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.

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. RAW264.7 cells 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.