

# pMCP-tag(m) Vector



## N9317S

20 µg Lot: 0011012  
Store at: -20°C Exp: 12/12

### Introduction

pMCP-tag(m) Vector is a mammalian expression plasmid encoding MCP, an MCP-tag protein, which is expressed under control of the CMV promoter. This plasmid is intended for the cloning and transient expression of MCP-tag protein fusions in mammalian cells. pMCP-tag(m) Vector contains two multiple cloning sites to allow cloning of the fusion partner as a fusion to the C-terminus of the MCP-tag and an appropriate signal peptide to the N-terminus of the MCP-tag.

The MCP-tag is a small protein tag (8 kDa) based on the acyl carrier protein (ACP) containing two mutations (D36-T36 and D39-G39), for labeling cell membrane proteins. It allows the specific, covalent attachment of virtually any molecule to a protein of interest. MCP-tag substrates are derivatives of coenzyme A (CoA). In the labeling reaction, the substituted phosphopantetheine group of CoA is covalently attached to a conserved serine residue of the MCP-tag by SFP Synthase. Having no cysteines, the MCP-tag is particularly suited for specifically labeling cell-surface proteins, and should be useful for labeling secreted proteins with disulfide bridges such as antibodies.

There are two steps to using this system: subcloning and expression of the protein of interest as a MCP-tag fusion, and labeling of the fusion protein using SFP Synthase with the substrate of choice. The cloning and expression of MCP-tag protein fusions is described in this document. The labeling of fusion proteins with CoA substrates is described in the documentation supplied with CoA substrates and SFP Synthase.

### Materials Required but not Supplied:

Mammalian cell lines  
Transfection reagents  
CoA substrates

### Storage

pMCP-tag(m) Vector is supplied in TE buffer (10 mM Tris-HCl, pH 8.0, 1 mM EDTA) at a concentration of 0.5 µg/µl. Plasmid solutions can be stored at 4°C for up to one week. For long-term storage -20°C is recommended.

### Detailed Description

A plasmid map and the sequence of the cloning region can be found at the end of these instructions. The complete plasmid sequence can be downloaded at [www.neb.com](http://www.neb.com). This plasmid encodes the gene MCP which is a mutant carrier protein. In the plasmid sequence, the MCP gene is encoded from bp 690 to 923. The MCP gene was cloned via HindIII and PstI including additional flanking restriction sites.

This plasmid is intended as a transient expression vector for MCP-tag gene fusions in mammalian cell lines. It is not recommended for the production of stable cell lines. The plasmid contains the b-lactamase (Ampicillin resistance) gene for maintenance in bacteria. The plasmid also contains a CMV promoter and SV40 polyadenylation signals for correct mRNA processing. The gene of interest should be cloned downstream of the MCP-tag coding sequence, as a fusion to the C-terminus of the MCP-tag. An appropriate cell surface signal peptide should be cloned upstream of the MCP-tag as an N-terminal fusion. A Kozak sequence is located upstream of the MCP gene to increase the translation efficiency of the fusion protein. The MCP-tag gene can be isolated from the plasmid using PCR or direct cloning in order to subclone it into a different vector system of choice.

### Cloning of MCP-tag Fusions in pMCP-tag(m) Vector

#### Cloning by PCR

To subclone an appropriate cell surface signal peptide into pMCP-tag(m) Vector creating an N-terminal fusion to the MCP-tag, use the available restriction sites SacI, SacII, NotI, EcoRV or HindIII which are located upstream of the MCP-tag.

To subclone the gene of interest into pMCP-tag(m) Vector creating a C-terminal fusion to the MCP-tag, use the available restriction sites downstream of the MCP-tag: SbfI (PstI), Ascl, BamHI, XhoI, ApaI and KpnI.

Note: When making a C-terminal fusion to the MCP-tag, note that there is a stop codon between the BamHI and XhoI sites, so SbfI (PstI), Ascl, or BamHI must be used as the 5' cloning site for your insert.

### Primer Design and Cloning Hints:

- Design your PCR primers to include a sufficient overlap with the sequence of the gene you want to amplify.
- You may also want to include a stop codon at the C-terminus of the fusion (in front of the downstream cloning site) in order to terminate translation at that position.
- For fusions upstream of the MCP-tag, ensure that a start codon is included. The addition of a Kozak sequence (e.g. GCCRCCATG, where the start codon is underlined) will increase the translation efficiency.
- In general, any linker peptide between the proteins should be kept short to avoid degradation by proteases. If required, specific protease cleavage sites can be introduced into the linker peptide.
- Care should be taken to design the cloning so that the fusion partners in the resulting construct are in frame.
- Perform the PCR reaction and subsequent cloning steps according to established protocols for molecular biology.
- After subcloning the gene of interest into pMCP-tag(m) Vector as a fusion with the MCP-tag gene, the resulting plasmid can be used for transient expression of the MCP-tag fusion proteins in a suitable cell line.

### Direct Cloning

Direct cloning can also be used to make fusions with the MCP-tag. This is only possible if the fusion partner has compatible sites adjacent to the gene of interest.

Care should be taken to design the cloning so that the fusion partners in the resulting construct are in frame.

Note: When making a C-terminal fusion to the MCP-tag, note that there is a stop codon between the BamHI and XhoI sites, so SbfI (PstI), Ascl, or BamHI must be used as the 5' cloning site for your insert.

### Expression of MCP Fusions

#### Transient expression

Expression of the fusion protein cloned in pMCP-tag(m) Vector can be achieved by transiently transfecting cells in culture with standard transfection protocols. The appropriate reagent and time to permit adequate expression must be empirically determined.

### Troubleshooting

#### Cloning of the Gene of Interest

If subcloning of your gene of interest with the MCP-tag does not work, reconfirm all the cloning steps (primer design, choice of restriction site, etc.). If all steps are confirmed as being correct, then try the cloning using different restriction sites. Be sure to include a positive control for the ligation reaction.

Alternatively try to subclone the MCP-tag gene into an expression vector already containing your gene of interest.

#### Expression

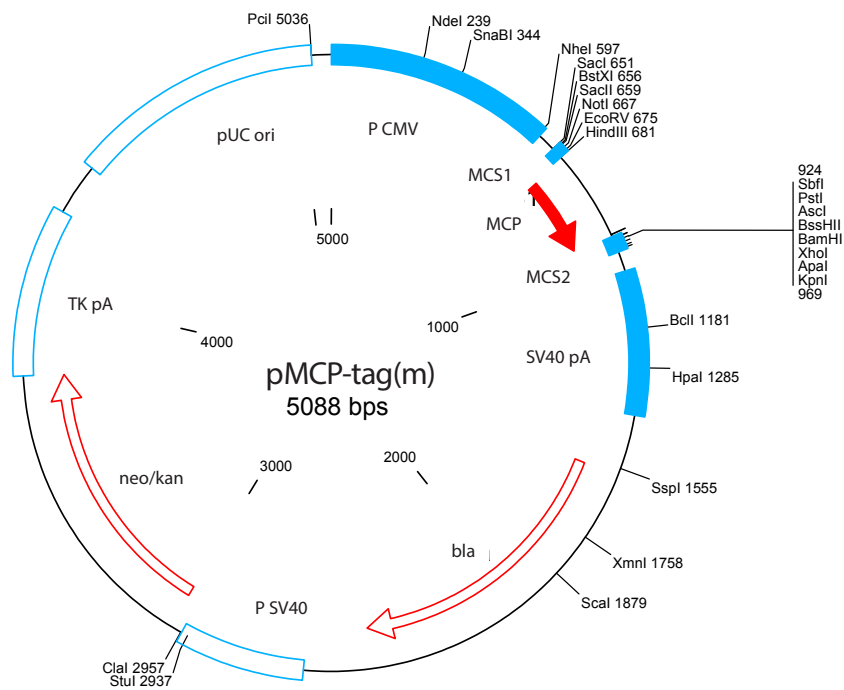
In general we have not experienced problems expressing MCP-tag protein fusions. However if your fusion gene does not appear to be expressed, try expressing the pMCP-GPI Control Plasmid (NEB #N93205). Labeling of such cells with a fluorescent CoA substrate should show membrane fluorescence. Note that the intensity of this fluorescence may vary depending on cell line and substrate used.

If the MCP-GPI construct is expressed but your fusion protein is not, then there are a variety of possible causes. It is possible that this fusion protein may be toxic for your cell line. It is difficult to troubleshoot such instances, but the use of a different expression plasmid or cell line may help. Signs of host-cell toxicity could include slow proliferation or apoptosis. Counterstaining live cells with Hoechst 33342 or fixed cells with DAPI can be used to determine whether nuclei are healthy if toxicity is suspected.

(see other side)

## Plasmid Map of pMCP-tag(m)

This map and the maps for the control plasmids can be downloaded at [www.neb.com](http://www.neb.com)



### Note:

NEB 10-beta Competent E. coli (High Efficiency) (NEB #C3019) is recommended for propagating this control plasmid.

### Companion Products:

pMCP-GPI Control Plasmid  
#N9320S 0.5 A<sub>260</sub> units



The CMV promoter is covered under U.S. Patent No. 5,385,839 and its use is permitted for research purposes only. Any other use of the CMV promoter requires a license from the University of Iowa Research Foundation, 214 Technology Innovation Center, Iowa City, IA 52242.

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The products and/or their use may be covered by one or more of the following patents and patent applications: U.S. Patent No. 7,939,284 (Methods for Using O6-Alkylguanine-DNA-Alkyltransferases); U.S. Patent No. 7,888,090 (Mutants of O6-Alkylguanine-DNA-Alkyltransferases); U.S. Patent No. 8,163,479 (Specific Substrates for O6-Alkylguanine-DNA-Alkyltransferases); U.S. Patent No. 8,178,314 (Pyrimidines reacting with O6-Alkylguanine-DNA-Alkyltransferases); PCT/EP2007/057597 (Labeling of Fusion Proteins with Synthetic Probes); EP07117800 (Drug Delivery); EP07117802 (Drug Delivery); EPO7120288 (GTPase-Transient Protein Protein Interactions) These patents and patent applications are owned by Covalys, or owned by the Ecole Polytechnique Fédérale de Lausanne (EPFL) and exclusively licensed to Covalys and NEB.

## Cloning Region of pMCP-tag(m) Vector

Unique restriction sites in the regions flanking the MCP gene are displayed above the coding strand. This map and the maps for the control plasmids can be downloaded at [www.neb.com](http://www.neb.com)

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481  tcaacgggac tttccaaaat gtcgtaacaa ctccgccccca ttgacgcaaa tgggcggtag
541  gcgtgtacgg tgggaggctc atataagcag agctggttta gtgaaccgtc agatccgcta
601  gcgattacgc caagctcgaa attaaccctc actaaagga acaaaagctg gagctccacc
                                     SacI
                                     MCS1 →
      BstXI      EcoRV
      SacII      NotI      HindIII
661  gcggtggcgg ccgcgatatc aagcttacca tgagcactat cgaagaacgc gtaagaaaa
                                     M S T I E E R V K K
                                     MCP →
721  ttatcggcga acagctgggc gtaagcagg aagaagttac caacaatgct tctttcgtt
   I I G E Q L G V K Q E E V T N N A S F V
781  aagacctggg cgcgacttct cttgggaccg ttgagctggt aatggctctg gaagaagagt
   E D L G A T S L G T V E L V M A L E E E
841  ttgatactga gattccggac gaagaagctg agaaaatcac caccgttcag gctgccattg
   F D T E I P D E E A E K I T T V Q A A I
                                     PstI
                                     SbfI
901  attacatcaa cggccaccag ggcctgcag gtataggcgc gccaggatcc tgactcgagg
   D Y I N G H Q A P A G I G A P G S -
      MCP → MCS2 →
      ApaI      KpnI
961  gggggcccgg taccaggtaa gtgtaccaa ttcgcctat agtgagtcgt attacaattc
      MCS2 →
1021 actcgatcgc ccttcccaac agttggcag cctgaatggc gaatggagat ccaattttta
    
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