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Effects of nicotine and lipopolysaccharide on the expression of MMPs, PAs, and their inhibitors in human osteoblasts

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Objective: Lipopolysaccharide (LPS) from periodontopathic bacteria can initiate alveolar bone loss through the induction of host-derived cytokines. Smoking increases the risk and severity of periodontitis. We examined the effects of nicotine and LPS on the expression of matrix metalloproteinases (MMPs), plasminogen activators (PAs), and their inhibitors, including tissue inhibitors of metalloproteinases (TIMPs) and PA inhibitor-1 (PAI-I), in human osteoblasts.

Methods: The cells were cultured with or without nicotine and/or LPS for 12 days or 100 ng/ml LPS for 12 days or with 10 μg/ml polymyxin B, 10-5 M D-tubocurarine, 10-5 M NS398, or 10-6 M celecoxib in the presence of nicotine or LPS for 12 days. Gene and protein expression levels for MMPs, PAs, TIMPs, and PAI-1 were examined using real-time PCR and ELISAs, respectively. PGE2 production was determined using an ELISA.

Results: The addition of nicotine and/or LPS to the culture medium increased the expression of MMP-1, -2, and -3 and tissue-type PA (tPA); decreased the expression of TIMP-1, -3, and -4; and did not affect expression of TIMP-2 or PAI-1. In the presence of nicotine or LPS, the stimulatory effects of nicotine and LPS on MMP-1 expression were unchanged, but they were unable to stimulate PGE2 production.

Conclusion: These results suggest that nicotine and LPS stimulate the resorption process that occurs during turnover of osteoid by increasing the production of MMPs and tPA and by decreasing the production of TIMPs. Furthermore, they suggest that the stimulatory effect of nicotine and LPS on PGE2 production is independent of their stimulatory effect on MMP-1 expression.

2P-26
Immobility-induced Cartilage Degeneration differed at Three Specific Areas

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Keywords: Immobilization, Cartilage, Degeneration

Objective: Joint immobilization induced cartilage degeneration. In our previous report, the changes of the articular cartilage were different at the three specific areas as follows; atrophic changes in the non-contact area, hypertrophic differentiation of chondrocytes in the transitional area, and decreased number of chondrocyte in the contact area [1]. The purpose of this study was to investigate the mechanism of articular cartilage degeneration after immobilization at the three specific areas.

Methods: Adult male Sprague-Dawley rats' knee joints were immobilized at 150° of flexion by rigid internal fixator (3 days to 16 weeks). After fixed with 4% paraformaldehyde and decalcified, specimens were embedded in paraffin. Expression of collagen I and II, matrix metalloproteinase (MMP)-8 and -13 was evaluated by in situ hybridization or immunohistochemistry. Total RNA was extracted from the articular cartilage and expression levels of these mRNA were measured by quantitative PCR.

Results: Expression of collagen II and MMP-8 was decreased after 3 days in the three areas, but increased after 2 weeks at hypertrophic differentiated chondrocytes in the transitional area. Immunostaining of collagen II at the transitional and contact areas was decreased. Immunostaining of collagen I was increased at hypertrophic differentiated chondrocytes in the transitional area and superficial chondrocytes in the non-contact area. Immunostaining of MMP-13 was observed at the hypertrophic differentiated chondrocytes in the transitional area. Expression levels of collagen II mRNA was decreased, however, MMP-8 and -13 mRNA was increased by quantitative PCR.

Conclusions: The mechanism of the articular cartilage degeneration after immobilization differs at the three specific areas [2, 3].

REFERENCES