

Diode Laser Effectiveness on Red-Complex Bacteria

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Background: Periodontitis is a multifactorial, inflammatory disease of the supporting tissues of the teeth caused by specific microbes, leading to advancing destruction of the periodontal ligament and bone along with pocket formation and gingival recession. Periodontitis is initiated by complex microbial biofilms that colonize the sulcular region and over time cause clinical attachment loss and pocket formation. The diode laser can be used to eradicate the inflamed pocket epithelium and decrease bacterial levels to promote healing.

Objective: This systematic review examined diode lasers irradiation effectiveness in reducing red-complex bacteria levels and clinical periodontal parameters of pocket depth and clinical attachment level.

Search methods and selection: Scopus, Embase, Medline, and Web of Science databases were electronically searched according to specific inclusion and exclusion criteria in July 2022. Randomized control trials that evaluated reduction of red-complex bacteria using diode lasers in patients with periodontitis were included. The primary outcome was the reduction in the microbial count of the red complex bacteria. The secondary outcome considered were clinical periodontal parameters of probing depth and attachment level. Articles in languages other than English were excluded. Study quality was assessed based on the Cochrane Handbook for Systematic Reviews of Interventions Handbook guidelines and ROB2 tool.

Figures & Tables:

Figure 1

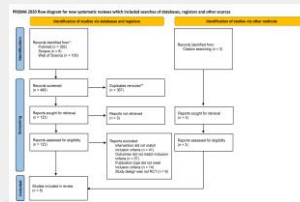


Figure 2

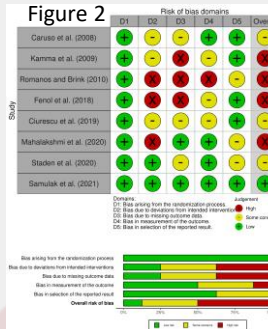


Figure 3

Author	Year	Study Design	Intervention	Control	Outcome
Caruso et al.	2008	Randomized controlled trial	Diode laser	Scaling	Red complex bacterial count
Kamma et al.	2005	Randomized controlled trial	Diode laser	Scaling	Red complex bacterial count
Romano and Dink	2011	Randomized controlled trial	Diode laser	Scaling	Red complex bacterial count
Fendi et al.	2018	Randomized controlled trial	Diode laser	Scaling	Red complex bacterial count
Cunescu et al.	2019	Randomized controlled trial	Diode laser	Scaling	Red complex bacterial count
Mahavishvi et al.	2020	Randomized controlled trial	Diode laser	Scaling	Red complex bacterial count
Staden et al.	2020	Randomized controlled trial	Diode laser	Scaling	Red complex bacterial count
Semulski et al.	2021	Randomized controlled trial	Diode laser	Scaling	Red complex bacterial count

Table 1. Characteristics of the selected studies

Author	Study Year	Study Design	Intervention	Control	Outcome
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Semulski et al.	2021	Randomized controlled trial	Diode laser	Scaling	Red complex bacterial count

Table 2. Summary of findings table

Outcomes	Quality assessment					Summary of findings		
	Risk of bias	Inconsistency	Indirectness	Imprecision	Publishing bias	Impact	No. of participants (Studies)	Certainty of evidence (GRADE)
Effect of diode laser on bacterial count reduction of the red complex bacteria	Serious*	Serious*	Not serious	Not serious	Not serious	Our confidence in the effect estimate is limited	210 (8)	Low ⊕⊕
Effect of diode laser on probing depth and clinical attachment levels	Serious*	Serious*	Not serious	Not serious	Not serious	Our confidence in the effect estimate is limited	200 (7)	Low ⊕⊕

* Five studies showed high risk of bias
 * Five studies showed high risk of bias
 * Large differences in effect across studies
 * Magnitude of effect is unclear

Results: A total of eight studies that examined 210 subjects were included in the review. The average age group of the study population was 30-60 years. The eight studies lacked consensus on the antimicrobial effect of diode lasers. Four studies reported no significant difference in the levels of red complex bacteria before and after laser application. Three studies reported significantly lower levels of red complex bacteria in the intergroup comparison. One study reported that laser had no significant effect on intergroup bacterial levels. Four studies showed a high risk of bias, and three studies had a rating of some concerns. Only one study had a low risk of bias. Overall, the combination of diode laser irradiation with scaling reduced the count of red complex bacteria and improved the clinical parameters, although not significantly.

Conclusion: Based on the limited evidence available, the adjunctive use of diode laser to scaling and root planning may provide some additional benefit in terms of reduction of red complex bacterial count and clinical parameters. Further well-designed trials adhering to reporting guidelines and using objective measures are necessary before outlining universal guidelines for best practice.

Clinical Implication: The adjunctive use of diode laser in non-surgical periodontal therapy may provide a decrease in the red complex microbial count and improvement in clinical parameters decreasing the need for periodontal surgery.