to the surface of the tooth that has not been cleaned. At the beginning of dental plaque formation, gram-positive coccus is the most common type of microorganism, such as *Streptococcus mutans*, *Streptococcus sanguis*, *Streptococcus mitis*, and *Streptococcus salivarius* [1,2].

These microorganisms are a group of *Streptococcus viridans*. Some viridans *Streptococcus* (for example, *Streptococcus mutans*) synthesize large polysaccharides such as dextran or levans from sucrose and play an important role in the formation of dental caries. Maintaining dental and oral hygiene during this time is by brushing teeth. But for some cases, mainly cases of dental and gum disease, the use of mouthwash is very necessary. The mechanism of the mouthwash is to clean the oral cavity mechanically and chemically. The antibacterial properties of mouthwash are mainly determined by the active ingredients contained therein, for instance, the active ingredient is chlorhexidine. Chlorhexidine can be used as a single active ingredient, but not infrequently it is also combined with alcohol. Chlorhexidine is effective against a variety of microorganisms, such as Gram-positive along with Gram-negative bacteria. Chlorhexidine also has an effect on *Streptococcus mutans* in the oral cavity [3].
Antibacterials that are bacteriostatic and bactericidal are also possessed by honey [4]. Honey has hydrogen peroxide as an antibacterial activity against *Pseudomonas aeruginosa*, *Escherichia coli*, *Staphylococcus aureus*, *Helicobacter pylori*. Honey also has antibacterial activity in *Streptococcus pyogenes* [5]. In addition to hydrogen peroxide, honey contains flavonoids that are antibacterial against *Streptococcus mutans* [6-8]. Honey with a concentration of between 12.5%, 50%, and 75% can significantly inhibit the growth of *Streptococcus mutans* in vitro [9,10].

2. Methods
This research is an experimental posttest only with control group design. *Streptococcus viridans* was taken from the Regional Health Laboratory. In determining the number of samples the researchers used the Federer formula. Each group (wild honey 50%, chlorhexidine gluconate 0.2% and aquadest) had nine-disc paper.

The data obtained from this study is the data of the growth inhibition power of *Streptococcus viridans* bacteria by measuring the width of the clear zone around the disc paper in each group.

3. Results
The study was conducted at the Laboratory Health Center of North Sumatra Province. Antibacterial activity of wild honey 50% against *Streptococcus viridans* bacteria in vitro shows that honey has antibacterial inhibitory power. Measurement is done by measuring the zone of inhibition in units of millimeters.

| Groups                  | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | P9 | Mean | Median |
|-------------------------|----|----|----|----|----|----|----|----|----|------|--------|
| **Chlorhexidine gluconate 0.2%** | 10 | 16 | 16 | 16 | 16 | 16 | 14 | 17 | 16 | 15.22| 16     |
| **Wild honey 50%**       | 16 | 7  | 7  | 16 | 7  | 7  | 14 | 7  | 8  | 9.88 | 7      |
| **Aquadest**             | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0    | 0      |

Mann Whitney test results for wild honey 50% group with chlorhexidine gluconate 0.2% group obtained a significant P value of 0.007 (α < 0.05). Wild honey 50% group with negative aquadest control group obtained a significant p-value of 0.000 (α < 0.05). The chlorhexidine gluconate 0.2% group with aquadest group obtained a significant p-value of 0.000 (α < 0.05).

Table 2. Statistical data analysis.

| Groups                  | Mean | *P Value* |
|-------------------------|------|-----------|
| Wild honey 50%          |      |           |
| Chlorhexidine gluconate | 12.55| 0.007     |
| 0.2%                    |      |           |
| Aquadest                | 4.94 | 0.000     |
| Chlorhexidine gluconate |      |           |
| 0.2%                    | 8.37 | 0.000     |
| Aquadest                |      |           |

* Mann Whitney test

4. Discussions
From the results of data processing and data analysis, wild honey 50% and chlorhexidine gluconate 0.2% have the ability as antibacterial inhibitors. In this study, the bacteria used were *Streptococcus viridans*. The ability of this inhibitory power is because honey contains polyphenol compounds, flavonoids, glycosides, and hydrogen peroxidase. Several factors that cause honey to have antibacterial activity are hydrogen peroxide and flavonoids. This study used honey concentration 25%, 50%, 75%, and 100%. Significant inhibition zone results with p < 0.001 were found in honey with
concentrations of 75% and 100%. The diameter of the inhibitory zone on 75% honey is 13 mm and in the 100% honey, the highest inhibition zone diameter is 15 mm [10].

Based on research data that has been done shows that honey has the potential as an antibacterial. Honey can inhibit bacterial growth with a minimum concentration of 12% in Streptococcus oralis [11]. Otherwise, the other studies found honey with a concentration below 25% could not significantly inhibit the growth of Streptococcus mutans, however, honey above 25% can significantly inhibit the growth of Streptococcus mutans [8,9].

In this study, the inhibition of wild honey with a concentration of 50% had the highest inhibitory zone diameter of 16 mm and chlorhexidine gluconate 0.2% had the highest inhibition zone diameter of 17 mm. From these results, it can be seen that the antibacterial inhibitory effect of wild honey 50% on the growth of Streptococcus viridans is smaller than the antibacterial inhibition of chlorhexidine gluconate 0.2%.

5. Conclusions

Wild honey 50% can inhibit the growth of Streptococcus viridans in vitro, though still has a significant difference (P< 0.05) compared to chlorhexidine gluconate 0.2%.

6. References

[1] Sondang P and Hamada T 2008 Menuju Gigi dan Mulut Sehat (Medan: USU Press)
[2] Listyasari N A Pengaruh Pasta Gigi dengan Kandungan Propolis terhadap Pembentukan Plak Gigi
[3] Nareswari A Efektivitas Obat Kumur Chlorhexidine Tanpa Alkohol Dibandingkan dengan Chlorhexidine Beralkohol dalam Menurunkan Kuantitas Koloni Bakteri Rongga Mulut
[4] Rostinawati T 2014 Aktifitas Antibakteri Madu Amber dan Madu Putih Terhadap Bakteri Pseudomonas aeruginosa multiresist dan Staphylococcus aureus
[5] Moussa A, Noureddine D, Mohamed H S, Abdelmelek M and Saad A 2012 Antibacterial activity of various honey types of Algeria against Staphylococcus aureus and Streptococcus pyogenes Asian Pac. J. Trop. Med. 5 773–6
[6] Sabir A 2005 Aktivitas Antibakteri Flavonoid Propolis trigona sp terhadap Bakteri Streptococcus mutans (in vitro) Maj. Ked. Gigi. 38 135–41
[7] Kurniawan A 2008 Perbandingan Efek Antibakteri Madu Randu (Ceiba pentandra), Madu Rambutan (Nephelium lappaceum) dan Madu Hutan Terhadap Pertumbuhan Populasi Streptococcus mutans
[8] Patrick R and Georgios N 2014 Antibacterial Potential of Manuka Honey Against Three Oral Bacteria in vitro Clinic of Preventive Dentistry, Periodontology, and Cariology, Center of Dental Sir John Walsh Research Institute, School of Dentistry, University of Otago, Section for Oral 124
[9] Nassar H M, Li M and Gregory R L 2012 Effect of honey on Streptococcus mutans Growth and Biofilm Formation Appl. Environ. Microbiol. 78 536–40
[10] Ghabanchi J, Bazargani A, Afkar M D, Foroshan S B and Ayeen S D 2010 In Vitro Assessment of Anti- Streptococcus Mutans Potential of Honey Iran. Red Crescent Med. J. 12 61–4
[11] Rupesh S., Winnier J.J, UA Nayak, AP Rao, NV Reddy J P 2014 Evaluation of the effects of manuka honey on salivary levels of mutants streptococci in children: A pilot study J Indian Soc Pedod Prev Dent 212–9