TECHNOTE 203

Poly-D-lysine Coating of Magnetic Nanoparticles for Cell Uptake

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Introduction

Poly-D-lysine is a synthetic amino acid chain that is positively charged and widely used as a coating to enhance cell attachment to surfaces. It can also be used to increase the uptake of magnetic nanoparticles into cells. Hedayati et al. have demonstrated an improved uptake of plain BNF-Starch particles into DU125 prostate cancer cells for hyperthermia applications [1].

Protocol

The protocol is given for the poly-D-lysine coating of plain nanomag®-D-spio and plain BNF-Starch or BNF-Dextran nanoparticles. The final suspension of PDL coated magnetic nanoparticles has an iron concentration of 1.5 mg/ml and a PDL concentration of 15 µg/ml in PBS buffer.

Material:
- plain nanomag®-D-spio (product-codes: 79-00-201, 79-00-501, 79-00-102) or
- plain BNF-Dextran (84-00-801, 84-00-102) or
- plain BNF-Starch particles (product-codes: 10-00-801, 10-00-102),
- PBS buffer, 0.01 M, pH=7.4
- poly-D-lysine hydrobromide (PDL) (MW > 300 kDa)

Calculations:

The volume of the stock particle suspension (V_s), the volume of PDL solution (V_{PDL}) and the volume of PBS buffer (V_{PBS}) for dilution are calculated from the target volume (V_T) and the iron concentration of the particle suspension c(Fe) as follows:

V_s [ml] = V_T [ml] x 1.5 mg/ml / c(Fe) [mg/ml]
V_{PDL} [ml] = V_T [ml] /100
V_{PBS} [ml] = V_T [ml] – V_s [ml] – V_{PDL} [ml]

Procedure:

- dissolve 5 mg of PDL in 3.33 ml PBS buffer to obtain a PDL concentration of 1.5 mg/ml.
- divide the solution into aliquots of 0.5 ml and store the aliquots at –20°C.
- mix the calculated volume of particle suspension V_s with the calculated volume of PBS buffer V_{PBS}
- add the calculated volume of PDL solution V_{PDL} to the particle suspension in PBS buffer immediately before your application of the PDL coated particles and shake.

Note:
This protocol is intended to provide a general guideline for the PDL coating of selected types of magnetic nanoparticles. Further optimization may be required in order to achieve optimal functionality and stability from case to case.

Reference

1. M. Hedayati, O. Thomas, B. Abubaker-Sharif, et al., The effect of cell-cluster size on intracellular nanoparticle-mediated hyperthermia: Is it possible to treat microscopic tumors? *Nanomedicine* **2012,** 8 (1): 29-41.