GREEN TEA CATECHIN (-)-EPICALLOATECHIN-3-GALLATE INHIBITS OSTEOCLASTOGENESIS

*Ho ML; *Lin, RW; *Chen IS; +*Wang, GJ
+*Kaohsiung Medical University, Kaohsiung, Taiwan
m675005@cc.kmu.edu.tw

INTRODUCTION:

Osteoporosis becomes a significant disease in developed countries nowadays. Besides causing suffering to the patient, the expenditure of medical care for osteoporosis is a socioeconomic burden for a society. A nutritional approach to prevent bone loss could be a future goal to achieve an inexpensive way for managing osteoporosis. A previous epidemiological study indicated that tea drinker had a higher bone mineral density than subjects without tea-drink habit. Tea drinking also reported to lower the risk of bone fracture. However, the effective components and the action mechanisms of tea on bone remodeling remain unclear. We have found that green tea catechin EGCG [(-)-epicalloatechin-3-gallate] increased the osteogenic function in mesenchymal stem cells. The higher rate of bone resorption than that of formation is a common feature of osteoporosis. Accordingly, to investigate the influence of catechin on osteoclasts would help to understand the beneficial effect of tea on osteoporosis. In this study, we examined the effect of EGCG on the potential of osteoclastogenesis.

METHODS:

The murine macrophage cell line RAW264.7 (ATCC, Rockville, MD) was maintained in Dulbecco Modified Eagle Medium (DMEM) containing 10% FBS. Cells were induced to differentiate into osteoclasts by supplement of 100 ng/ml RANKL and 30 ng/ml M-CSF. Cultures were treated with EGCG (100-10 µM) for 5 days. Osteoclastogenesis was examined by tartrateresistant acid phosphatase (TRAP) stain and counter-stained by Hoechst 33342. Cell apoptosis was detected by terminal deoxyribonucleotidyl transferase-mediated dUTP nick end labeling (TUNEL) stain.

RESULTS:

TRAP(+) stained multinucleated cells (MNCs) were induced by RANKL/M-CSF supplemented medium in RAW264.7 cultures, revealing osteoclastogenesis. The result showed that a 5-day treatment of EGCG (10–100 µM) significantly suppressed osteoclastogenesis of RAW264.7 cells and revealed a dose dependent manner (Fig. 1). The result from TUNEL staining indicated that the ratio of apoptotic cell to the total cells was significantly increase by 100 µM EGCG (Fig. 2).

DISCUSSION:

EGCG, one of the major green tea flavonoids, was indicated to have the most potential on anti-oxidation. Our previous experiment also showed that among 4 major green tea catechins, EGCG revealed the strongest effect on the osteogenesis in a mesenchymal stem cell line. In this study, we further found that a 5-day treatment of EGCG (10–100 µM) significantly suppressed the RANKL/M-CSF induced osteoclast differentiation in RAW264.7 cells. Moreover, we also found the higher concentration of EGCG (100 µM) not only suppressed the differentiation of these precursor cells but also induced cell apoptosis. Together with the findings of the previous study in osteogenesis and this study, we suggest that EGCG may be an agent to prevent osteoporosis through both enhancing bone formation and suppressing bone resorption. More evidences are needed to prove whether green tea is a beneficial drink for preventing osteoporosis.

REFERENCES:


Fig. 1 EGCG inhibits osteoclastogenesis

Fig. 2 EGCG induces cell apoptosis