

Cinnamon ingredients accelerate Calcium deposition during Osteogenesis; an experimental research on Adipose-derived Stem cells

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Background and aim: Osteoporosis is a geriatric disorder affecting both long and wide bone. Using complementary medicine it is possible to prevent bone fractures in geriatrics. Using regenerative medicine the treatment or prevention of bone fractures would be possible. Human adipose-derived stem cell (hADSC) is a good source for regenerative medicine purposes. We aimed to explore the effect of eugenol and cinnamaldehyde, two active ingredients of cinnamon, on the calcium deposition during osteogenic differentiation of hADSC.

Methods: hADSC obtained from pregnant women and kept in proliferation culture medium (DMEM+10% fetal bovine serum plus 0.1% antibiotics) to have enough cells for following steps. Certifications of hADSC were done using negative CD45 and CD56 but positive CD73, CD90 and CD105. The best concentrations of cinnamaldehyde and eugenol were justified from toxicology tests. Ultimately, the cells were treated with 2.5 $\mu\text{mol/mL}$ cinnamaldehyde and 0.1 $\mu\text{g/mL}$ eugenol during Osteogenesis differentiation of hADSCs and the results were compared with 0.01% DMSO-treated (-T), eugenol-T or cinnamaldehyde-T and untreated control cells. Mean \pm SD of calcium depositions after alizarin red staining and densitometry quantification with Image-J software were compared statistically (significant level=0.05).

Results: Mean \pm SD of calcium depositions using densitometry method were equal as: untreated control group= 46.18 \pm 2.07, DMSO-T (0.01%)=30.95 \pm 2.36, cinnamaldehyde-T (2.5 $\mu\text{mol/mL}$)=46.54 \pm 3.0 and eugenol-T (0.1 $\mu\text{g/mL}$)=64.5 \pm 2.88 (ANOVA p-value=0.000). Except cinnamaldehyde-T cells compared

untreated cells (p=1.000) other groups had meaningful p-values (p<0.05) for double comparisons using Tukey-HSD method. DMSO reduced significantly calcium deposition rate in hADSCs differentiated to the osteocytes. As DMSO was the solvent of cinnamaldehyde and eugenol in cell culture, after normalization, the pure effect of cinnamaldehyde was the significant increased rate of calcification.

Conclusion: Eugenol and cinnamaldehyde bot increase the calcium depositions in Osteogenesis model developed in hADSC. Eugenol is more potent than cinnamaldehyde but bot can be used as probable natural ingredients for Osteoporosis treatment. Anyway, this should be proven using animal models and clinical trials.

Speaker Biography

Abdorrahim Absalan is born in Ahwaz city, in southwestern Iran in 1978. He has trained in different courses in different universities, research centers, and clinical laboratories in Iran; BSc (Clinical laboratories sciences), MSc, and Ph.D. (Clinical Biochemistry). He was one of the best national Iranian students in 2011, who was rewarded by the Iranian president because of his scientific activities. His research has been focused on the cellular and molecular targets of herbal ingredients, computational drug discovery, and trace elements. He says that "I have interesting results when I worked with the cell-line and primary cells; but, after finishing my Ph.D., investigation tools were not in my hand to do deeper studies to reach a definite therapeutic product". He is trying to leave the university (a boring atmosphere for creative people) and work in his company to develop diagnostic kits and products using R&D activities.

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