

Efek Propolis Fluorida 10% Terhadap Respons Oksidatif dari Biofilm Dual-spesies *Streptococcus mutans* dan *Veillonella parvula* = Effects of Propolis Fluoride 10% on Oxidative Response of *Streptococcus mutans* and *Veillonella parvula* Dual-species Biofilm

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Abstrak

Pendahuluan: Propolis fluorida 10% (PPF 10%) memiliki kemampuan mencegah pembentukan biofilm monospecies, tetapi penelitian dalam mencegah biofilm multispecies belum pernah dilakukan. Tujuan: Mengamati efek inhibisi PPF 10% terhadap biofilm dual-species *Streptococcus mutans* dan *Veillonella parvula* melalui ekspresi gen NRAMP dan SloR/Dlg_C. Metode: Pembuatan biofilm dilakukan dengan metode 96-well plate dengan inkubasi 1 dan 3 jam. Ekstraksi RNA dan sintesis cDNA dilakukan pada sampel biofilm, dan konsentrasi cDNA distandarisasi untuk reverse-transcription quantitative- polymerase chain reaction (RTqPCR). Gen target dalam penelitian ini adalah NRAMP dan SloR/Dlg_C, dan 16srRNA sebagai kontrol internal. Perubahan gen dikuantifikasi dengan menggunakan metode Livak (2^{-Ct}) dan analisis statistik dilakukan menggunakan SPSS. Hasil: Ekspresi gen NRAMP pada sampel monospecies dan dual-species lebih rendah pada perlakuan PPF 10% pada 1 dan 3 jam dengan perubahan masing-masing -12.25 dan -8.75 log-fold change ($p < 0.05$). Ekspresi gen SloR/Dlg_C lebih rendah pada sampel monospecies dan dual-species dengan perlakuan PPF 10% dengan masing-masing -4.86 dan -5.57 log-fold change ($p < 0.05$). Kesimpulan: Kelompok perlakuan PPF 10% menunjukkan perubahan ekspresi gen yang berhubungan dengan stres oksidatif dan simbiosis pada biofilm dual-species *S. mutans* dan *V. parvula*, mengurangi aerotoleransi dan meningkatkan kerentanan terhadap reactive oxygen species.

.....Introduction: Propolis fluoride 10% inhibits monospecies biofilm formation, but there are no research regarding its effects on multispecies biofilms. Objective: To investigate the inhibiting effects of PPF 10% on *Streptococcus mutans* and *Veillonella parvula* dual-species through NRAMP and SloR/Dlg_C gene expression. Method: Biofilms were made using the 96-well method in 1 and 3-hour incubation. RNA was extracted for cDNA synthesis and standardized using a Qubit fluorometer for reverse-transcription quantitative- polymerase chain reaction (RTqPCR). Target genes used in this study were NRAMP and SloR/Dlg, and 16srRNA as the internal control. Alterations of gene expression were quantified using Livak's method (2^{-Ct}). Statistical analysis was performed using SPSS. Results: NRAMP gene expression is lower in PPF 10% treated monospecies and dual-species samples than negative control sample in 1-hour and 3 hours incubation with -12.25 log-fold change and -8.75 log-fold change ($p < 0.05$) respectively. Lower gene SloR/Dlg_C gene expression is also observed in monospecies and dual-species samples with -4.86 and -5.57 log-fold change respectively ($p < 0.05$). Conclusion: PPF 10% treated group showed altered oxidative stress and symbiotic related gene expression in *S. mutans* and *V. parvula* dual-species biofilm, reducing aerotolerance, thus increasing reactive oxygen species susceptibility of dual-species biofilm.