



# Translational Nanomedicine Research Laboratory The Sharma Research Group



## Synthetic Challenges in the Clinical Translation of Nanoparticle-based Targeted Drug Delivery Systems

- Complexity in formulation design
- Reproducibility in the scale-up
- Batch-to-batch inconsistency
- Introduction of multiple functions at nanoscale
- Characterization methods
- Definition of the benchmarks of the final product

Efficient chemical strategies:  
Reproducible + scalable nanomaterials

Ultimate objective of research in The Sharma Lab: Taking nanotherapeutics from bench to bedside to prevent, control, and treat debilitating diseases

## Techniques in Sharma Lab

### Synthesis

- small molecules and macromolecules synthesis
- chemical reactions under inert atmosphere
- reactions in microwave

### Purification

- Thin layer chromatography
- Column chromatography
- Dialysis
- Tangential Flow Filtration

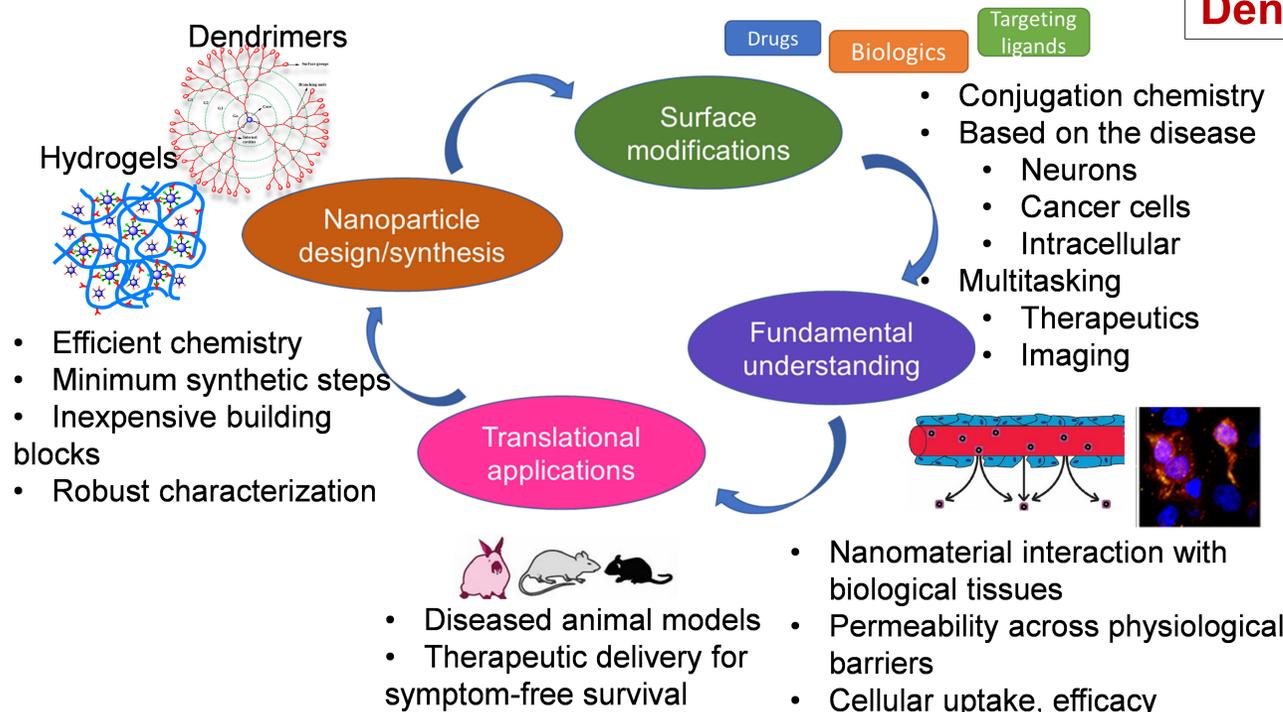
### Characterization

- Nuclear Magnetic Resonance
- High Performance Liquid Chromatography
- Spectrophotometer
- Dynamic light scattering
- Mass spectroscopy

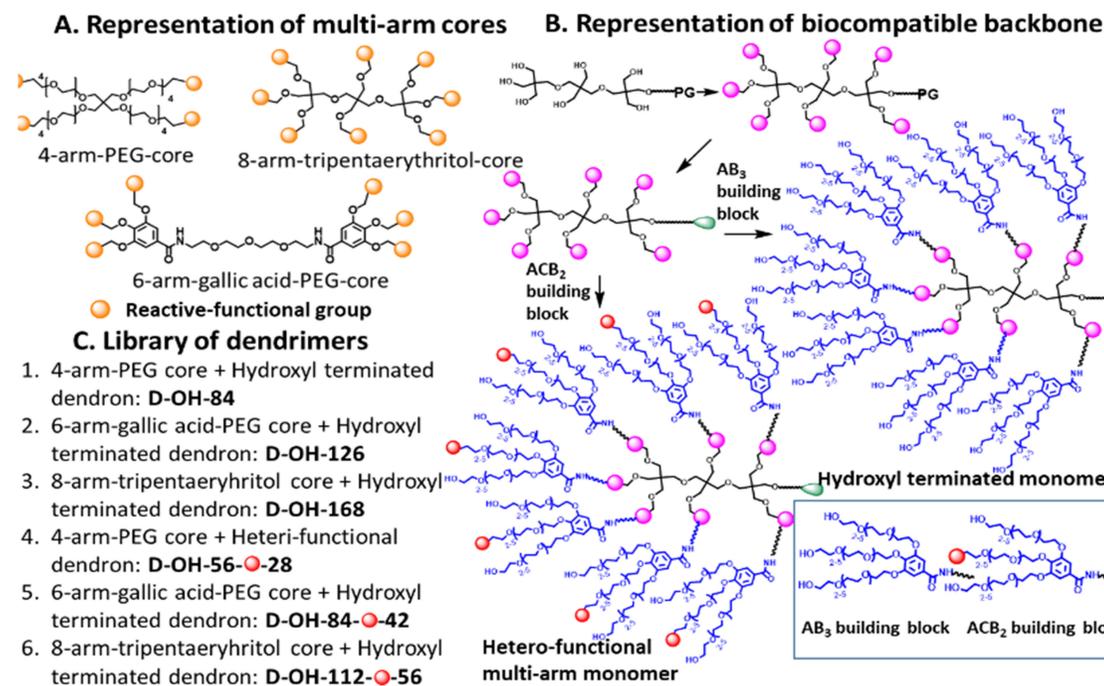
### In vitro, ex-vivo and in vivo techniques

- Cell culture techniques
- Nanoparticles extraction and quantification from animal tissues
- Confocal microscopy

## Research Program: Core Principles

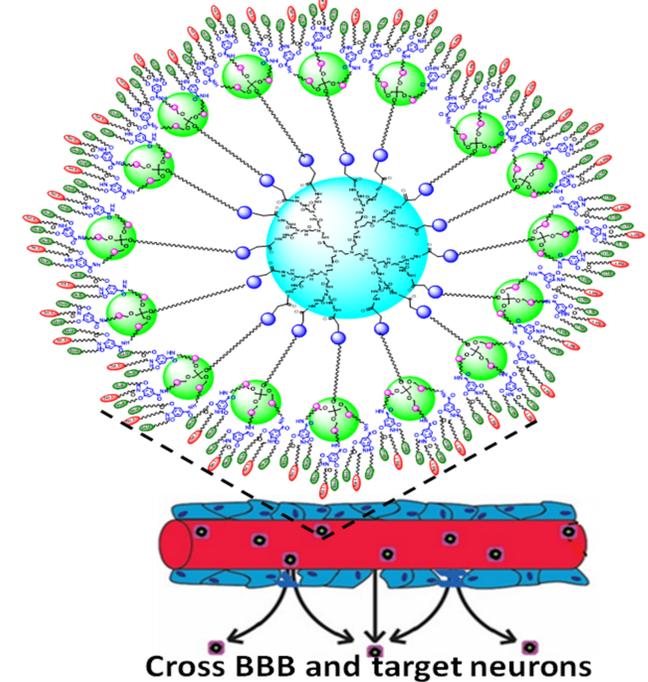


## Research Area 1: Rationally-designed Dendrimer Backbones for Biological Applications



## Research Area 2: Brain Penetrating Dendrimers for Intracellular Drug Delivery

### Brain penetrating dendrimer for neuronal targeting



## Research Area 3: Cancer Nanomedicines

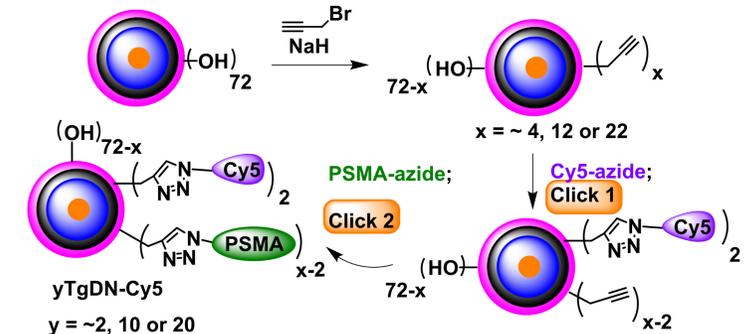


Table 1. Physicochemical characterization

Size	~5 nm
Zeta potential	Neutral
Molecular weight	21.5 kDa
HPLC Purity	99%

