

Drug delivery to the coclea using poly(amino acid) drug carriers by oligoarginine conjugation

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Hearing loss is a major public health problem, and its treatment with traditional therapy strategies is often unsuccessful due to limited drug access in the cochlear cell. We developed hydrophobic core nanoparticles with sizes below 50nm. We examined the distribution of Nile red, a fluorescent dye, encapsulated PHEA-C₁₈-Arg8 nanoparticles in the coclea. Poly(2-hydroxyethyl aspartamide) (PHEA), a water soluble synthetic polymer with amide linkage, is biocompatible polymer. However, the low biomembrane permeability was generally considered to be limiting factor in successful delivery of the coclea. So we synthesized PHEA conjugated with Arg8, cell penetrating peptide, to permeate the round window membrane. The Nile red nanoparticles placed on the round window membrane were identified in the scala tympani, indicating that the PHEA conjugated with Arg8 nanoparticles can permeate through the round window membrane. These findings indicate that the nanoparticles can be an useful drug carrier to the coclea via local application.