

## Product Application Bulletin

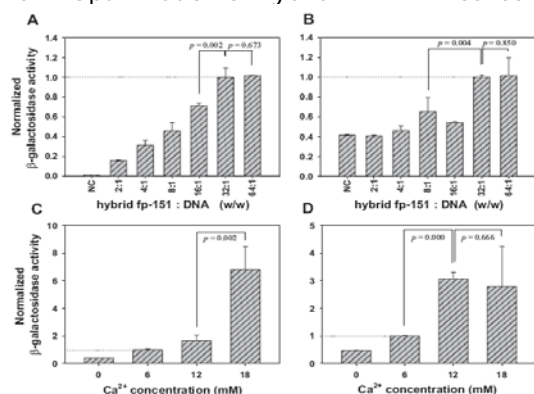
### Recombinant Mussel Adhesive Protein as a Gene Delivery Material

Dong Soo Hwang, Kyoung Ro Kim, Seonghye Lim, Yoo Seong Choi, Hyung Joon Cha  
National Research Laboratory of Molecular Biotechnology and Department of Chemical Engineering,  
Pohang University of Science and Technology, Pohang, Korea

#### Abstract:

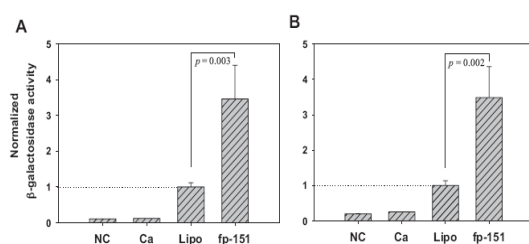
Efficient target gene delivery into eukaryotic cells is important for biotechnological research and gene therapy. Gene delivery based on proteins, including histones, has recently emerged as a powerful non-viral DNA transfer technique. Here, we investigated the potential use of a recombinant mussel adhesive protein, hybrid fp-151, as a gene delivery material, in view of its similar basic amino acid composition to histone proteins, and cost-effective and high-level production in *Escherichia coli*. After confirming DNA binding affinity, we transfected mammalian cells (human 293T and mouse NIH/3T3) with foreign genes using hybrid fp-151 as the gene delivery carrier. Hybrid fp-151 displayed comparable transfection efficiency in both mammalian cell lines, compared to the widely used transfection agent, Lipofectamine™ 2000. Our results indicate that this mussel adhesive protein may be used as a potential protein-based gene-transfer mediator.

Figure 1. Optimization of hybrid MAPTrix® concentration



Optimization of hybrid fp-151 (A and B) and calcium chloride (C and D) concentrations for efficient transient transfection of lacZ reporter gene into human 293T (A and C) and mouse NIH/3T3 (B and D) cells under serum-presence condition.

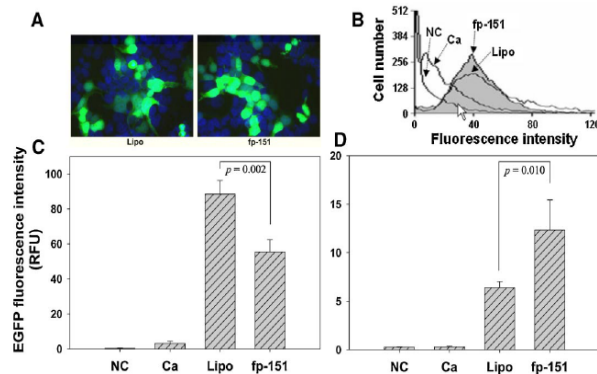
Figure 2. Comparison of the transfection efficiencies



Comparison of the transfection efficiencies of lacZ reporter gene into human 293T (A) and mouse NIH/3T3 (B) cells under serum-presence condition.

**FOR RESEARCH USE ONLY. NOT FOR DIAGNOSTIC OR CLINICAL USE**

Figure 3. EGFP expressing fluorescent and DAPI nuclear stained cells



EGFP-expressing fluorescent (green) and DAPI nuclear-stained (blue) cells transfected with Lipofectamine™ 2000 or hybrid fp-151 were observed using fluorescence microscopy (400x magnification). B: Comparison of the transfection efficiencies of egfp reporter gene into human 293T cells using flow cytometric analyses. Comparison of the expression efficiencies of EGFP reporter in (C) human 293T and (D) mouse NIH/3T3 cells.

#### References:

1. Cha HJ, Hwang DS, Lim S. 2008. Development of bioadhesives from marine mussels. *Biotechnol J* 3: 631–638.
2. Jung HJ, Hwang DS, Wei QD, Cha HJ. 2008. Carassius auratus-originated recombinant histone H1 C-terminal peptide as gene delivery material. *Biotechnol Prog* 24: 17–22.
3. Hwang DS, Yoo HJ, Jun JH, Moon WK, Cha HJ. 2004. Expression of functional recombinant mussel adhesive protein Mgfp-5 in *Escherichia coli*. *Appl Environ Microbiol* 70: 3352–3359.
4. Hwang DS, Gim Y, Cha HJ. 2005. Expression of functional recombinant mussel adhesive protein type 3A in *Escherichia coli*. *Biotechnol Prog* 21: 965–970.
5. Hwang DS, Gim Y, Yoo HJ, Cha HJ. 2007a. Practical recombinant hybrid mussel bioadhesive fp-151. *Biomaterials* 28: 3560–3568.
6. Kaouass M, Beaulieu R, Balicki D. 2006. Histonefection: Novel and potent non-viral gene delivery. *J Control Rel* 113: 245–254.
7. Puebla I, Esseghir S, Mortlock A, Brown A, Crisanti A, Low W. 2003. A recombinant H1 histone-based system for efficient delivery of nucleic acids. *J Biotechnol* 105: 215–226.

Note: The above study was published:

- *Biotechnology and Bioengineering*, Vol.102(2), pp.616-623 (2009)

**FOR RESEARCH USE ONLY. NOT FOR DIAGNOSTIC OR CLINICAL USE**