

بسم الله الرحمن الرحيم

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بقسم التوثيق الإلكتروني بمركز الشبكات وتكنولوجيا المعلومات دون أدنى مسئولية عن محتوى هذه الرسالة.

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Antimicrobial Efficacy of Chlorhexidine-Loaded Silver Nanoparticles on Enterococcus Faecalis Biofilm

(An In-Vitro Study)

Thesis

Submitted to the Department of Endodontics, Faculty of Dentistry, Ain Shams University, in the partial fulfillment for Master's degree in Endodontic Dentistry

By

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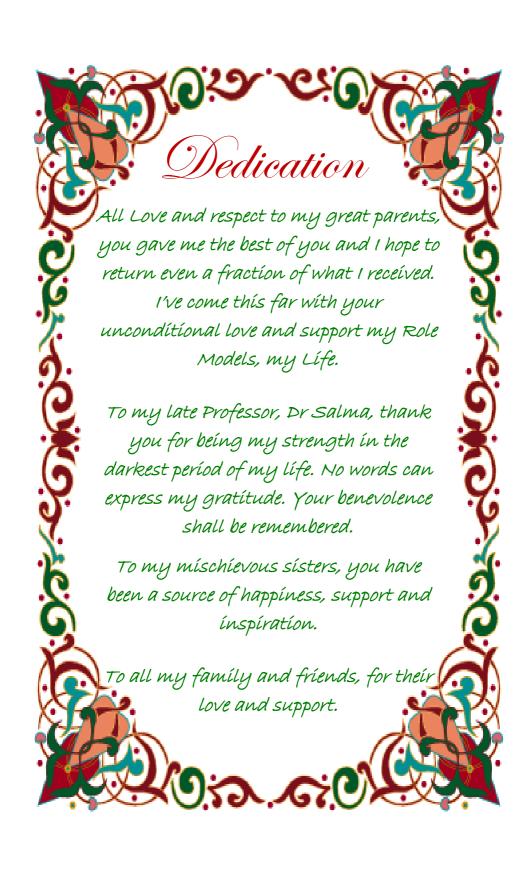
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List of Abbreviations

Abbreviation Full Term

%R Percentile Red Intensity per Slide

 $\mathbf{C}_{\mathbf{r}\%}$ Percentage Reduction of log CFU

Ag⁺ Silver ions

Ag-GO AgNPs in aqueous Graphene Oxide matrix

Ag-MSNs@CHX CHX-loaded, Silver-decorated Mesoporous

Silica Nanoparticles

AgNPs Silver Nanoparticles

AO Acridine Orange

BHI Brain Heart Infusion

BL Buccolingual

CBD Calgary Biofilm Device

CFU Colony Forming Units

CHX Chlorhexidine

CI Conventional Irrigation

CLSM Confocal Laser Scanning Microscopy

DL Diode Laser

eDNA Extracellular DNA

EDTA Ethylene-Diamine-Tetraacetic Acid

EPS Extracellular Polymeric Substance

HBD3 Human Beta-Defensin 3

HEDP 1-Hydroxyethane 1,1-Diphosphonic Acid

HMP Human Microbiome Project

HUVECs Human Umbilical Vein Endothelial Cells

ICG Indocyanine Green

LPS Lipopolysaccharides

LTA Lipoteichoic acid

MBEC Minimum Biofilm Eradication Concentration

MBIC Minimum Biofilm Inhibitory Concentration

MD Mesiodistal

MDR Multiple Drug Resistance

MIC Minimum Inhibitory Concentration

NaOCl Sodium Hypochlorite

NIH-3T3 Mouse Embryonic Fibroblasts

NPs Nanoparticles

NSG Nanosilver gel

PC Im-based Positively-Charged Imidazolium-based

AgNPs Silver Nanoparticles

PCR Polymerase Chain Reaction

PDT Photodynamic Therapy

PI Propidium Iodide

PLLA Poly L-lactide

ppm Parts per Million

PVP Polyvinyl-pyrrolidone

qRT-PCR Quantitative Real-time PCR

RC Root Canal

RCT Root Canal Treatment

ROS Reactive Oxygen Species

rRNA ribosomal RNA

SCHNC Silver Cross-linked Hydrogel Nanocomposite

SD Standard Deviation

SEM Scanning Electron Microscope

TEM Transmission Electron Microscope(y)

UAI Ultrasonically-activated Irrigation

UV-Vis Ultraviolet-visible

VBNC Viable but Non-Cultivable

XPEF XP Endo Finisher activation

Introduction

Microbial etiology is the leading cause behind almost all clinical endodontic pathosis. Bacteria, viruses, fungi and archaea contribute to the endodontic microbiota and biofilm formation; which may subsequently lead to primary or secondary infections of the root canal system, with or without periapical or periodontal involvement. These infections may persist long after standard endodontic treatment protocols application. Commonly isolated endodontic microbiota includes *Fusobacterium*, *Prevotella*, *Treponema*, *Actinomyces*, *Streptococcus*, etc; among which *Enterococcus faecalis* is the most commonly isolated endodontic pathogen. *E faecalis* can exist in primary and secondary infections, as well as in acute and chronic ones, in planktonic and biofilm phases, and in single-, dual- and multi-species biofilm.

Biofilms are the most predominant form of microbial existence in natural environment, on surfaces, and within infected tissues. Microbial biofilm is defined as an assemblage of surface-associated microbial cells (i.e. sessile cells) that are enclosed in an extracellular polymeric substance matrix (EPS). Microbial biofilms are structurally and metabolically heterogeneous, multicellular communities, where aerobes and anaerobes coexist. They grow slowly via a predictable arcade of events starting with microbiota attachment to a suitable substrate followed by its adhesion and EPS production, the biofilm then slowly