

SCIENCE FLASH

Bone graft material coated with Emdogain® shown to enhance biologic factors involved in periodontal wound healing and bone formation in an in vitro model

Miron RJ, Bosshardt DD, Hedbom E, Zhang Y, Haenni B, Buser D, Sculean A.: Adsorption of enamel matrix proteins to a bovine-derived bone grafting material and its regulation of cell adhesion, proliferation, and differentiation. J Periodontol. 2012 Jul;83(7):936-47

RESEARCH QUESTIONS

1. How is the enamel matrix derivative (EMD)* adsorption to bone graft** particles influenced by the presence of blood?
2. What are the cellular responses if bone graft particles are pre-coated with EMD?

METHODS

1. To discover the influence of blood on EMD adsorption to the particulate material
 - a. Pre-coating of bone graft particles with different combinations of EMD and or human blood vs a control of no coating
 - b. Detection of EMD adsorption and penetration of bone graft particles by immunological assays
2. To discover the cellular response when EMD is applied to particulate material:
 - a. Cultures of periodontal ligament cells (PDL) and osteoblasts were exposed to bone graft particles which were left uncoated, coated with blood or coated with EMD
 - b. Measurement of cell attachment and proliferation on bone graft particles of cells involved in bone formation and periodontal regeneration in these cultures
 - c. Measurement of certain protein markers involved in periodontal regeneration and wound healing processes

RESULTS

- Blood contact with bone graft particles prior to EMD adsorption hinders EMD from adsorbing on and penetrating into bone graft particles
- Cell adhesion (Fig 1 and 3), proliferation (Fig 2 and 4) and differentiation are significantly higher on EMD coated bone graft particles compared to uncoated or blood coated particles at multiple time points studied
- EMD coating enhances the expression of factors important for the formation of bone (BMP-2) at all time points studied
- EMD coating reduces expression of pro-inflammatory marker proteins (IL-1) at multiple time points studied

CONCLUSIONS

- EMD enhances osteoblast and PDL cell attachment, proliferation and differentiation on bone graft particles
- EMD affects the release of factors important for bone formation and reduced wound inflammation
- EMD attachment to bone graft particles may be reduced in the presence of blood

Influence on Osteoblast cells

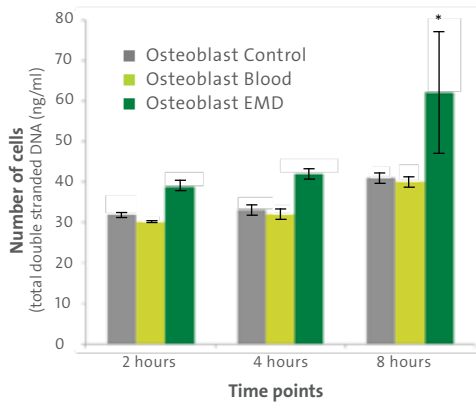


Fig 1: Osteoblast cell attachment. *p<0.05

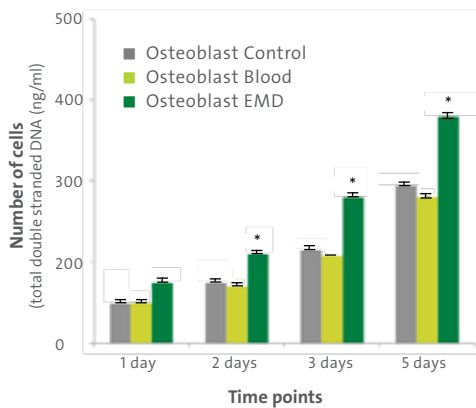


Fig 2: Osteoblast cell proliferation. *p<0.05

Influence on PDL cells

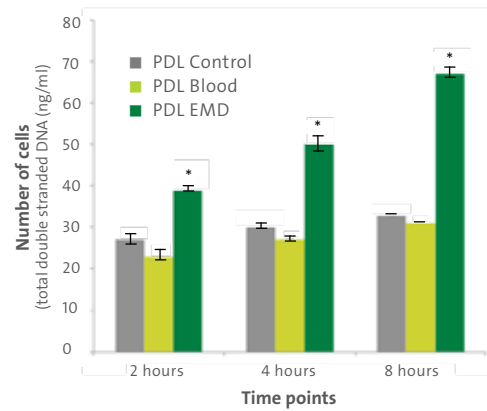


Fig 3: Periodontal ligament (PDL) cell attachment. *p<0.05

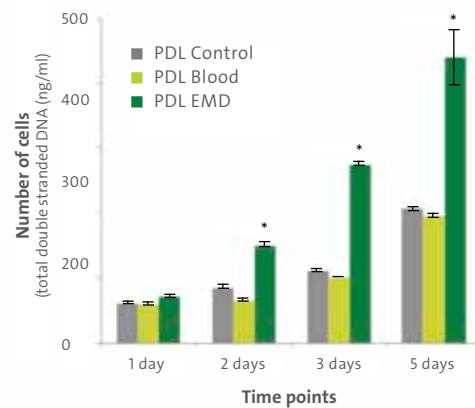


Fig 4: Periodontal ligament cell (PDL) proliferation. *p<0.05