

## Synthesis and in-vitro characterization of polyamidoamine (PAMAM) dendrimers nanoparticles for gene delivery

S. Ayatollahi\*, M. Ramezani, K. Abnous, R. Oskuee

*Department of Biotechnology, School of Pharmacy, Mashhad University of Medical Sciences, Mashhad, Iran*

**Background and Aims:** The present study was designed for Synthesis and in vitro Characterization of Polyamidoamine (PAMAM) Dendrimer-for gene delivery.

**Methods:** in this study PAMAM G4 and G5 were modified via the substitution of various percentages of their primary amines (10%,30%) with a series of  $\alpha$ -bromoalkylcarboxylic acids with different chain lengths (5,9,15bromoacetic acids), and PEG 3400 polymers were complexed with plasmid and the particle size and zeta potential of the polyplexes were determined. Ethidium bromide dye exclusion was used to show the DNA binding ability of the polymers and their transfection activity and cytotoxicity was evaluated in Neuro2A mammalian cells. Measurement of the buffering capacity polymer for evaluation of proton sponge also is performed.

**Results:** 3% PEG -6-bromo, 7% 6-bromo, graft to PAMAM G4, G5 was increased gene expression in cell line Neuro2A, in contrast with 6-bromohexanoic (10%,30%) alone, transfection efficiency decrease with increasing occupied primary amines by 6-bromohexanoic acid. however, grafting, 10%,30%, 10 bromodecanoic acid and 10%,30% 16bromohexadecanoic acid to PAMAM G4 increased gene expression in this cell line but on the PAMAM G5 not had significant increasing but adding 3% PEG -10-bromo, 7% 10-bromo improved gene delivery. Increasing of transfection with 3% PEG-6-bromo, 7% 6-bromo was 7 -fold relative to unmodified PAMAMG5, and 2-fold relative to unmodified PAMAMG4, and for PAMAM G4 grafting 10%, 30% bromodecanoic acid was 17 -fold relative to unmodified polymer and for 10% 16-bromohexadecanoic acid this increasing was 19-fold and for 30% 16- bromohexadecanoic acid increasing was 13-fold, besides toxicity was decreased.

**Conclusions:** The results obtained suggest adding PEG to  $\alpha$ -bromoalkylcarboxylic acids increase transfection especially on PAMAMG5 and, decrease toxicity. alkylated PAMAM G4(bromohexadecanoic acid) and flexibility of PEG, increase hydrophobicity and flexibility, in addition decrease vector toxicity.

**Keywords:** PAMAM; Gene Delivery; Bromoalkylcarboxylic acid