

ABSTRACT

Background : Inflammatory disease of periodontal tissue (periodontitis) is still a problem in many developing countries including in Indonesia due to its very high prevalence. The disease is an infectious inflammatory condition of the periodontal tissue caused by *Porphyromonas gingivalis*. Gingival epithelial plays an important role in oral tissue protection from invasion or bacterial attack. Epithelial cells act as mechanical barriers to the attack of pathogenic organisms and enhance intercellular communication through complex cell-cell junction. Administration of Curcumin is expected to increase epithelial defences.

Purpose : The purpose of this study was to prove the role of Claudin-1, E-Cadherin, TLR-4, NFκB, COX-2, PGE-2, and MMP-7 in barrier epithelial in gingiva epithelium. Furthermore, recent study to examine the influence of curcumin to increase barrier epithelial in gingiva epithelium and repair the gingival epithelium damaged by exposure to LPS bacteria Pg.

Methods : The experimental animals used were white rats (*Rattus norvegicus*), Wistar strains, males, 12 weeks old, weighing 200-250 grams. All animals adapted for 2 weeks. Then the random allocation of 40 rats divided into 8 time-based research groups. One as a healthy group and the seven others were exposed by LPS Pg. Six groups consist of three which injection by LPS Pg and three treatment groups which treatment with curcumin 1%. The other one group were control for the vehicle. Sample was taken from gingival tissue of mandibula incisors. On 1 day, 7 days and 14 days, Claudin-1, E-Cadherin, TLR-4, NFκB, COX-2, PGE-2, and MMP-7 expression were examined by immunochemistry method. Tight junctions and adherens junction bonds were examined by Transmission Electron Microscopy (TEM).

Results and discussion : In groups which injected by LPS Pg, showed an increase in TLR-4, NFκB, COX-2, PGE-2, and MMP-7 expression and decreased Claudin-1 and E-Cadherin expression ($p < 0,05$). Administration of 1% curcumin topically can reduce TLR-4, NFκB, COX-2, PGE-2, and MMP-7 expression and increase Claudin-1 and E-Cadherin expression ($p < 0,05$). Examination with TEM showed the bonds of tight junction (TJ) and adherent junction (AJ) in the treatment group occurred with LPS Pg showed tissue damage ie visible cell swelling, cell shrinking, and disruption of TJ and AJ. Examination with TEM showed that the bonds of tight junction (TJ) and adherent junction (AJ) in LPS Pg group with curcumin administration showed tissue repair that showed start intact cell. In this study, LPS Pg can cause decreased expression of tight junction protein, Claudin-1 and adherent junction protein, E-Cadherin. This decrease causes the tight junction and adherent junction damage that is visible from the TEM image. Administration of curcumin may increase Claudin-1 and E-Cadherin expression resulting in improved tight junction and adherent junction bonds, as seen from the TEM

Conclusion : The conclusions of this study were, Claudin-1, E-Cadherin, TLR-4, NFκB, COX-2, PGE-2, and MMP-7 play an important role in barrier epithelial in gingiva epithelium. Administration of 1% curcumin topically can repair the gingival epithelium damaged by exposure to LPS bacteria Pg.

Keywords : *curcumin, gingiva epithelium, tight junction, adheren junction, TEM*

ABSTRAK

Latar belakang : Infeksi pada jaringan periodontal (periodontitis) masih menjadi masalah di banyak negara berkembang termasuk di Indonesia karena prevalensinya sangat tinggi. Periodontitis merupakan infeksi pada jaringan periodontal yang disebabkan oleh *Porphyromonas gingivalis*. Epitel gingiva memainkan peran penting dalam perlindungan jaringan mulut dari invasi atau serangan bakteri. Sel epitel berperan sebagai penghalang mekanis terhadap serangan organisme patogen dan meningkatkan komunikasi antar sel melalui persimpangan sel-sel yang kompleks. Pemberian kurkumin diharapkan dapat meningkatkan pertahanan epitel dan memperbaiki kerusakan epitel gingiva karena invasi bakteri.

Tujuan : Tujuan dari penelitian ini adalah untuk membuktikan peran Claudin-1, E-Cadherin, TLR-4, NFκB, COX-2, PGE-2, dan MMP-7 pada *epithelial barrier* gingiva. Selanjutnya, penelitian ini juga untuk mengetahui pengaruh pemberian kurkumin terhadap peningkatan pertahanan epitel gingiva dan perbaikan epitel gingiva yang rusak akibat paparan bakteri LPS Pg.

Metode : Hewan coba yang digunakan adalah tikus putih (*Rattus norvegicus*), strain Wistar, jantan, umur 12 minggu, berat 200-250 gram. Semua hewan diadaptasikan selama 2 minggu. Kemudian dilakukan alokasi acak dari 40 tikus dibagi menjadi 8 kelompok penelitian berbasis waktu. Satu sebagai kelompok sehat dan tujuh lainnya dipapar oleh LPS Pg. Tiga kelompok diberi LPS Pg saja dan tiga kelompok diberi LPS Pg dan curcumin 1%, sedangkan 1 kelompok di beri LPS Pg dan *corn oil* sebagai pembawa kurkumin. Pengambilan sampel dilakukan pada hari ke 1, hari ke 7 dan hari ke 14, dilakukan pemeriksaan Claudin-1, E-Cadherin, TLR-4, NFκB, COX-2, PGE-2, dan ekspresi MMP-7 dengan metode imunohistokimia. Ikatan *tight junction* dan *adheren junction* diperiksa dengan Transmission Electron Microscopy (TEM).

Hasil dan diskusi : Pada kelompok yang disuntikkan oleh LPS Pg, menunjukkan peningkatan ekspresi TLR-4, NFκB, COX-2, PGE-2, dan MMP-7 dan menurunkan ekspresi Claudin-1 dan E-Cadherin ($p < 0,05$). Pemberian kurkumin 1% secara topikal dapat menurunkan ekspresi TLR-4, NFκB, COX-2, PGE-2, dan MMP-7 serta meningkatkan ekspresi Claudin-1 dan E-Cadherin ($p < 0,05$). Pemeriksaan dengan TEM menunjukkan ikatan TJ dan AJ pada kelompok perlakuan LPS Pg menunjukkan kerusakan jaringan yaitu pembengkakan sel terlihat, penyusutan sel, dan tidak *intact*. Pada kelompok LPS Pg dengan kurkumin 1%, menunjukkan bahwa ikatan TJ dan AJ terjadi perbaikan jaringan yaitu sel mulai *intact*. Dalam penelitian ini, LPS Pg dapat menyebabkan penurunan ekspresi protein TJ Claudin-1 dan protein AJ, E-Cadherin. Penurunan ini menyebabkan kerusakan ikatan TJ dan AJ yang terlihat dari gambaran TEM. Pemberian kurkumin 1% dapat meningkatkan ekspresi Claudin-1 dan E-Cadherin yang menghasilkan perbaikan ikatan TJ dan AJ yang tampak dari gambaran TEM

Kesimpulan : Kesimpulan dari penelitian ini bahwa Claudin-1, E-Cadherin, TLR-4, NFκB, COX-2, PGE-2, dan MMP-7 berperan dalam *epithelial barrier* epitel gingiva. Pemberian kurkumin 1% secara topikal dapat memperbaiki epitel gingiva yang rusak akibat paparan bakteri LPS Pg.

Kata kunci : kurkumin, epitel gingiva, *tight junction*, *adheren junction*, TEM