Star-polymers are a new class of polymer architecture which consist of linear arms radiating from a central core. Novel Star-polypeptides discovered at RCSI have been demonstrated to have superior transfection and delivery efficacy compared to current commercially available technologies. Therapeutic applications include the delivery of DNA plasmids, siRNA and miRNA to cells.

VALUE PROPOSITION

The RCSI star-shaped polypeptides, with their densely packed poly-L-lysine units possess several advantages as functional non-viral gene delivery vectors compared to commercially available systems. These advantages include:

- The ability to efficiently deliver different nucleic acid cargos (plasmid DNA siRNA, miRNA) to both primary cells (e.g. mesenchymal stem cells) and cell lines (e.g. Calu-3 cells, cystic fibrosis bronchial epithelial cells, A549s)
- Transfection efficiency is superior or comparable to gold standard vectors such as polyethylenimine or SuperfectTM
- Tuneable chemistry to optimise cargo loadings
- High loading capacity: Ability to co-deliver two plasmids within a single population of star-PLL
- Star-PLL-nucleic acid complexes can be lyophilised to form an "off the shelf", ready to use transfection product

TECHNOLOGY

The RCSI Star polypeptide technology relates to a specific type of star-polymer whereby the core is made from a polypropylene imine dendrimer and the "arms" consist of polypeptides. Those polypeptide arms which have been synthesised to date include:

- Poly-L-lysine (Star-PLL)
- Poly-L-glutamatic acid (Star-PGA)
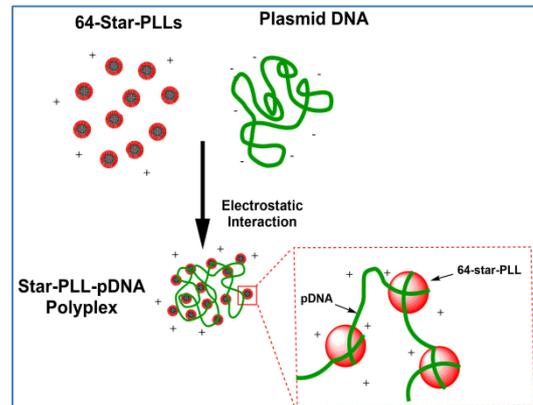- Poly-L-arginine (Star-PLA)
- Poly-L-histidine

Fig 1. Electrostatic condensation of a model nucleic acid plasmid DNA molecule by a 64-armed star-shaped poly-L-lysine polypeptide.

- **FEATURES AND BENEFITS**

Features	Benefits
Ability to optimise structures for any nucleic acid cargo	Can be loaded with pDNA, siRNA, miRNA
High RNA/DNA loadings, degradation resistant, with superior transfection	Maximise efficacy for high value RNA cargoes
Biocompatible and stable nanoparticles with ease of handling for the end user	Allows for rapid identification and scale-up of the optimum RCSI STAR delivery vector for your applications

- **APPLICATIONS**
    - RNA DRUG DELIVERY
    - GENE THERAPY
    - STEM CELL TRANSFECTION

- **TECHNOLOGY READINESS LEVEL**
    - IN VITRO PROOF OF CONCEPT
    - PATENT PROTECTED

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