EFFECTIVENESS OF NEEM OIL (*Azadirachta indica*) AS AN ANTIBACTERIAL AGENT TOWARDS DENTAL CARIES BACTERIA (*Streptococcus mutans*)

Vithya Lakshmi Bjya Gabal, Angga Prawita Kautsar
Pharmacy Faculty, Padjadjaran University
Jl. Raya Bandung Sumedang Km 21 Jatinangor 45363
vt890214@gmail.com

ABSTRACT

One of the usual oral disease in the world is dental caries. It is normally triggered by the microorganisms *Streptococcus mutans*. Where tooth enamel will be affected. Regardless of the fact that poor hygiene and interrelated to multiple full-body conditions and diseases are one of the major cause that around 80% of all over the world adults will be identified with caries. As number carries cases increase but there are only a few successful preventative treatments. Herbal treatment research towards bacterial ecology in the mouth and the other correlated factors that may contribute to caries are being carried out. The awareness of new treatment and prevention options for this exceedingly usual infection are being figured out. One of effective treatment is Neem (*Azadirachta indica*) as antibacterial, antifungal, and biopesticide. Most recent research is towards the effectiveness of neem oil towards *Streptococcus mutans* as antibacterial due to its active properties.

Keywords : Dental caries, *Streptococcus mutans*, Neem oil, Antibacterial activity.

INTRODUCTION

Sugar-rich foods are one of the common cause for the dental cavity. However, there are plenty off multifaceted ecology of microflora that dwells in the human oral cavity**.** Where almost 400 types of bacteria can be found in the human mouth, and normally the ecosystem is well maintained at homeostasis. Changes within oral cavity care due to an increased consumption of glucose which eventually can alter the homeostasis of a well maintain ecosystem to an acidic condition. The acidophilic bacteria loves this condition, therefore, invade to teeth and resulting with dental caries (Vanka A, 2001).

The most contagious species cause caries are *Streptococcus mutans*, which has stood to be the originator of most dental caries, which is an infectious bacterium that can be transferred both parallel and upright. Dental caries can be mirrored as unique and the most prevalent and common contagious infections on the earth.The current study has

revealed that human oral cavity with its specific system with a complex ecology of contagious species, and the human connection with contagious oral pathogens, definite with *Streptococcus mutans*, to be a one of the common cause, aiding mutually host and bacterium (Wolinsky LE, 2001).

Microorganisms that dwell the human mouth seem to have a mutualistic relationship with their human host. Oral cavity can be considered as a supreme atmosphere for the growth of microorganisms since the environment is in such way where nutrients available from saliva and food consumption**.** In statistic, it has been designed that around 4 X 1010 bacteria in each gram of plaque removed from the teeth. Usually, more or less than 400 species live organized in the oral cavity (Tanzer, 2001).

In addition, *Lactobacilli* stay calm to service the dorsum, while *Streptococcus mutans* needs a hard and a non-shedding surface for optimum growth. This was confirmed with the speedy arrival of *S. mutans* in the oral cavity of toothless newborns when obturators are introduced to repair forked plates (Tanzer, 2001).

Certain microbe will collaborate in a mutualistic mode for a joint gain, as when species work together via dissimilar species-specific enzymes to halt intricate host fragments that cannot be processed through a solitary species (Pai MR, 2004).

Bionetwork of the mouth not only include interfaces among microorganisms but somehow, involve the host to plays a massive part in preserving an unchanging ecology, particularly through the drool. Saliva an intricate mineral- and protein-rich fluid that distributes nutrients for the countless bacteriological types inside the mouth while defending the host sides. While munching, saliva flow increases prevent variations in oral pH, the existing buffer bicarbonate in saliva works as an acid sink after acidic foodstuffs are being presented into the mouth (Prashant GM, 2004).

Low concentrations of urea and peptide present in saliva and yield ammonia by

hydrolyzation process, which is involved in elevating pH. Lactic acid neutralized by buffering which formed by anaerobic bacteria by mouth through the fermentation process which occurs after nutrients present, the teeth triggered by this acid which causes decay (Vanka A, 2001).

Saliva encompasses glycoproteins which known to be an antibacterial, for an example lysozyme and lactoperoxidase. These two combinations act autonomously in the host organization and can extinguish hostile bacteria without destroying the ecological equilibrium of oral cavity where original microbe obligate developed resistance (Prashant GM, 2004).

An extraordinary model of well-adjusted correlation between saliva and oral microbe that saliva a fundamentally supersaturated compound composed of calcium and phosphate ions where precipitates in order to form hydroxyapatite and mineralized the teeth (Wolinsky LE, 2001). This supersaturated compound consequence in tooth growth cause of the increasing element of calcium phosphate. However, proteins containing proline and a peptide called statherin deliberate the speed of precipitation lead to decay (Prashant GM, 2004).

Usual lactic acid formation helps teeth to remain caries-free while the microbe continues to colonize. The widespread deterioration and wild levels of *S. mutans* in patients with xerostomia or decrease saliva flow is an indicator of saliva role preventing caries Moreover, patients experiencing radioactivity due to head and neck tumors are frequently used as dummies for the evolution of decay (Vanka A, 2001).

Methods

Antimicrobial action of neem seed oil identified by using agar well diffusion method and minimum inhibitory concentration (MIC). According to a trial conducted by Pai Microorganisms, Test is done using Virulent bacteria – *Streptococcus mutans* (MTCC*497) attained from Microbial Type Culture Collection. Bacteria subcultured into unambiguous media

infusion agar then nurtured at 37°C (Pai MR, 2004).

A study conducted by Vanka and Wolinsky towards antimicrobial activity, screening is done using neem seed oil and resolute by agar well diffusion method. Pure isolates microbes cultured on a medium at 37°C for 24hr. 100µl of inoculum of test organism spread onto media plates and 6 mm diameter wells were jaded with a sterile tool in the inoculated agar plates. A 100µl volume from the oil was used on precise media agar plates during each test. Then plates stand still for 10-15 min in order diffusion to take place. Then incubated at 37°C for 24hr. The antibacterial action was determined by the inhibition zone formed nearby the well-encompassing neem oil. Zone of inhibition dignified in millimeters. Experiments were conducted and mean values calculated based on diameter at the zone of inhibition as well as ± standard deviation (Rajasekaran C, 2008).

In a research done by Prashant determination of MIC done with broth dilution method with Tryptic soy broth (TSB) medium at 37°C for 24 hr. The neem seed oil dissolved in order to get a concentration of 200 mg/ml, therefore, diluted to two-fold dilutions to achieve concentrations in a ranging from 200 to 0.39 mg/ml. Then incubated at 37°C for 24 hr. (T24) were determined by looking at bacterial growth inhibition and determined by using this formula:

1-(OD test well at T24 – OD test well at To)

(OD control well at T24 – OD control well at To) x 100% inhibition

Result and discussion

During the initial results by Vanka neem inhibited *Streptococcus mutans* and overturned in initial carious lacerations (Vanka A, 2001). Whereas a research according to Wolinsky the saliva-conditioned hydroxyapatite treated with neem shows a great inhibition zone when used towards *Streptococcus* colonization on tooth surfaces (Wolinsky LE, 2001). Prashant et al. run a research in order to view the effect of mango & neem towards

organisms which provoke dental caries and result in maximum inhibition zone towards neem seed oil compare to mango (Prashant GM, 2004). During 6 week trial conducted by Pai to estimate the value of neem merged on mucoadhesive dental gel thru chlorhexidine gluconate as (+) control shows a significant inhibition towards plaque microorganism (Pai MR, 2004).

Conclusion

The neem oil presented major antibacterial activity against *Streptococcus mutans* microbial strains and it seems to be promising. Based on the antimicrobial results obtained. This endorses that the effectiveness of neem seed oil as an antimicrobial agent. Antimicrobial agents from neem appear rewarding where it will guide to the expansion of a phytomedicine towards virulent microbes. Isolation and purification of phytoconstituents from neem seed possibly will produce important innovative antimicrobials, as neem plant have gigantic therapeutic potential and can assist the purpose without any side effects that usually linked with modern medicines. Properties presence in neem oil is Nimbidin, Azadirachtin, and Nimbinin. These properties work as an antibacterial agent in the removal of oral aerobic and anaerobic pathogens in the most effective way, indirectly prevent cavities and gum disease.

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