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# REEVALUATING THE ROLE OF SYSTEMIC ANTIBIOTICS IN PERIODONTAL DISEASE TREATMENT: ARE WE CAUSING MORE HARM THAN BENEFIT?

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**ABSTRACT:** The use of systemic antibiotics in the treatment of periodontal disease has been a subject of considerable debate. While these antibiotics can effectively reduce pathogenic bacterial loads and support the healing process, their broad-spectrum nature raises concerns about antibiotic resistance, disruption of normal microbiota, and potential adverse effects. This review critically examines the benefit and risks associated with associated with systemic antibiotic therapy current clinical guidelines, the effectiveness of antibiotics in managing various forms of periodontal disease, and the implications of antibiotic resistance. By evaluating recent research and clinical outcomes, we aim to provide a balanced perspective on whether the routine use of systemic antibiotics in periodontal treatment is justified or if alternative strategies should be prioritized to minimize potential harm.

**Keywords:** Systemic antibiotics, periodontal disease, antibiotic resistance, periodontal therapy, microbiome disruption.

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## 1. INTRODUCTION

Systemic antibiotics are often prescribed in combination with scaling and root planing (SRP) to treat periodontal disease when conventional nonsurgical treatments do not yield desired results. This

approach aims to support the immune system in reducing subgingival pathogens. However, the widespread use of antibiotics raises significant concerns regarding antibiotic resistance exacerbated by both medical treatments and agricultural practices [1-5].

## THE ROLE AND RISKS OF ANTIBIOTICS IN DENTISTRY

Antibiotics have been instrumental in treating various diseases, significantly improving health outcomes. However, their extensive use has led to a critical rise in antibiotic resistance. The Centers for Disease Control and Prevention (CDC) report that antibiotic resistance adds more than $20 billion annually to healthcare costs in the United States [6]. Antibiotics destroy harmful bacteria but can also eliminate beneficial bacteria, allowing resistant strains to thrive and proliferate [7-8].

## IMPROPER PRESCRIPTION PRACTICES

Nearly half of all antibiotics administered today are either unnecessary or improperly prescribed [9-10]. For instance, broad-spectrum antibiotics have shown significant clinical improvement in chronic periodontitis patients when used with SRP, but this must be weighed against the risk of developing resistance [11-12]. Evidence-based dentistry should guide the prescription of antibiotics, ensuring their benefits outweigh the risks [13-15].

## MICROBIAL IDENTIFICATION AND ANTIBIOTIC PRESCRIPTION

Microbial identification through plaque analysis is essential before prescribing antibiotics for periodontal disease. This allows the provider to determine the specific bacteria present in each periodontal pocket [16]. The selection of antibiotics should consider the patient's health history, medical history, drug allergies, and other factors such as age and renal function [17-18]. For example, tetracycline is contraindicated for patients with developing teeth and bones. Additionally, antibiotics can compromise the effectiveness of medications like oral contraceptives, so patients must be informed of potential side effects [19-20].

## EFFECTIVENESS OF ANTIBIOTICS

Studies have shown that systemic antibiotics such as amoxicillin and metronidazole can provide clinical improvement in patients with chronic periodontitis when used alongside SRP [21-22]. However, the use of antibiotics should be cautious, as the benefits must outweigh the risks. The overall effects of antibiotics and the practice of evidence-based dentistry are crucial to prevent adverse outcomes [23]. Researchers have noted that these antibiotics do not have specific target bacteria and that only a small portion of these antibiotics reach their targets, which contributes to resistance as other organs absorb the excess [24].

## ANTIBIOTIC RESISTANCE AND STEWARDSHIP

Bacterial resistance has become a global public health problem, projected to cause an estimated 10 million deaths worldwide by 2050 [25]. Antibiotics can reduce "good" bacteria along with harmful bacteria, diminishing the body's natural defenses and providing an opportunity for drug-resistant bacteria to grow. To prevent further antibiotic resistance, dental professionals must practice antibiotic stewardship, recommending antibiotic treatment only as a last resort and following clear and concise protocols for managing antibiotics [26]. The CDC's antibiotic stewardship program has improved infection treatment and reduced unnecessary antibiotic use [26].

## ALTERNATIVE APPROACHES AND HOST-MODULATING THERAPIES

Given the rising concerns about antibiotic resistance, alternative approaches to managing periodontal disease are being explored. Probiotics and host-modulating therapies have shown promise in restoring the microbial balance and controlling inflammation without the risks associated with antibiotics [27]. Probiotics, for instance, have shown promise in reducing the need for surgery by restoring positive bacterial populations [8]. Additionally, host-modulating drugs such as low-dose aspirin combined with omega-3 derivatives have been shown to improve the results of mechanical anti-infective treatment without the hazards of antibiotic use [27].

## CONSIDERATIONS FOR DOSING AND LONG-TERM EFFECTS

When prescribing antibiotics, it is important to consider the dosing regimen carefully. Time-dependent antibiotics require prolonged exposure to the antimicrobial agent to be effective, and maintaining constant blood levels through frequent dosing is crucial [17]. Moreover, the prescriber must decide whether a loading dose is needed, as some antibiotics take six to 12 hours to achieve therapeutic effects [23]. Long-term studies have yet to definitively prove the survival benefits of adjunctive antibiotic therapy over standard treatments in periodontics. The societal cost of widespread antibiotic use, particularly the increase in antibiotic resistance, must be critically evaluated [28].

## THE NEED FOR EVIDENCE-BASED GUIDELINES

Despite the demonstrated short-term benefits of antibiotics in periodontal therapy, the long-term advantages remain debatable. Consequently, professional guidelines must evolve to emphasize the judicious use of antibiotics, reserving them for cases unresponsive to conventional treatments. This approach aligns with global health initiatives aimed at combating antibiotic resistance [28].

## EMERGING ALTERNATIVES: PROBIOTICS AND HOST-MODULATING THERAPIES

The exploration of probiotics and host-modulating therapies offers promising alternatives to traditional antibiotic treatments. Probiotics can help restore a healthy microbial balance and have been shown to

improve clinical outcomes in periodontal treatment without the risks associated with antibiotics [29]. Host-modulating therapies such as the use of omega-3 fatty acids and low-dose aspirin have demonstrated efficacy in reducing inflammation and enhancing the results of mechanical periodontal therapy [30].

## 2. CONCLUSION

The use of systemic antibiotics in periodontal disease treatment must be carefully considered due to the potential for antibiotic resistance. Evidence-based dentistry requires a comprehensive evaluation of the patient's case, understanding the patient's needs, familiarity with current literature, and treatment within the provider's expertise. Alternatives such as probiotics and host-modulating therapies offer promising results in managing periodontal disease without the adverse effects associated with antibiotics. Dental professionals should reserve antibiotics for cases where other treatments have failed and ensure patients are educated about the risks and benefits of antibiotic use.

## ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Not applicable.

## HUMAN AND ANIMAL RIGHTS

No animals or humans were used for the studies that are based on this research.

## CONSENT FOR PUBLICATION

Not applicable.

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## CONFLICT OF INTEREST

The authors declare no conflict of interests.

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