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Methyl gallate : A natural agent for early carious lesion treatment

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Abstract:

The reveive article focused on A natural agent for early carious lesion treatment.Dental caries is a chronic disease that is unique to humans and is one of the most common global oral health problems today. It is the destruction of dental hard acellular tissue by acidic by products from bacterial fermentation of dietary carbohydrates, particularly sucrose. A Polyphenolic Compound Commonly Found in Natural Plants Is Methyl Gallate (Mg). Magnesium has demonstrated a wide range of biological functions, including anti-inflammatory, anti-tumor, anti-oxidant, neuroprotective, hepatoprotective, and anti-microbial properties. It also offers promising opportunities for further research and development.

Keyword-Dental caries, methyl gallate, anti-inflammatory, anti-oxident

Introduction:

One of the most prevalent preventable diseases that is known to be the main cause of tooth loss and oral pain is dental caries. It is a serious oral disease that affects people of all ages and makes it more difficult to achieve and maintain oral health. It is a significant oral disease that affects people of all ages and hinders their ability to achieve and maintain oral health. In the initial study using Ga, the inhibitory effect on carious lesions was shown to be quite mild. However, the researchers looked into the possibility that other related compounds might have a far stronger inhibitory effect throughout the course of the next several years of trial and error. Methyl gallate was one of the compounds they looked at, and it was confirmed to have a mitigating effect on demineralization when it was synthesized and applied to the carious lesion 20 times over the course of 14 days. This marked the start of the documentation process regarding its impact on early-stage carious lesions in vitro Green tea, wine, and grapes are just a few examples of the natural substances that contain the phytochemical compound methyl gallate. It Is An Effective Antioxidant That Prevents Demineralization of the Dentin and Enamel. This Process Is Critical To The Development Of Novel Therapies For Early Tooth Decay. An area of demineralization on the surface of the tooth that appears as a white spot that has not yet cavitated is known as a carious lesion. The human body may be harmed by the current preventive and treatment methods for carious lesions, which include applying fluoride and

using invasive dentistry techniques. Methyl gallate, a compound, has led to the idea of developing an organic method that can lessen early carious lesions in vitro.[1,2]

Objective: The study will outline the categorization of the proposed treatment approach for simple caries, with the expectation that the results of this study will position MG as an agent for treatment of noncavitated carious lesions and demonstrate that a management technique using a natural agent such as MG is a visible alternative to traditional invasive management of dental caries.This study will also highlight the advantages of the optical method of carious detection for early diagnosis and lesion monitoring in clinical trials.

Dental Caries Prevalence in the National Scenario:

Table: 1. Prevalence Of Dental Caries In National Scenario

S.No.	**Age Group**	**Prevalence (%)**	**Sample Size**	**District**	**Year**
1.	5-6	23.23	638	Bhaktapur	2007-2008
	12-13	50.00			
2.	5-6	63.64	638	Lalitpur	2007-2008
	12-13	41.00			
3.	5-6	74.46	638	Kathmandu	2007-2008
	12-13	57.06			
4.	5-7	20.7	376	Pokhara	2012
	8-10	48.2	1174		
	11-14	52.46	1624		
5.	5-6	52	361	Chitwan	2013
6.	1-6	85.2	392	Kathmandu	2013

Types Of Caries	**Description**
Incipient Caries /Primary Caries	decay at a place where there hasn't been any prior decay .
Recurrent Caries /Secondary Caries	appears where there has previously been a history of caries and is often found around fillings and other dental restorations. .
Arrested Caries	A Cavitation-Producing Lesion on a Previously Demineralized Tooth That Was Later Remineralized

Background Of Early Carious Lesion Treatment

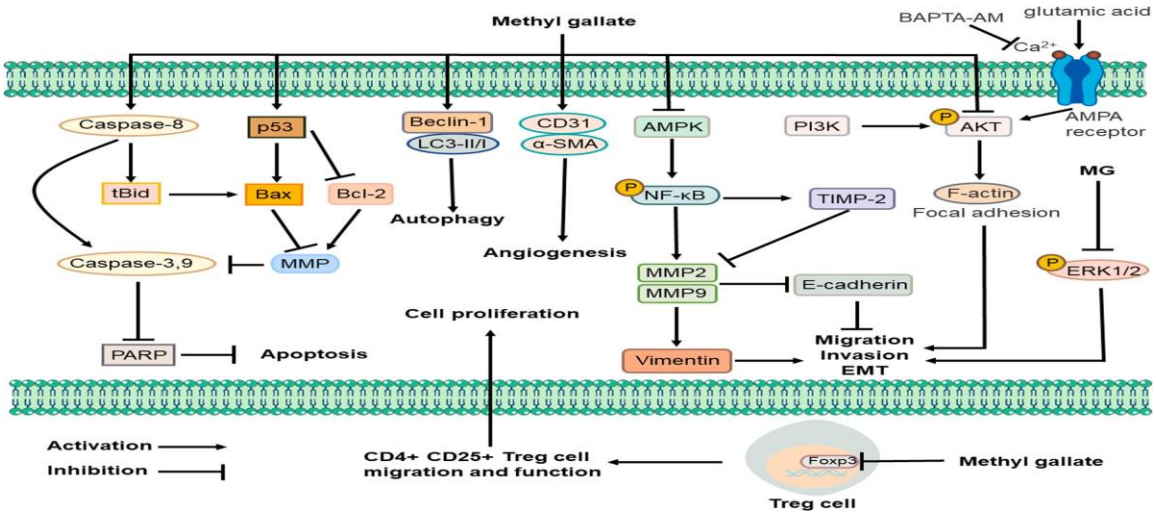
Although the use of fluoride in caries prevention has been quite successful, some researchers are concerned about the long-term effects of fluoride at excessive levels. Fluoride supplements are not recommended for children under the age of eight who live in non-fluoridated areas or for children under the age of twelve who live in fluoridated areas due to the increased risk of dental fluorosis. Various forms of topical fluoride have also been linked to enamel fluorosis. Another concern is that the cariostatic effect of fluoride is most noticeable when dental caries are in their early stages and may not be effective on established lesions. As a result, there is interest in looking for other agents with cariostatic properties.
These agents may be especially useful for adults who are at high risk of developing new carious lesions but have reached their fluoride intake limit.

Sodium fluoride was discovered to have cariostatic properties in the 1930s, and since then, extensive research has been conducted on its effect on dental caries. Systemic fluoride is incorporated into the tooth structure throughout development to increase the enamel's resistance to acid dissolution. As a result, children are the primary group that benefits from systemic fluoride throughout the mineralization of their primary and permanent teeth.
Topical fluoride has been demonstrated to give ongoing protection against caries in all age groups and has a direct impact on the remineralization of demineralized enamel. The most popular and extensively used type of topical fluoride is sodium fluoride, which has been shown in numerous clinical trials to improve the remineralization process and inhibit demineralization. Fluoride has cariostatic effects because it can inhibit demineralization, improve remineralization, and inhibit bacterial metabolism. It can also potentially increase enamel resistance to bacterial acid production. Soni et al. reviewed the cariostatic properties of fluoride and concluded that fluoride is an irreplaceable agent in the era of minimally invasive dentistry. Dental caries, commonly referred to as cavities, is the cause of a carious lesion. Dental caries is a multifactorial disease involving the intricate long-term interactions of environmental, agent, and host factors. Even while dental caries has been less common in industrialized nations over the past 20 years, a significant portion of the population still struggles with it. According to data from the 1999–2004 Nhanes, 26% of adults aged 20–64 who have dental caries untreated and 92% of adults aged 20–64 who have dental caries in their permanent teeth. Since 1988, there has been an increase in the total number of filled or restored teeth; however, since many new dental restorations are replacements for older restorations, this is not a true indicator of the improvement in oral health.

and Could Finally Indicate The Disease's Advancement. These restorations are susceptible to recurring caries and eventual failure and have a limited lifespan. Consequently, it is imperative to treat or prevent dental cavities as soon as possible. The initial phases of carious lesions involve the demineralization of tooth enamel. The ultimate goal of caries management is to preserve the natural tooth structure, which can be achieved if this process can be halted or reversed before a cavity forms. There are a number of ways to achieve this through remineralization, but fluoride treatment is one of the best strategies.[3,4]

1.Anti-Inflammatory Activity

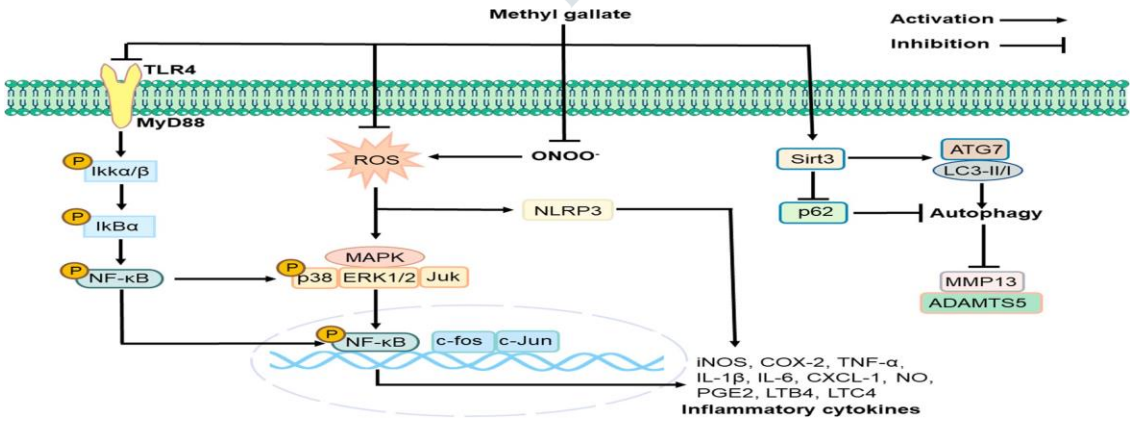
Numerous studies have discovered that magnesium can, via a variety of mechanisms, have distinct anti-inflammatory effects on different models of inflammatory injury, such as intestinal inflammation, arthritis, nephritis, and dermatitis. In a dose-dependent manner, magnesium-inhibited Lps induces phosphorylation of Erk1/2 in Raw264.7 cells.[5]



1. Anti-Microbial Activity

In the natural world, microorganisms are widely dispersed, and infections by pathogenic microbes can be harmful to human health. Simultaneously, the rise in drug resistance makes more and more pathogenic microorganisms harder to treat, which has become a widespread concern. Proved That Mg Has A Direct Inhibitory Effect On Fusobacterium Nucleatum Growth. Comparably, R.K. Mishra et al. [80] demonstrated that magnesium had no toxicity toward Nih3t3 mouse fibroblast cells and that its minimum inhibitory concentration (Mic) against Klebsiella pneumoniae was 0.32 mg/ml. Furthermore, it has been demonstrated by other researchers that magnesium, when combined with ciprofloxacin, can down-regulate virulence and quorum sensing genes, effectively inhibiting Salmonella Typhimurium's adhesion, invasion, and intracellular survival in vitro.

It has been shown that the combination of magnesium with nalidixic acid enhances the inhibitory effect on bacteria resistant to nalidixic acid in a synergistic way. In addition to its anti-salmonella action, magnesium can lessen liver damage and drowsiness in Ws-5-infected Balb/C mice via inhibiting DNA gyrase or atpase. Strong pharmacological effects of magnesium have been demonstrated in the destruction of bacterial membrane integrity.shown that magnesium possesses notable antibacterial activity. Mg Increases Tylosin (Ty)'s Membrane Instability And Biofilm-Inhibitory Effect In Salmonella. Typhimurium. Additionally, it effectively reduces Salmonella Typhimurium adhesion and invasion of intestinal epithelial cells. Mg Can Cause Bacterial Physiological Changes, Resulting In A Significant Decrease In Ph, Affecting Membrane Potential, And Reducing Atp Levels To Exhibit Antibacterial Activity, Which Is Achieved By Disrupting Membrane Integrity [86]. According to research, magnesium inhibits the growth of oral bacteria in vitro, as well as biofilm formation and acid production by Streptococcus mutans [87,88]. It Effectively Controls Humoral



Test for antioxidant activity We use DPPH to measure the antioxidant activity of a pure molecule. After weighing and dissolving 7.9 mg of DPPH (BM 394.32) in 50 ml of methanol proanalysis, the solution was stored in a dark bottle. The blank solution was then prepared by homogenizing 1 milliliter of 0.4 milliliter DPPH solution in a 5-milliliter test tube, followed by the addition of methanol proanalysis to the mark. Aluminum foil was used to cover the tube. To prepare the mother liquor, weigh 5 mg of the material and dissolve it in 10 ml of methanol proanalysis (500 µg/ml). To measure concentrations, five milliliter tapered test tubes were filled with 50, 100, 150, 200, and 250 microliters of mother liquor. To get concentrations of 5, 10, 15, 20, and 25 µg/ml, pipette 50, 100, 150, 200, and 250 µl of mother liquor into a 5 ml tapered test tube. Each tube received one milliliter of one-millimeter DPPH solution, followed by five milliliters of methanol proanalysis and homogenization. Aluminum foil is wrapped around the tube. The test solution was incubated for 30 minutes at 37°C in a water bath with varying concentrations. The solution's absorption was measured using ultraviolet-visible spectroscopy at 515 nm, its maximum absorption wavelength.[6,7]

Conclusions

The bacterial disease process known as dental caries is brought on by acids from bacterial metabolism that seep into enamel and dentine, dissolving the mineral. Organic acids are produced by the responsible bacteria as a byproduct of their metabolism of fermentable carbohydrates. A Continuum of Demineralization and Remineralization Cycles Leads To The Caries Process. Cavitation is the end point of demineralization, which starts at the atomic level at the crystal surface inside the enamel or dentine and can go on indefinitely if left unchecked. There are numerous ways to get involved in this ongoing process and stop or stop the lesion's progression. The Natural Repair Process For Non-Cavitated Lesions, Remineralization, Depends On Fluoride-Assisted Calcium and Phosphate Ions To Create A New Surface On Pre-Existing Crystal Remnants In Subsurface Lesions That Remain After Demineralization. Compared to the original mineral, these remineralized crystals are far less soluble, making them resistant to acid.

For more than a century, methyl gallate chemicals have been utilized in dentistry. Studies conducted in laboratories and clinics have demonstrated their effectiveness as agents, especially in preventing and stopping caries in permanent and primary teeth. Even though the discoloration effect is unquestionably a significant side effect for many patients.

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