The effects of human periodontal ligament cells to glabridin

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Introduction

Periodontitis is a chronic inflammatory disease and induces periodontal tissue destruction. Periodontal ligament cell-based treatment is considered as one of the most promising methods in periodontal tissue regeneration. This study examined the regenerative effects and anti-destructive effects of glabridin on periodontal ligament fibroblasts (PDLFs).

Methods

We assessed the regenerative effects of glabridin on PDLFs by measuring the expression of alkaline phosphatase, type I collagen, osteocalcin, Runx2 and osteoprotegerin using the quantitative real-time PCR.

We also determined the anti-destructive effects of glabridin on PDLFs under inflammatory conditions by examining the expression of proteolytic enzymes, including matrix metalloproteinase (MMP)-1, MMP-2 and MMP-8 using the quantitative real-time PCR.

Additionally, we evaluated the effects of glabridin on inflammatory mediators by measuring the secretion of interleukin -1β (IL-1β), tumor necrosis factor-α (TNF-α), interleukin-6 (IL-6) and nitric oxide (NO) on RAW264.7 cells.

Results

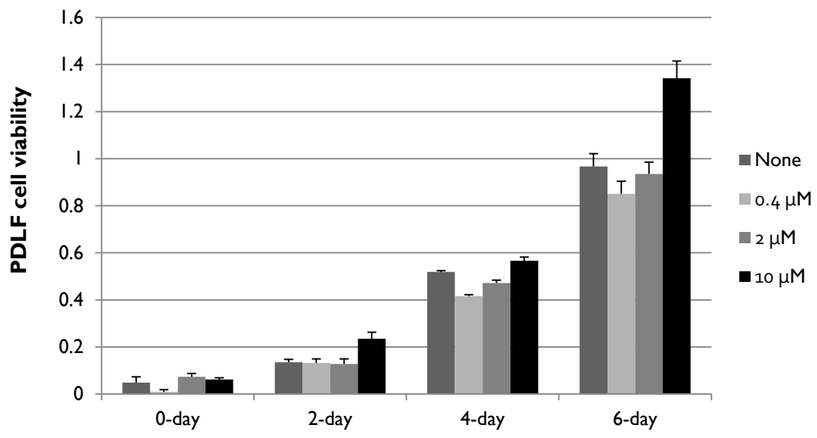

Figure 1. Effects of glabridin on cell viability in PDLFs. PDLFs were treated with glabridin for 0~6 days. After culture, the formazan granules were solubilized, and the absorbance was measured using a microplate reader. The cell viability was expressed as the absorbance ratio

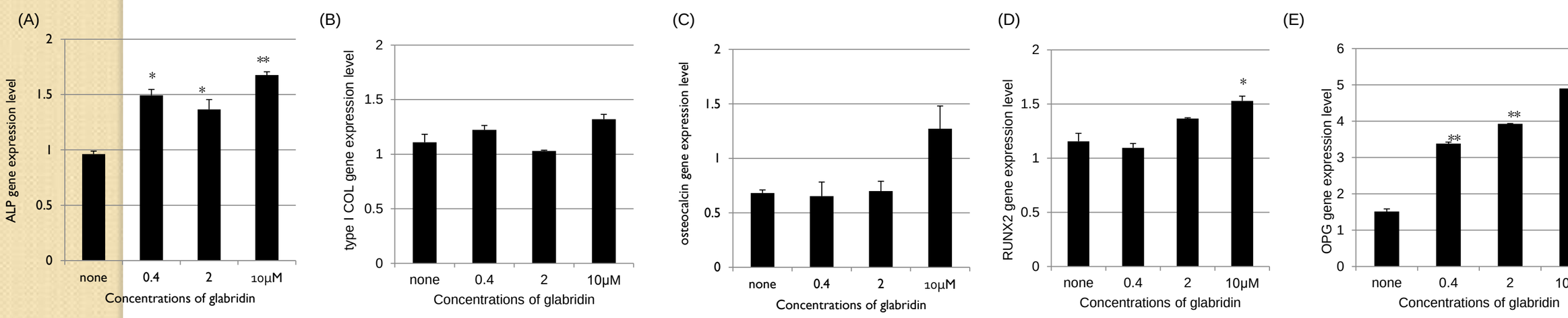

Figure 2. Effects of glabridin on gene expression in PDLFs. PDLFs were treated with glabridin for 4 days. After culture, (A) alkaline phosphatase, (B) type I collagen, (C) osteocalcin, (D) RUNX2 and (E) osteoprotegerin gene expression levels were measured by real-time PCR analysis, and normalized against the expression of GADPH. Data are presented as mean ±S.E. *<0.05, **<0.01 compared with none group.

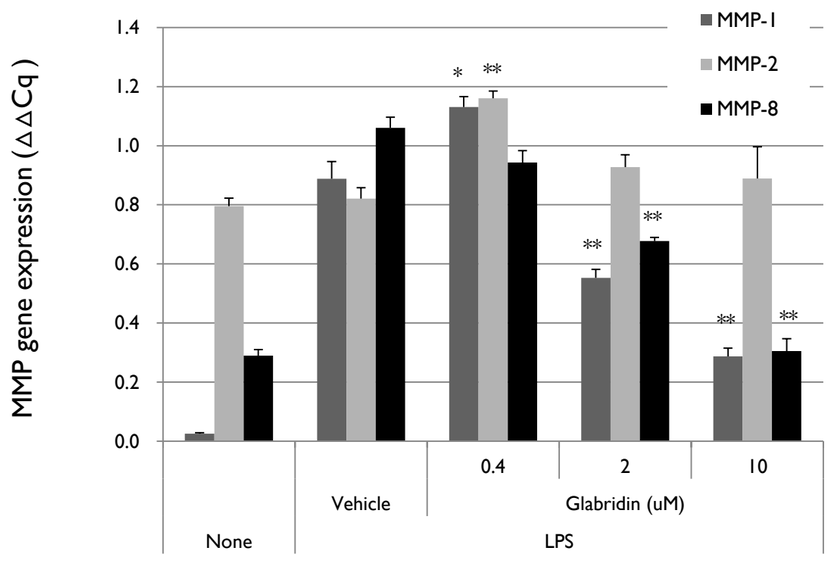

Figure 3. Effects of glabridin on MMP gene expression in PDLFs. PDLFs were treated with glabridin for 4 days. After culture, MMP-1, 2, and 8 gene expression levels were measured by real-time PCR analysis, and normalized against the expression of GADPH. Data are presented as mean ±S.E. *<0.05, **<0.01 compared with vehicle group.

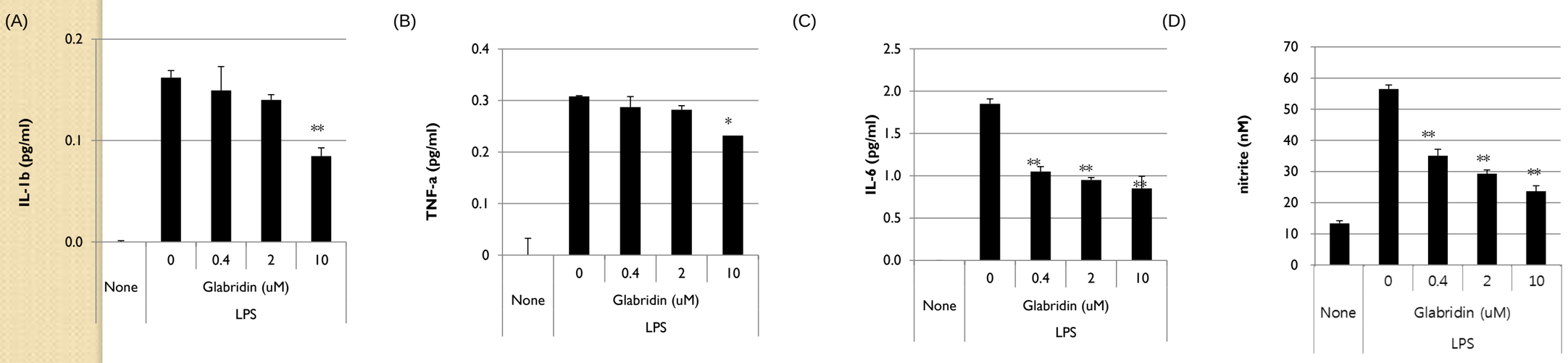

Figure 4. Effects of glabridin on pro-inflammatory cytokines in monocytes. RAW264.7cells were treated with glabridin for 2 days. After culture, (A) IL-1β, (B) TNF-α, (C) IL-6, and (D) NO secretion were measured using ELISA kits (for IL-1β, TNF-α and IL-6) or griess reagent (for NO). Data are presented as mean ±S.E. *<0.05, **<0.01 compared with vehicle group.

Conclusions

Glabridin increased significantly alkaline phosphatase, Runx2 and osteoprotegerin mRNA expression. Glabridin suppressed the expression of MMP-1 and MMP-8 in the PDLFs. In addition, glabridin had no effect on viability of the RAW264.7 cells and decreased the release of LPS-induced IL-1β, TNF-α, IL-6 and NO in RAW264.7 cells. These findings suggest that glabridin can stimulate the osteogenic differentiation and alleviates the tissue-destructive processes that occur during periodontal inflammation.