

## Modified HIV tat peptide with cationic lipids as a non-viral vector for efficient gene delivery *in vitro* and *in vivo*

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To improve the efficiency of non-viral gene delivery, we combined the lipid FuGENE HD (FH) with the HIV Tat peptide sequence modified with histidine and cysteine residues (mTat), and evaluated whether mTat/FH could be used for gene delivery *in vitro* and *in vivo*. mTat/FH transfection was evaluated by luciferase expression plasmid in five cell types compared to five commercial reagents. Cytotoxicity, the zeta potentials, and size of mTat/FH and each component individually were determined, and transfection efficiency at different temperatures was examined. The endocytosis mechanism of mTat/FH/DNA complexes was investigated. To examine the ability of mTat/FH *in vivo*, luciferase expression was measured using a real-time bioluminescence imaging system after intramuscular administration of mTat/FH/DNA. mTat/FH produced significant improvement in transfection efficiency of all cell lines with little cytotoxicity when compared to mTat alone, FH alone, or five commercial reagents. The zeta potential of mTat/FH/DNA was significantly higher compared to FH, mTat, or their DNA combination. The particle size of the FH/DNA complex was significantly reduced by addition of mTat. It was revealed that temperature-dependent and caveolae-mediated endocytosis of mTat/FH transfection was utilized. The results of *in vivo* study demonstrated the animals intramuscularly administered with mTat/FH/DNA had significantly higher and longer luciferase expression than those with mTat/DNA or FH/DNA. These findings demonstrated a combination of mTat with lipids improved transfection efficiency in several cell lines and it enabled efficient gene delivery *in vivo*. It makes mTat/FH a highly interesting non-viral gene vector for the future utilization, both *in vitro* and *in vivo*.

### Biography

Seiichi Yamano is Assistant Professor of Prosthodontics at New York University College of Dentistry. Dr. Yamano first earned his dental degree from Nihon University and then a PhD in Medical Sciences from Tokyo Medical University in Japan. Then, he came to the US as a Research Fellow at the National Institutes of Health. Also, he received his DMD from the University of Pennsylvania, and a Prosthodontics certificate and MMSc in Oral Biology from Harvard University. Currently, his laboratory is focused on tissue engineering for oral and craniofacial regeneration using gene therapeutic technology, especially novel non-viral vectors.

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