

# Controlled Release of Hepatocyte Growth Factor from MPEG-b-(PCL-ran-PLLA) Diblock Copolymer for Scarless Vocal Fold Regeneration

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## Background

An in situ-forming gel system comprised of MPEG-b-PCL and MPEG-b-(PCL-ran-PLLA) diblock copolymer could be used in controlled drug delivery for tissue remodeling. Degradation and viscosity of MPEG-b-(PCL-ran-PLLA) diblock copolymers can be easily manipulated by adjusting PLLA (poly-L-lactic acid) contents. The purpose of this study was to demonstrate favorable vocal folds (VF) regeneration by using MPEG-b-(PCL-ran-PLLA) diblock copolymers (C97L3; CL/LA ratio 97:3) incorporating hepatocyte growth factor (HGF).

## Methods

A scar was made with microscissors on both VFs in 32 rabbits, followed by injection of HGF only, C97L3 only, or HGF-C97L3 composite gel in the left side VF, while the right side VF was left untreated. VF scars were evaluated with an in vivo fluorescence live imaging system (IFLIS), endoscopic examination, histology, and videokymography (VKG) 12 weeks after the injection.

## Results

Gradual and sustained release of HGF from C97L3 was

detected and biochemical properties of released HGF were maintained. IFLIS demonstrated that C97L3 enabled the sustained release of injected HGF in the scarred VF. The histological analysis showed increased hyaluronic acid accumulation and decreased collagen deposition by HGF-C97L3 composite gel. VKG analysis showed more favorable vibrations of HGF-C97L3 treated VF mucosa, compared to other treatment groups.

## Conclusion

In conclusion, the controlled HGF release helped to regulate ECM synthesis, and led to the eventual functional improvement of the scarred VF. The results of the present investigation suggest that the C97L3 in situ-forming gel system has potential for use as an HGF delivery vehicle for enhanced wound healing and improved functional remodeling following VF injury.

## Keywords

Extracellular matrix, Hepatocyte growth factor, Vocal folds, Wound healing, MPEG-b-(PCL-ran-PLLA) diblock copolymers, In vivo fluorescence live imaging system