

***Effect of Cinnamon Extracts on
Streptococci and Mutans Streptococci in
Comparison to Chlorhexiden Gluconate***

(A comparative in vitro and in vivo study)

A Thesis

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Abstract

Background: Cinnamon is among the world's most frequently used spices in recipes and is relatively inexpensive. It is considered to be a powerful herb that none of other plants came close to cinnamon in its medicinal applications. People, since ancient times, were adding cinnamon in tea that may have provided beneficial warming effect and curing the flu or cold. The compounds in the essential oil of cinnamon bark are responsible for its activity, due to its essential oils- scientists define cinnamon as an anti-microbial and anti-inflammatory food.

Aim of the Study: To assess the effect of different concentrations of cinnamon extracts on the growth of mutans streptococci in comparison to 0.2% chlorhexidine gluconate and deionized water.

Materials and Methods: Cinnamon extracts were prepared by two methods (ultrasonic and oil), Different concentrations of cinnamon extracts were prepared and estimated in gram per 100 milliliter deionized water. Chlorhexidine gluconate was used in this study as a control positive, deionized water was used as a control negative. For *in vitro* experiment stimulated saliva were collected from five females dental students/University of Baghdad aged (21-22 years), from which mutans streptococci were isolated, purified and diagnosed according to morphological characteristic and biochemical test. For *in vivo* experiment stimulated saliva was collected from 20 female dental students' volunteers (21-22 years) at 10:00 a.m. after withdrawal of oral hygiene measures, they were divided into four groups each group rinse done with either chlorhexidine, deionized water, ultrasonic or oil extracts for one minute. The counts of these bacteria, salivary pH and flow rate were recorded at different time points (one minute prior to the rinse as a base line, one minute after rinsing, 15 minute, 30 minute and one hour).

Results: Sensitivities of mutans streptococci according to Agar Well Technique showed that both cinnamon extracts were effective in the inhibition of these bacteria. Mutans streptococci were more sensitive to chlorhexidine compared to both ultrasonic and oil extracts but at high concentration (4% for oil extract and 4.5% for ultrasonic and more), they were more effective compared to chlorhexidine indicated by wider zone of inhibition on Mueller Hinton Agar. Statistically high significant reduction in the viable count of bacteria were recorded for Chlorhexidine gluconate (0.2%) and all concentration of both cinnamon extracts ($P < 0.001$) except for concentration 3% of ultrasonic extract which showed no significant reduction in the counts of bacteria ($P > 0.05$). The study also involved one *in vivo* experiment, a slight reduction in the counts of these bacteria was noticed for deionized water but the greatest reduction in the counts of bacteria was shown by CHX. Cinnamon extract had a high significant anti microbial activity against streptococci and mutans streptococci in the following time points (15 minute, 30 minute and one hour) as it can reduce the viable counts of bacteria in comparison to deionized water, but still CHX is more effective than the other agents in reduction the salivary counts of the two types of bacteria.

Salivary pH and flow rate increase immediately after rinsing with CHX and continue to increase for all time points of the experiment while for both cinnamon extracts the increase in salivary pH and flow rate continue after half an hour and then started to decrease after one hour but still higher than the base line value. Chlorhexidine gluconate (0.2%) stimulated the highest increase in salivary pH and flow rate.

Conclusions: Both ultrasonic and oil extracts of cinnamon were effective against mutan streptococci, at high concentration they were even more effective than CHX.