

# Recombinant Human Platelet Derived Growth Factor - BB Released From PLGA Microsphere In 3D Coragraft Promotes Early Osteogenic Differentiation Of Human Mesenchymal Stromal Cells

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## INTRODUCTION:

Tissue engineering aims to generate or facilitate regrowth or healing of damaged tissues by applying a combination of biomaterials, cells, and bioactive signaling molecules. Growth factors clearly play important roles in regulating cellular fate (Lynch et al.1991). Uncontrolled release of growth factors has been demonstrated to produce severe side effects on the surrounding tissues. In this study, poly (lactic-co-glycolic acid) (PLGA) microspheres (MS) incorporated three-dimensional CORAGRAF scaffolds were engineered to achieve controlled release of platelet-derived growth factor-BB (PDGF-BB) for the differentiation of stem cells within the 3D polymer network

## MATERIALS & METHODS:

Microspheres are fabricated through the double emulsion method, it is assessed through SEM and mastersizer analysis. The sustained release rate of protein will be investigated throughout 30 days. The PLGA microspheres embedded on coragraft and coragraft without microspheres are assessed through SEM, BET, FTIR and AFM. MSCs are seeded on coragraft embedded with PLGA microspheres loaded and unloaded with PDGF are examined through Alamar blue, confocal and SEM imaging. Lastly the spend culture medium is assessed through osteocalcin and ALP elisa kit.

## RESULTS:

Microspheres fabricated through double emulsion method have a mean size of 400uM. FTIR examines the functional groups present in coragraft loaded and unloaded with microspheres. AFM shows the 3d positioning of microspheres within the coragraft. BET calculates the pore size as unloaded coragraft has more pore size compared to loaded coragraft. SEM done on coragraft embedded with microspheres confirms the cell attachment on the coragraft and microspheres which shows no toxicity.

Figure 1  
SEM of cell on coragraft embedded with microspheres

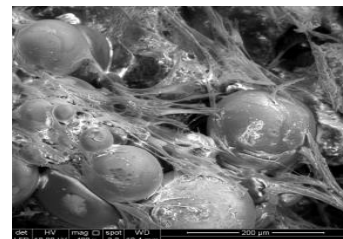
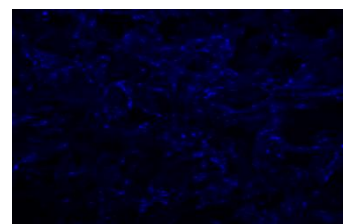


Figure 2  
Confocal of Coragraft



Confocal is done to confirm the cell attachment on the coragraft embedded with microspheres. The cell proliferation is studied through the increase in reduction rate of alamar blue and the cell differentiation is examined through osteocalcin and ALP which has a positive result compared to coragraft with unloaded PDGF microspheres.

## DISCUSSIONS:

Initial result shows a burst release due to the protein which is present on the surface during fabrication. The 2nd and 3rd week protein is released through diffusion method. Higher release was found on 4th week due to the degradation of microspheres. PDGF increase the expression of ALP and osteocalcin.

## CONCLUSION:

The sustain release of PDGF from PLGA microspheres has showed a better proliferation and differentiation of MSC on coragraft embedded with PDGF loaded microspheres.

## REFERENCES:

1. Lynch et al. Effects of the platelet-derived growth factor/insulin-like growth factor-I combination on bone regeneration around titanium dental implants. Results of a pilot study in beagle dogs. *Journal of Periodontology*. 1991;62:710-716