

# Osteoblast repair action induced by ESWT

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## Introduction:

Osteoclastogenesis is regulated by signaling system between pro-apoptotic (Bax-CyclinE2-Cdk2) and necrosis factor families (RANKL-RANK-OPG).

## Methods:

Murine osteoblast cultures were subjected to shockwaves at low energy intensities (0.05mJ/mm<sup>2</sup>) and 500 impulses, whereas control cells received no treatment. We evaluated cell viability quantifying the expressions of Bax and Opg by PCR.

## Results:

We found an immediate negative effect on cell viability, that occurs with an increase of Bax protein expression, after 3 hours of treatment. After a longer time lapse a stimulatory effect on cell proliferation, as reflected by the increase of a G1-S-phase marker, was observed. In the 24, 48 and 72 hours following ESWT, we found a stronger association of Cyclin E2 and Cdk2, forming active cyclin E-Cdk2 kinase, compared to untreated cells. We explored the molecular mechanism for the ESW induction of osteogenesis: by Real-Time-PCR an enhancement of Runx2 mRNA, evident 48 hours after treatment, was found. A link between physical ESW and Runx2 activation has already been demonstrated. ESW-induced O<sub>2</sub> production, followed by tyrosine-kinase mediated ERK activation and Runx2 activation, resulted in osteogenic cell growth and maturation. We analyzed the cytokines RANK-L and OPG osteoblast expression, involved in regulation of osteoclastogenesis. A decrease in RANK-L /OPG ratio was found, perhaps leading to a reduced osteoclastogenesis.

## Discussion:

ESWT is used in orthopaedic treatments to induce bone repair, but its mechanism of action needs further investigation.

**Conclusion:** Shockwaves have repair action on bone which can be explained by the regulation on osteoclastogenesis by apoptotic pathway of BAX and OPG.