

Republic of Iraq
Ministry of High Education
And Scientific Research
University of Baghdad
College of Dentistry



Antibacterial Effect of Kappa Carrageenan on Mutans Streptococci and Lactobacilli

(In vitro study)

A Thesis

Submitted to the College of Dentistry, Baghdad University in
Partial Fulfillment Requirements for the Degree of Master of
Science in Preventive Dentistry

By

Sarah Jassim Ali

B.D.S

Supervised by

Prof. Dr. Ahlam Taha Mohammed

B.D.S., M.Sc., Ph.D.

Baghdad-Iraq

2020 A.D.

1442 A.H

Abstract

Background: Carrageenan is sulfated polysaccharides extracted from red algae, being hydrocolloid in nature; carrageenan has gelling, thickening and emulsifying properties allowing it to be used in the food industry, oral health care products and in cosmetics. Due to its bioactive compounds, carrageenan has demonstrated antimicrobial, antiviral, anti-oxidant and anti-tumor properties.

Aims of the study: This in vitro study was conducted to evaluate the effect of kappa carrageenan on acidogenicity, adherence and growth, of Mutans Streptococci and Lactobacilli in comparison to chlorhexidine-gluconate (0.2%). Kappa carrageenan minimum inhibitory concentration on Mutans Streptococci and lactobacilli was also intended to be evaluated in this study.

Materials and methods: Ten mutans streptococci and lactobacilli isolates were isolated from saliva samples that had been collected from volunteers (18-22 years old healthy dental students), and identified according to their morphological and biochemical properties after being cultured on their selective media (Mitis Salivarius Bacitracin Agar for Mutans Streptococci, and Rogosa Selective Agar for lactobacilli). Agar-well diffusion technique has been utilized to test antibacterial effect of different concentrations of kappa carrageenan (500,700 and 1000 mg/ml) on mutans streptococci and lactobacilli; also its minimum inhibitory concentration was evaluated. Kappa carrageenan's effect on MS and LB acidogenicity and adherence on extracted human teeth had been examined.

Results:

Mutans streptococci and lactobacilli were sensitive to kappa carrageenan solution at concentrations 500,700 and 1000 mg/ml, mean of growth inhibition zone for Mutans Streptococci was significantly higher in 1000 concentration of kappa carrageenan compared with that in 700 and 500 mg/ml concentrations (19.7 versus

16.0 and 13.6 mm, $P < 0.05$). The mean of growth inhibition zone was significantly higher in chlorhexidine than that in 500 mg/ml concentration of kappa carrageenan and in 700mg/ml concentration (23.8 versus 13.6 mm, $P < 0.01$; and 23.8 versus 16 mm, $P < 0.01$ respectively).

No statistically- significant differences ($P \geq 0.05$) were detected in, mean of growth inhibition zone between Kappa carrageenan 1000mg/ml concentration and chlorhexidine.

Regarding lactobacilli, all concentrations of kappa carrageenan and chlorhexidine showed an antibacterial activity against LB bacteria which was found the highest level when using chlorhexidine (23.8 mm) while it increased by the increment of the concentration of kappa carrageenan. That mean of growth inhibition zone was significantly higher in 1000 mg/ml concentration of kappa carrageenan compared with that in 500mg/ml concentration (25.4 versus 15.4 mm, $P < 0.01$) and in 700 mg/ml concentration (25.4 versus 20.1 mm, $P < 0.05$). No significant difference detected in mean of growth inhibition zone that developed by 700 mg/ml concentration of kappa carrageenan or 500mg/ml concentration (20.1 versus 15.4, $P \geq 0.05$)

The minimum inhibitory concentration of kappa carrageenan of Mutans Streptococci and lactobacilli was found 300 mg/ml. In addition kappa carrageenan prevented Mutans Streptococci and lactobacilli adherence (on teeth surface *in vitro*) and acidogenicity in concentration dependent manner in which their activity increased as their concentration increased, so 1000 mg/ml was found the most effective.

Conclusion: kappa carrageenan had revealed antibacterial activity against Mutans Streptococci and Lactobacilli; therefore it can be used as an effective oral health preparation which helps in prevention and treatment of dental caries and periodontal disease.