

Antibacterial effect of synthetic peptide LyeTx-I and the association compound LyeTx-I/ β -CD against planktonic and multispecies biofilms of periodontal pathogens

Edison Andrés Cruz Olivo, Daniel Santos, Maria Elena de Lima, Vera Lúcia dos Santos, Rubén Dario Sinisterra, and Maria Esperanza Cortés / Universidade Federal de Minas Gerais – Faculdade de Odontologia

Abstract

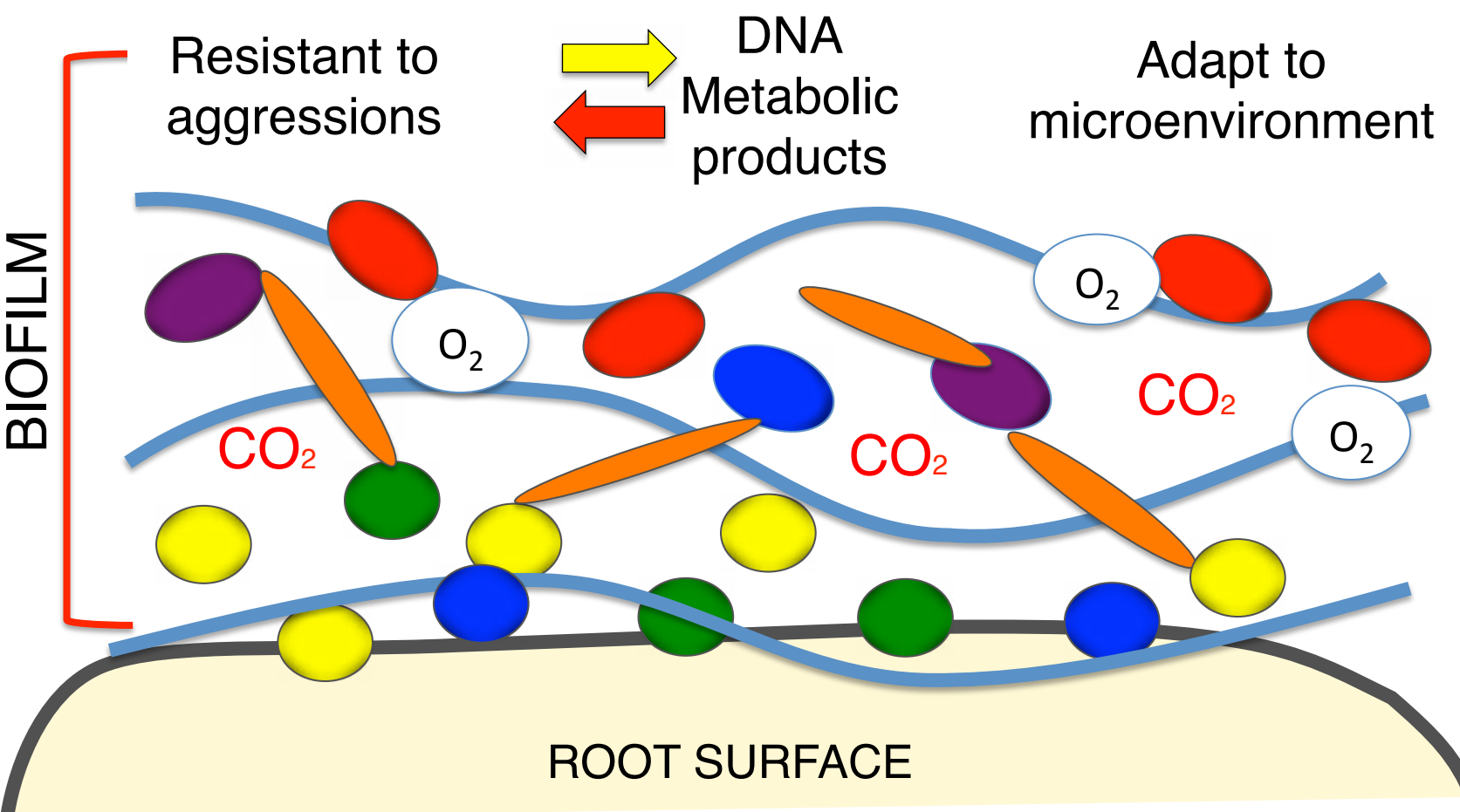
Background: This study evaluated in vitro antimicrobial activity of synthetic peptide LyeTxI and association compound LyeTxI/ β -cyclodextrin (β CD) against multispecies biofilms.

Methods: Sensibility to LyeTxI and LyeTxI/ β CD was determined for planktonic Gram-negative periodontopathogens. Time-kill kinetic assay was performed at minimum inhibitory concentrations (MICs) in all planktonic strains. Multispecies biofilms were grown on pegs using a biofilm device and studied by scanning electron microscopy at 2, 5, and 10 days. Minimal biofilm eradication concentration (MBEC) was determined for 2- and 4-day multispecies biofilms. Metabolic activity of biofilms was determined by fluorometry study.

Results: Biofilms showed reproducible cell density on pegs of the biofilm device. LyeTxI and LyeTxI/ β CD were active against all strains tested at concentrations $\leq 62.5 \mu\text{g/mL}$. Kinetic assays showed rapid bactericidal effect of LyeTxI against all periodontopathogens. MBECs of LyeTxI and LyeTxI/ β CD against multispecies 2-day biofilms were two-fold higher than MICs of cells shed from biofilms. LyeTxI was able to reduce multispecies 2-day metabolic activity by 90%. Multispecies 4-day biofilms were tolerant to all agents tested.

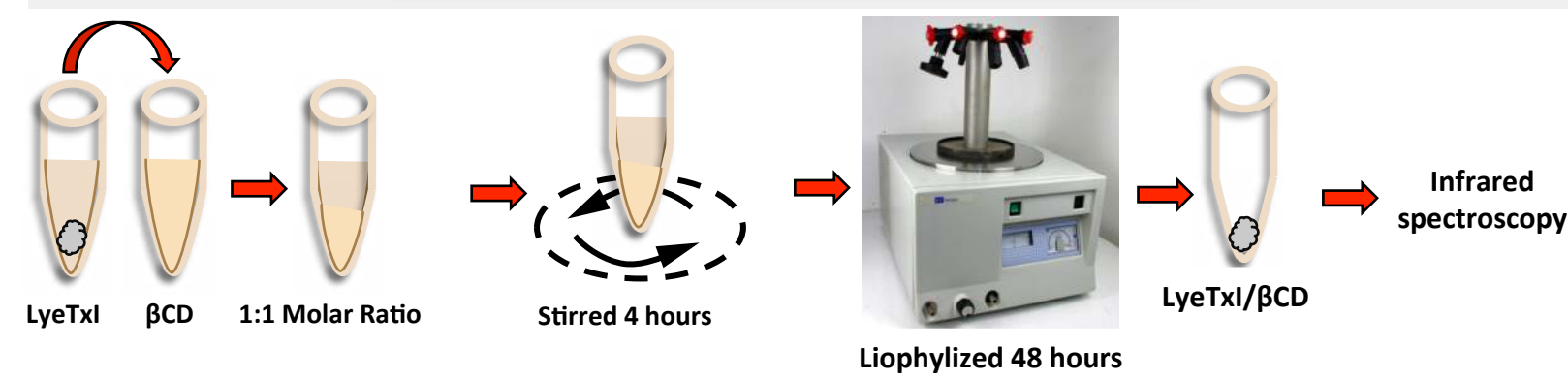
Conclusions: LyeTxI and LyeTxI/ β CD are active against periodontopathic bacteria, showing rapid bactericidal effect and may be used to prevent biofilm development. In the future, AMPs could be therapeutic tools for treatment of periodontitis.

Background and Aim

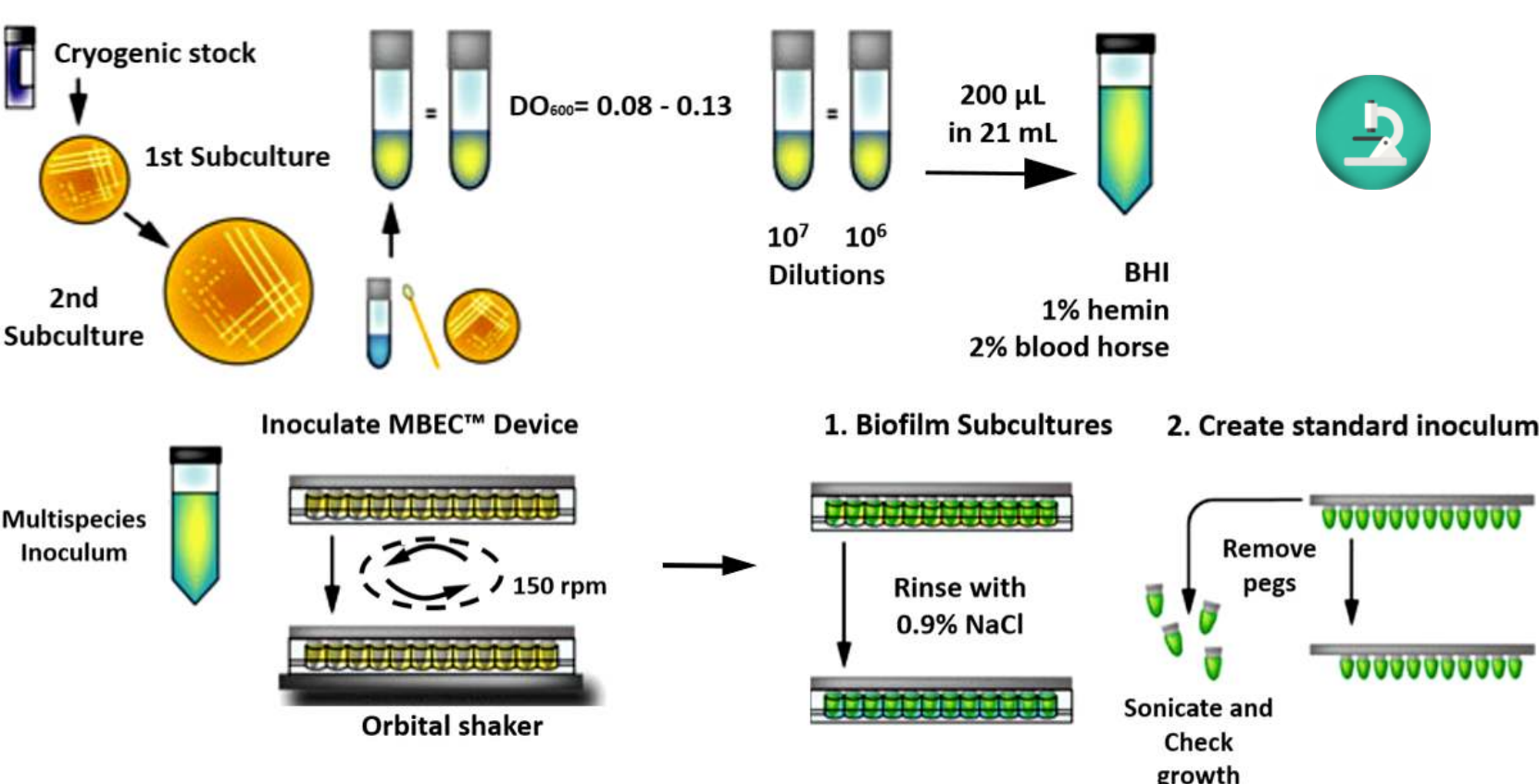


Thus, the present study evaluated the in vitro antimicrobial activity of synthetic peptide LyeTxI and the association compound LyeTxI/ β -cyclodextrin (β CD) against multispecies biofilms.

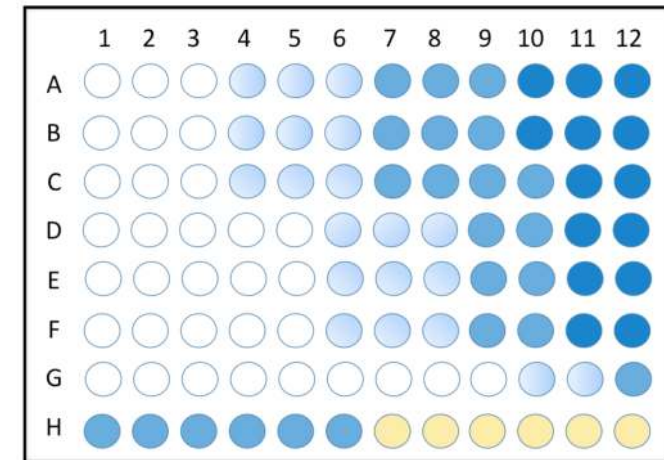
Methods and Materials



- E. corrodens* (ATCC 23834)
- F. nucleatum* (ATCC 25586)
- P. intermedia* (ATCC 49046)
- P. gingivalis* (ATCC 23834)
- A. actinomycetemcomitans* (ATCC 29522)



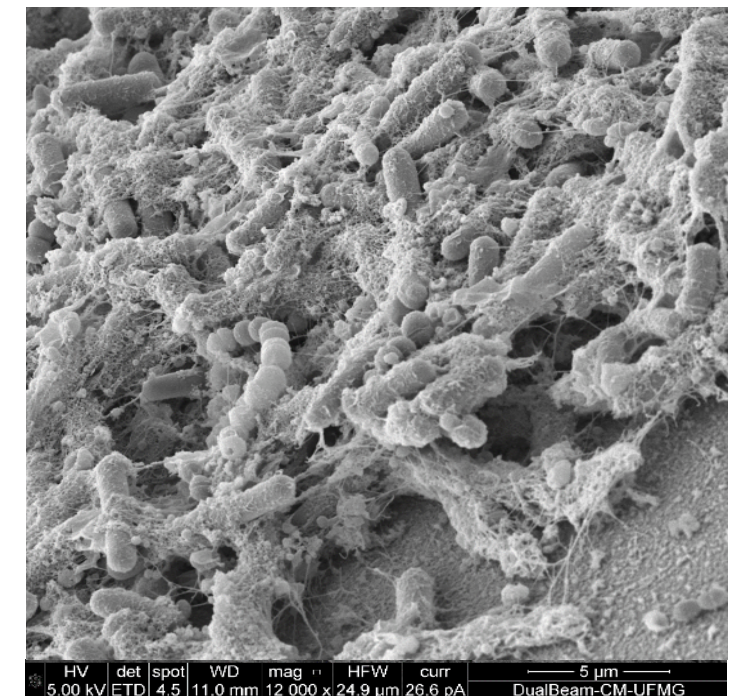
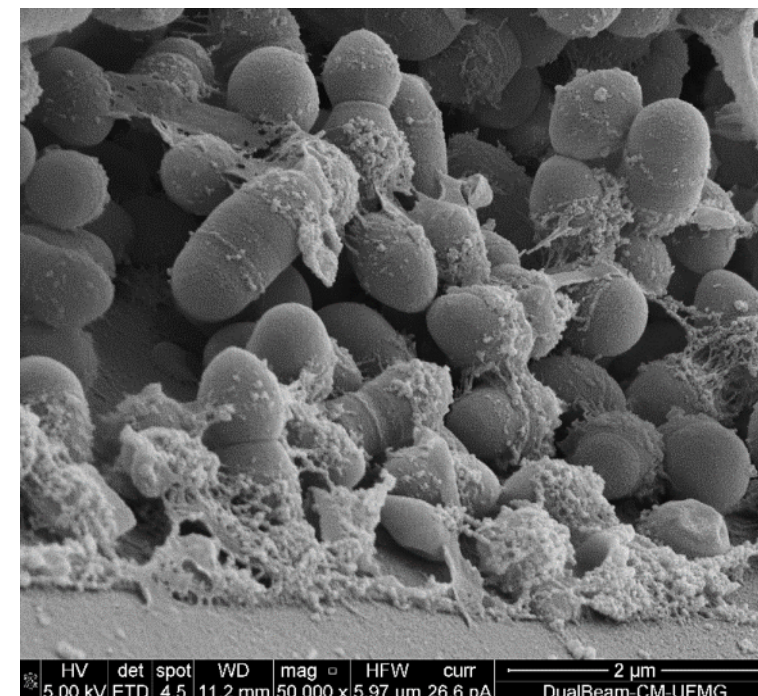
	1	2	3	4	5	6	7	8	9	10	11	12
A	120 $\mu\text{g/mL}$ LyeTxI	60 $\mu\text{g/mL}$	30 $\mu\text{g/mL}$	15 $\mu\text{g/mL}$	7.50 $\mu\text{g/mL}$	3.75 $\mu\text{g/mL}$	1.87 $\mu\text{g/mL}$	0.93 $\mu\text{g/mL}$	0.46 $\mu\text{g/mL}$	0.23 $\mu\text{g/mL}$	0.12 $\mu\text{g/mL}$	0.06 $\mu\text{g/mL}$
B	LyeTxI											
C	LyeTxI											
D	LyeTxI/ β CD											
E	LyeTxI/ β CD											
F	LyeTxI/ β CD											
G	CHX											
H	Bacteria	Bacteria	Bacteria	Bacteria	Broth growth media	Broth growth media	Broth growth media	Broth growth media	LyeTxI 240 $\mu\text{g/mL}$	LyeTxI/ β CD 240 $\mu\text{g/mL}$	β CD	0.12% CHX



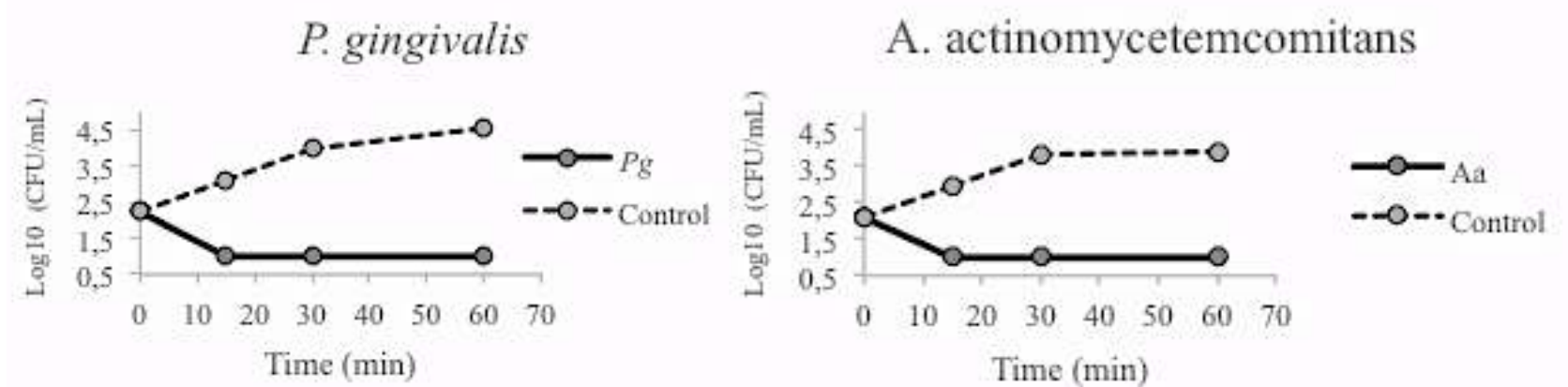
- ✓ (MBEC)
- ✓ Metabolic Activity of Biofilms by fluorometry
- ✓ MIC
- ✓ MBC
- ✓ Time Kill Kinetic Assay

Results

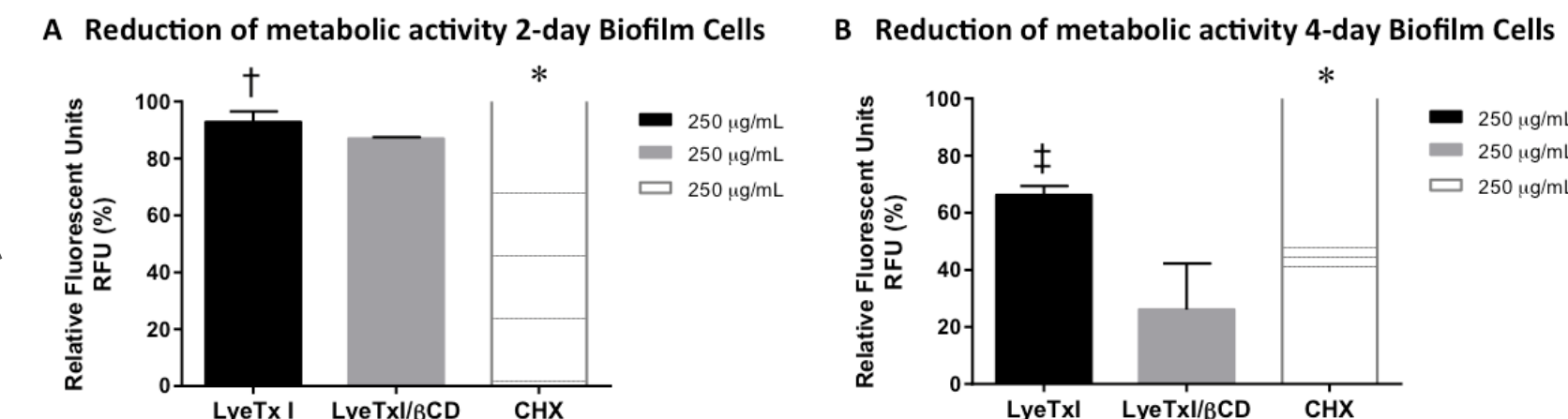
- Scanning electron photomicrographs of multispecies biofilms formed on pegs from the biofilm device.



- Time-kill kinetic assay



- Metabolic activity



- Table 1. Reduction of metabolic activity of 2-day and 4-day biofilms after exposure to LyeTxI and LyeTxI/ β CD at the highest concentration (250 $\mu\text{g/mL}$).

	LyeTxI (mean \pm SD)	p Value	LyeTxI/ β CD (mean \pm SD)	p Value	Chlorhexidine (mean \pm SD)	p Value
Multispecies Biofilms						
2-day	92.87 \pm 3.66	> 0.05	87.00 \pm 0.50	> 0.05	97.65 \pm 0.50	< 0.05
4-day	67.18 \pm 3.05	< 0.05	28.26 \pm 15.64	< 0.05	94.75 \pm 0.00	< 0.05
Planktonic Cells from Biofilms						
2-day	82.45 \pm 0.36	< 0.05	41.82 \pm 9.36	< 0.05	94.75 \pm 0.00	< 0.05
4-day	72.53 \pm 1.69	< 0.05	44.78 \pm 8.02	< 0.05	94.75 \pm 0.00	< 0.05

SD= Standard Deviation

Conclusions

LyeTxI and LyeTxI/ β CD are active against periodontopathic bacteria, showing rapid bactericidal effect and may be used to prevent biofilm development on teeth and dental implants.

References

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