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Dental Caries

An ever expanding horizon

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Authors:

Dr. Abhishek Jahagirdar, PG student, Dr. Ahmed Mujib B. R., Prof. and Head, Dr. Pavan G. Kulkarni, Assist. Prof., Dept of Oral Pathology and Microbiology, Bapuji Dental College and Hospital, Davangere, Karnataka, India

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Poster Award
First Prize

Introduction

Dental caries continues to be a common chronic disease among various population groups. Patient care can be improved with prevention, detection, reversal and management at the earliest stage. Accuracy in the above mentioned areas would permit targeted preventive treatment, thereby significantly improving dental health and reducing the need for expensive treatment. The latest improvements and research in these core areas of dental caries have been brought out in this poster which when adopted by the clinicians will definitely help in eliminating the carious process in its bud stage.

Objectives

Current techniques do not have sufficient sensitivity and specificity in prevention, detection, reversal and management of dental caries. We hereby, present with latest research technologies with higher sensitivity and specificity.

Material and Methods

Searched articles from the Pubmed database and Dental Clinics of North America for latest researches, reviews and clinical trials. Main search involved mesh terms associated with caries, caries research, caries vaccine etc. additional search involved Bluetooth device, diagenodent, gene therapy, probiotics etc as well as relevant searching of references of all the retrieved articles for possible inclusion.

Results

Caries prevention

The latest methods in caries prevention are the Bluetooth device which sends signals to the mobile device when the $pH < 5.5$, gene therapy modifying the bacterial genetic pattern, probiotics overgrowing the pathogens, nanorobots fighting the pathogens and the use antibacterial composites.



Fig 1: Bluetooth device

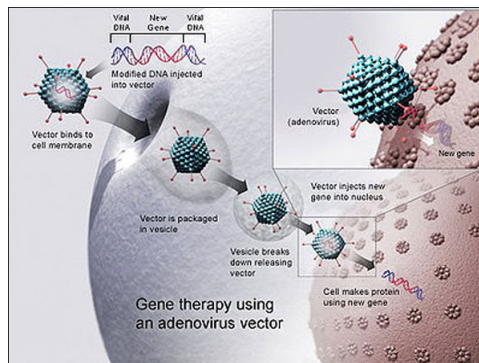


Fig 2: Gene therapy using adenovirus vector

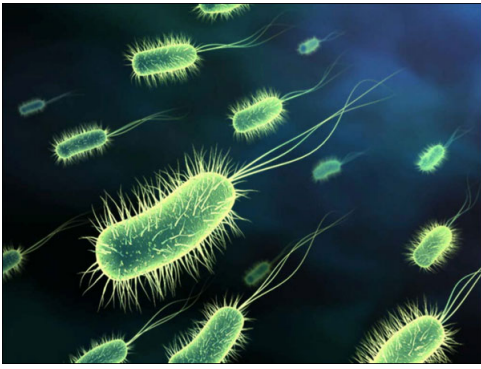


Fig 3: Probiotic bacteria

Fig 4: Dental nanorobots



Fig 5: Plant extracts

Fig 6: Antibacterial composites

Caries diagnosis

The latest in diagnosis are the optical coherence tomography, polarized raman spectroscopy studying the composition, crystallinity and demineralization, impedance spectroscopy measuring the impedance to current, laser fluorescence seen in carious lesions, electronic caries monitor measuring the resistance of enamel and near infrared imaging showing high specificity of detection for caries.

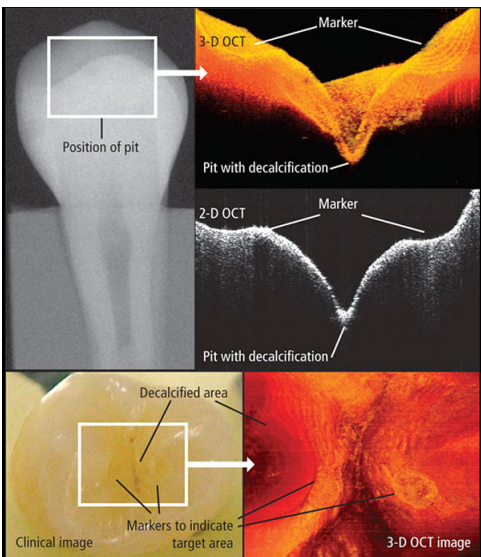


Fig 7: Optical Coherence Tomography

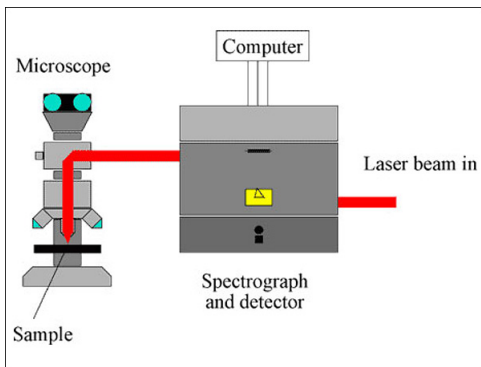


Fig 8: Principle of Polarized Raman Spectroscopy



Fig 9: Impedance spectroscopy

Fig 10: Laser fluorescence



Fig 11: Electronic caries monitor

Fig 12: Near infrared imaging

Caries reversal

Caries reversal using the ozone which destroys the bacteria, plant extracts reversing the demineralization, nanosolutions promoting better bonding, lasers reversing caries, resin infiltration for early pit and fissure caries and tooth mousse pastes which help in early remineralization are the methods on the horizon which are proving themselves very effective.



Fig 13: Laser apparatus

Fig 14: Process of resin infiltration



Fig 15: Tooth mousse

Fig 16: Ozone machine

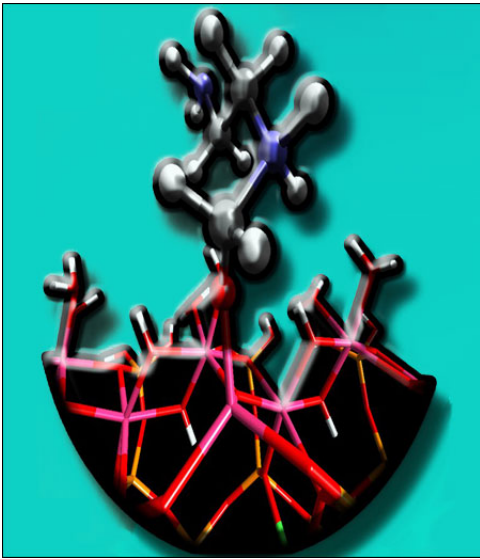


Fig 17: Nanosolution

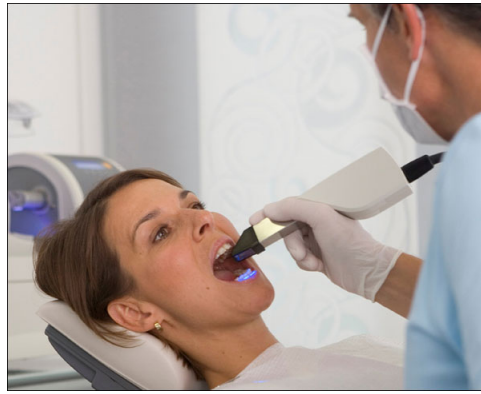


Fig 18: Micro invasive procedure

Caries management

Air abrasive tooth preparation with a flow of abrasive particles at high speed, bioengineering the natural tooth invivo or invitro, ultrasonics for minimal and effective tooth removal, micro invasive procedures promoting bonding, bonded sapphire replacing the enamel giving the natural enamel the strength of ceramics and waterlase which is a combination of water and laser for better hydrodynamic efficiency are some of the future trends in caries management.



Fig 19: Bonded sapphire replacing enamel



Fig 20: Waterlase apparatus

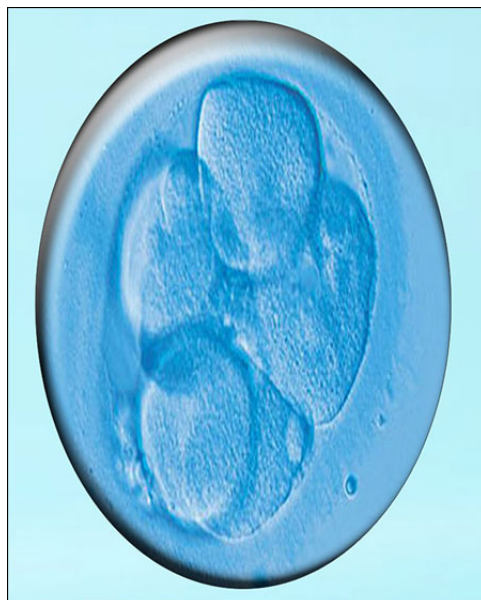


Fig 21: Air abrasion apparatus

Fig 22: Bioengineering



Fig 23: Ultrasonic handpiece

Conclusions

Exploring these various future technologies by continued research and bringing them into dental practice shows great promise to erase dental caries.

Literature

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This Poster was submitted by Dr. Abhishek Jahagirdar.

Correspondence address:

Dr. Abhishek Jahagirdar
Bapuji Dental College and Hospital
Department of Oral Pathology and Microbiology
Davangere-577 004
Karnataka, India

DENTAL CARIES - AN EVER EXPANDING HORIZON

Exploring the various future facts reveals promising aids to erase dental caries

CARIES PREVENTION

CARIES DIAGNOSIS



Sends signal to mobile device when $pH < 5.5$

BLUE TOOTH DEVICE
(Astor Kolah et al.)

These Nano robots harbor in the oral cavity and fight against caries causing pathogens



DENTIFROBOTS
(Santama et al.)



OCT is similar to ultrasound but uses light waves (10 to 30um)

OPTICAL COHERENCE TOMOGRAPHY
(Ling, ng et al.)

Carious lesions emit fluorescence under laser



LASER FLUORESCENCE
(Diagnost by Xerox)



Modifying bacterial genetic pattern

GENE THERAPY
(Niu T et al.)

Extracts of *Garcinia Kola*, *Gibbericous Sahiagrafi*, *Solanum americanum*



NATURAL PRODUCTS
(Palomba et al.)



Composition, crystallinity, orientation, de-mineralization and remineralization

POLARISED RAMAN SPECTROSCOPY
(Lee et al.)

Measures Resistance



ELECTRONIC CARIES MONITOR
(Liu et al.)



Oecygonus the caries causing pathogens

PROBIOTICS
(Longbottom et al.)

Releases anti-bacterial agents



ANTIBACTERIAL COMPOSITES
(Veronesi et al.)



Measure impedance to current

IMPEDENCE SPECTROSCOPY
(Kholopier et al.)

High specificity detection



NEAR INFRARED IMAGING
(Fried et al.)

CARIES MANAGEMENT

CARIES REVERSAL



It is a flow of abrasive particles at high speed

AIR ABRASIVE TOOTH PREPARATION
(Longbottom et al.)

Improved material properties make better bonding to the teeth



MICRO INVASIVE PROCEDURES
(Moncada et al.)



Destroys bacteria and opens the channels in dentin

OZONE
(G. M. Night et al.)

Caries preventive effect and least thermal damage



LASER
(Estes et al.)



Natural Tooth can be made *in vivo* or *in vitro*

BIO-ENGINEERING
(Choo-Smith et al.)

Made esthetically like ceramics



BONDED SAPPHIRE REPLACING ENAMEL
(Ricketts et al.)



Tannins Polyphenols

PLANT EXTRACTS
(Ferracane et al.)

Penetrates in porous enamel



RESIN INFILTRATION
(Xu/Bassa et al.)



Ultrasonic Tooth preparations provides a minimal and effective tooth removal

ULTRASONICS
(Jymat et al.)

Combination of Laser with water for better hydrodynamic efficiency



WATERLASE
(Longbottom et al.)



Better Bonding

NANOSOLUTION
(Santini et al.)

Early re-mineralization available in paste form



CPP-ACP
(Leima et al.)