

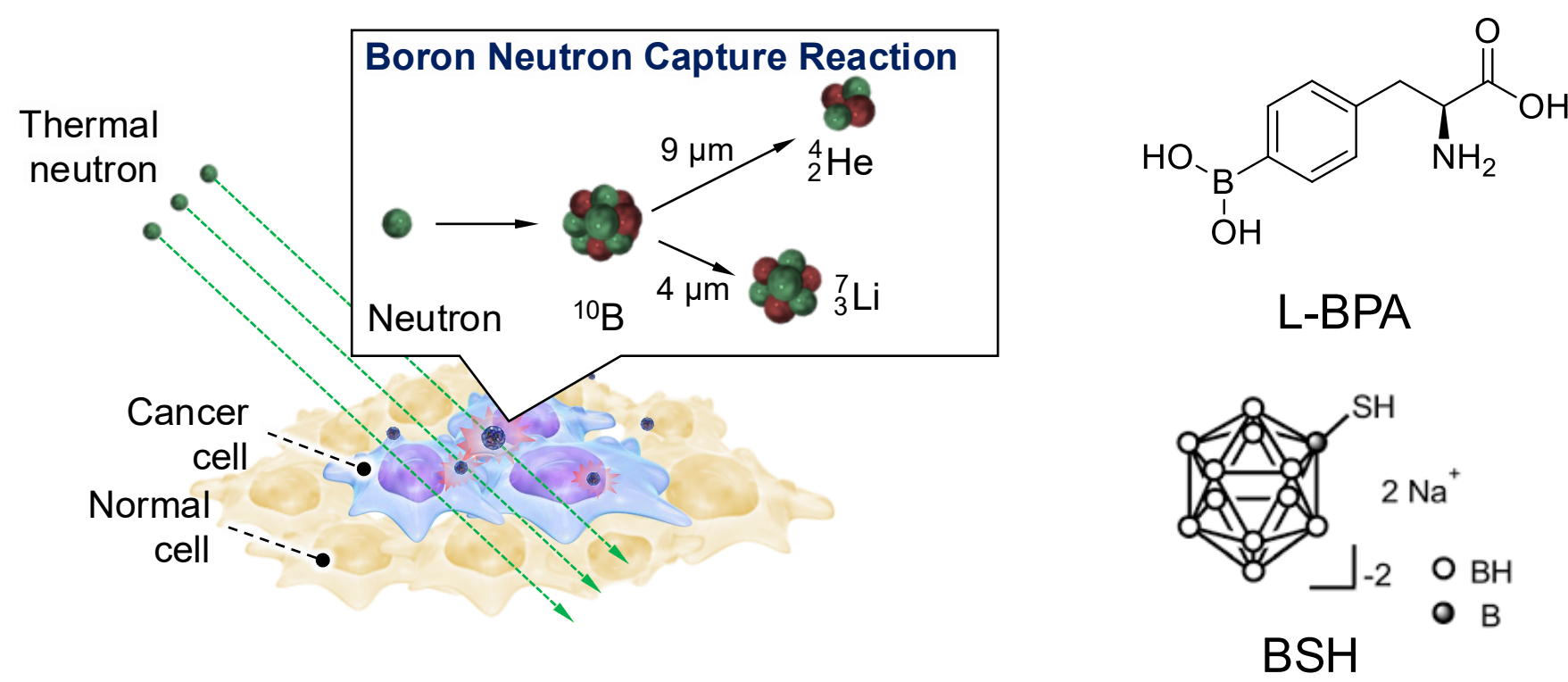


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Introduction

BNCT and Boron Agents

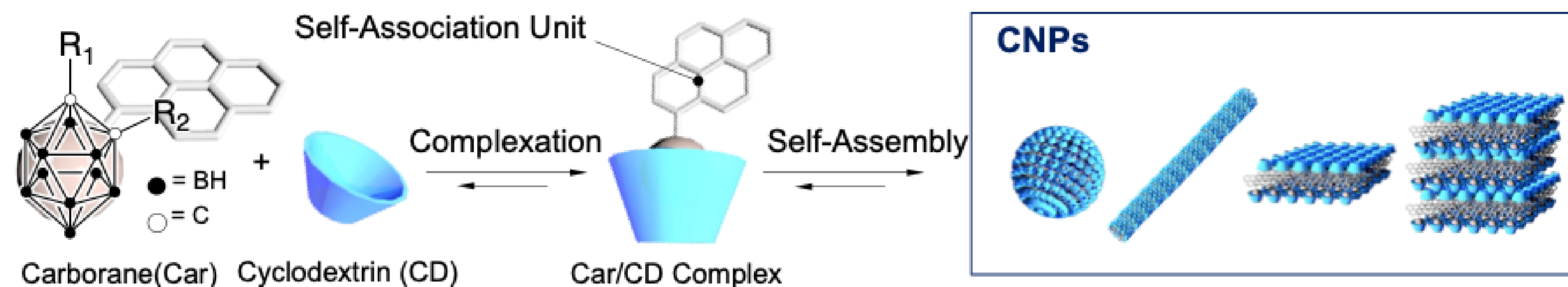
A minimally invasive radiotherapy pioneered that utilizes the energy generated from the nuclear reaction between boron-10 and neutrons.



- BNCT**
- Excellent biocompatibility
 - Minimal invasiveness
- Issues**
- × Poor efficiency in BNCR
 - × Low

Purpose of This Study

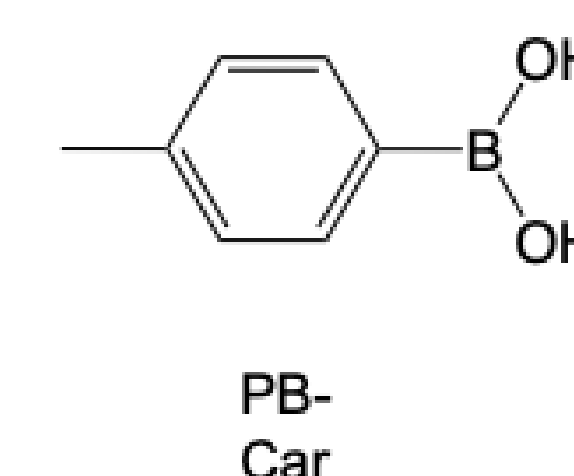
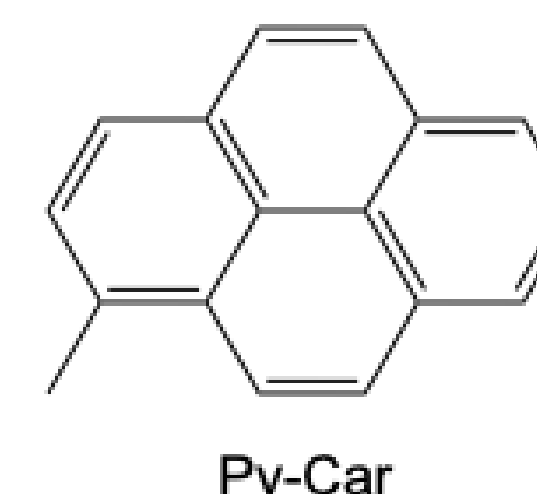
Self-association unit substituted carborane-cyclodextrin complex formulate nanoparticles via self-assembly.



Advantages

- ✓ Water Dispersible
- ✓ Size, Morphology, and Chirality of CNPs Tunability
- ✓ Large Surface Area for BNCR
- ✓ Protein Loading Capacity
- ✓ Tunability of Interaction with Cells

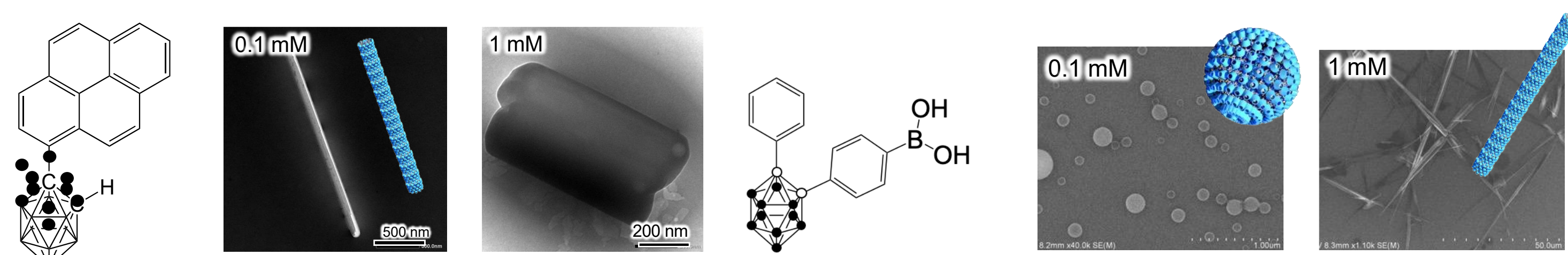
Synthesized Car



Results and Discussion

Synthesis of CNPs

With alternating substituted group, Py (fluorescent) and PB (tumor targeting) and concentration, CNPs were prepared by complexing with cyclodextrins.



Pyrene-Car (Py-CB)

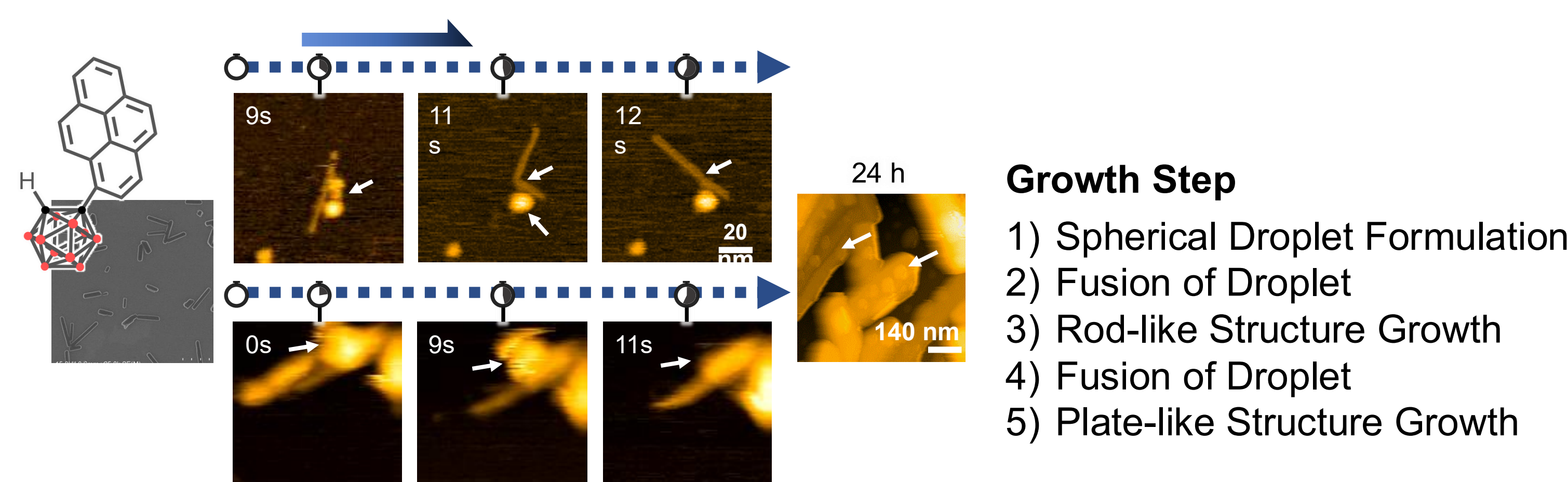
Phenylboronic acid-Car (PB-CB)

Size and morphology of CNPs can be tuned by substituted groups and concentration

Effects of surface and morphology on interaction with cells can be investigated by using current systems.

Formulation of CNPs

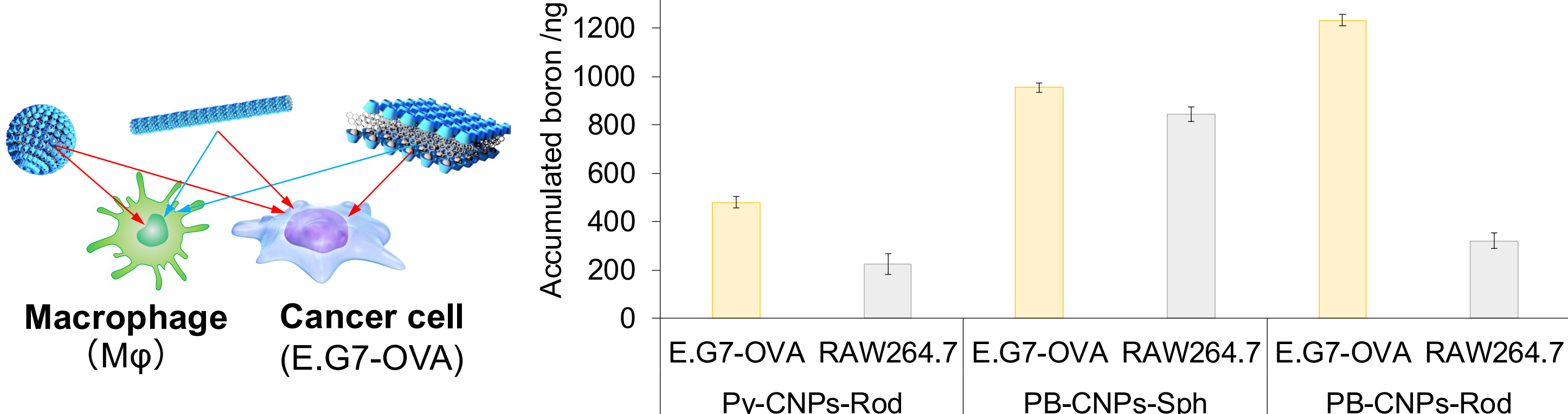
Formulation of nanoassembly was tracked by high-speed AFM.



Cellular uptake of CNPs: Recognition of Morphology or size?

Effects of morphology of CNPs on cellular recognition from cancer cells (E.G7-OVA) and macrophages (RAW264.7) were investigated by quantifying accumulated amount of boron using ICP-AES.

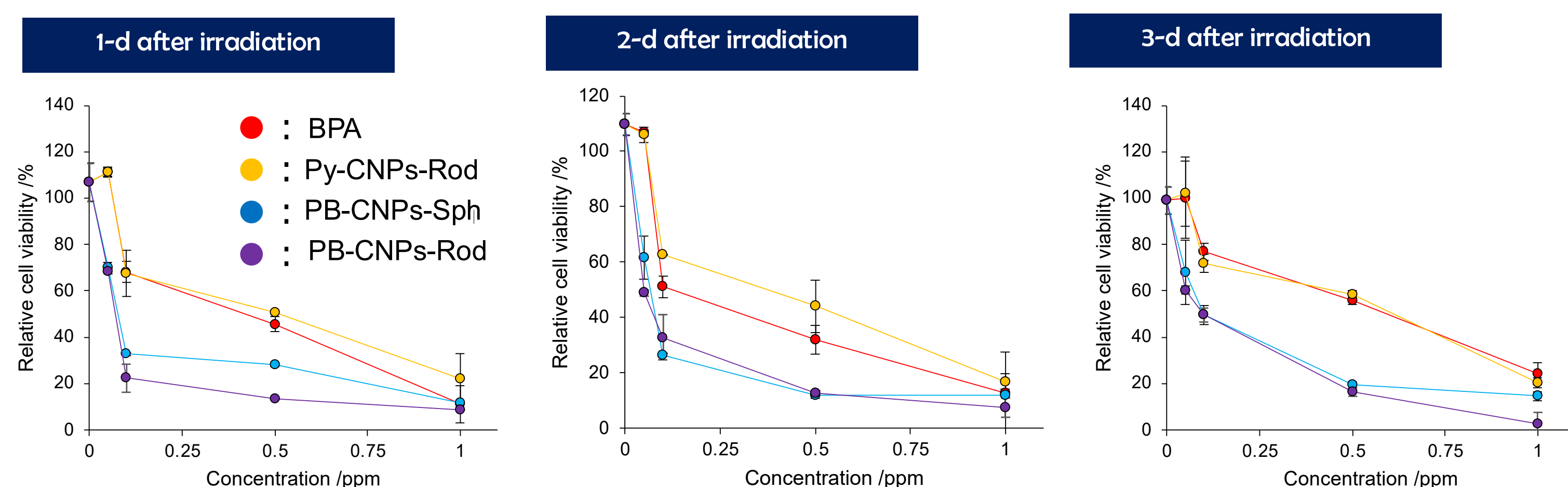
Cellular Uptake Amount of CNPs



BNCT activity of CNPs (Py-CNPs-Rod, PB-CNPs-Sph, PB-CNPs-Rod) *in vitro* was evaluated.

BNCT activity *in vitro*

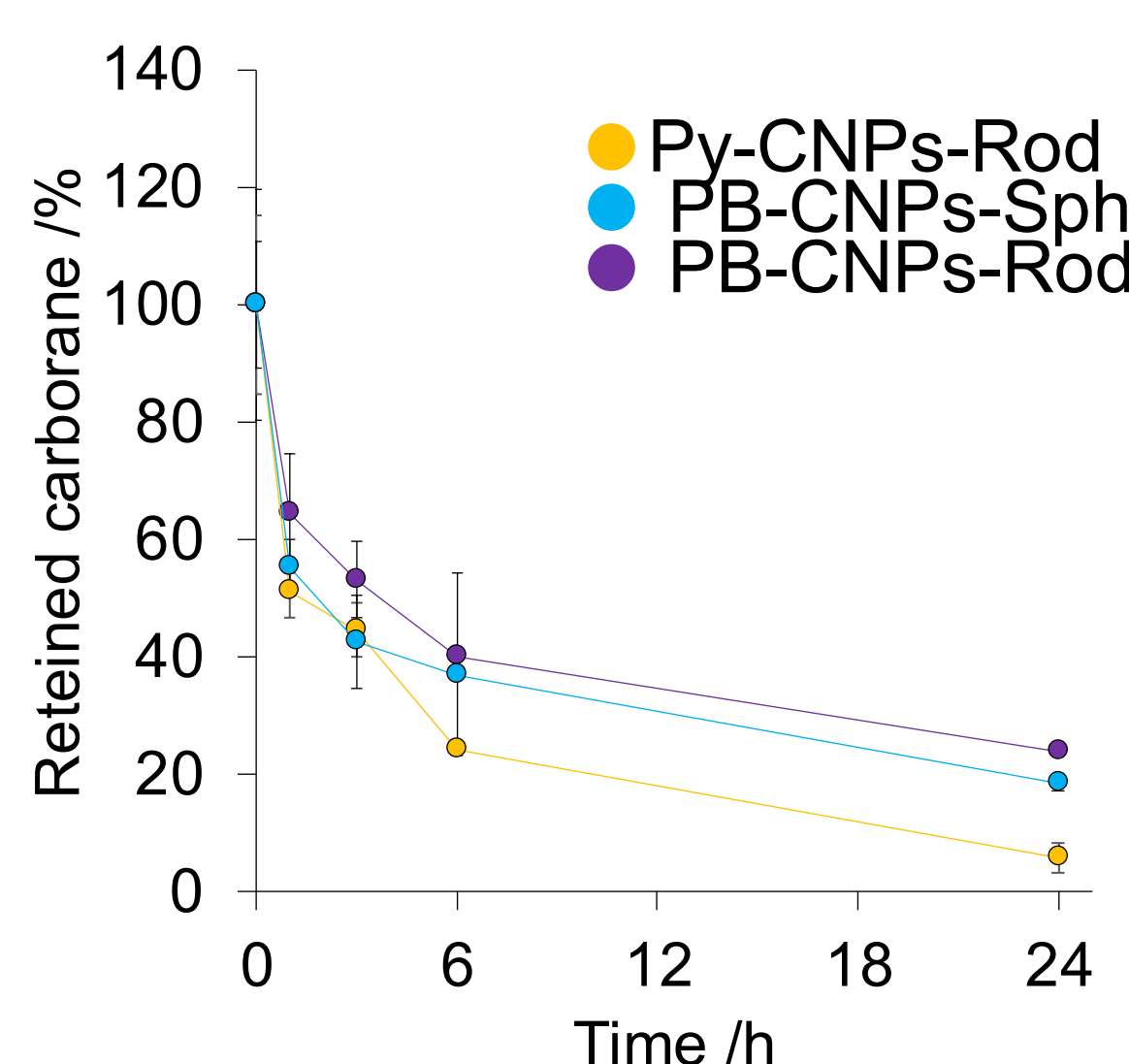
Rod-like structure are advantageous in avoiding capturing by macrophage. PB surface are actively uptaken by cancer cells via recognition of sialic acid.



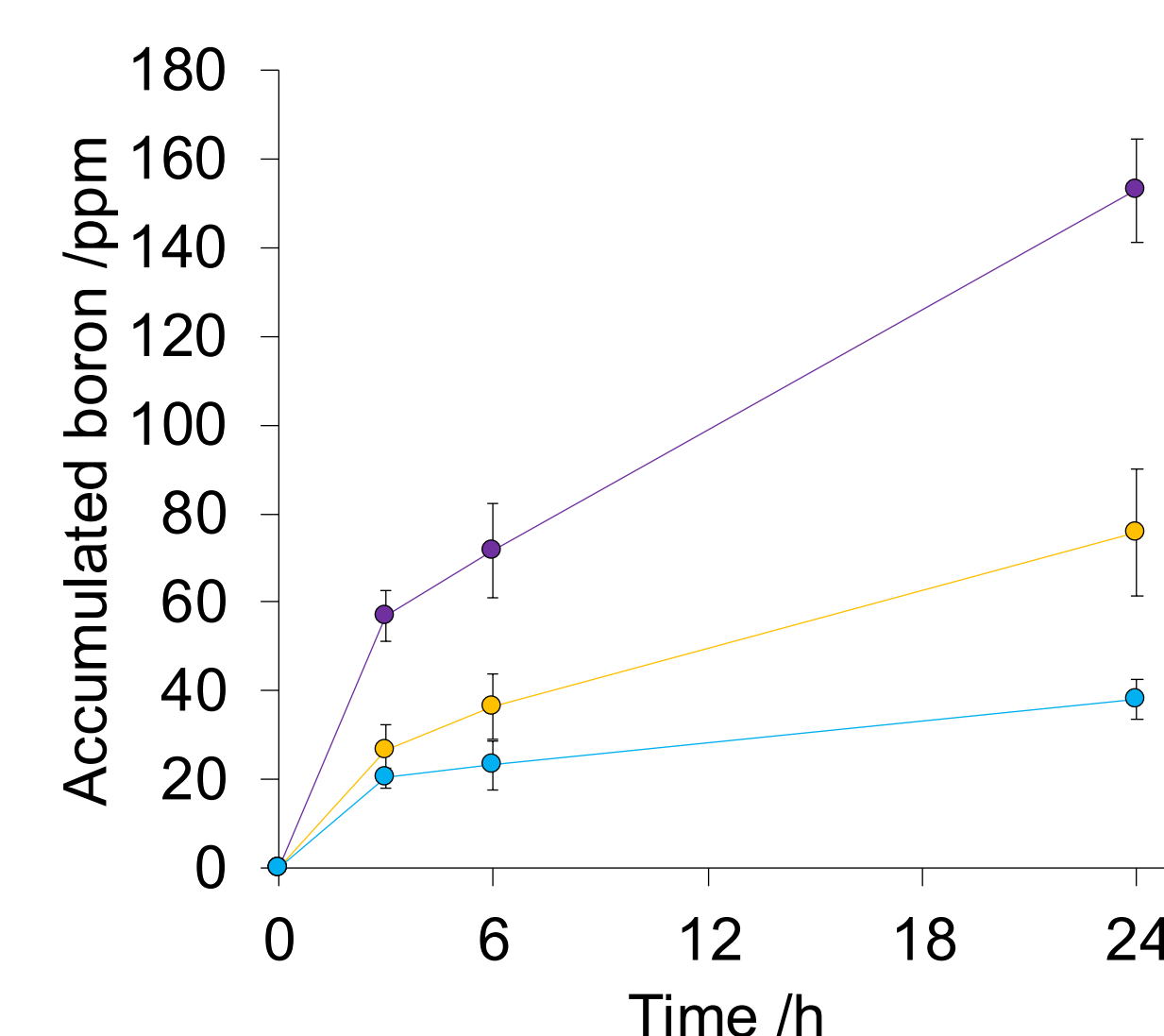
Tumor Accumulation and Blood Circulation of CNPs

Tumor accumulation and blood circulation of CNPs (Py-CNPs-Rod, PB-CNPs-Sph, PB-CNPs-Rod) in tumor xenograft mice were tracked by quantification of accumulated boron atom.

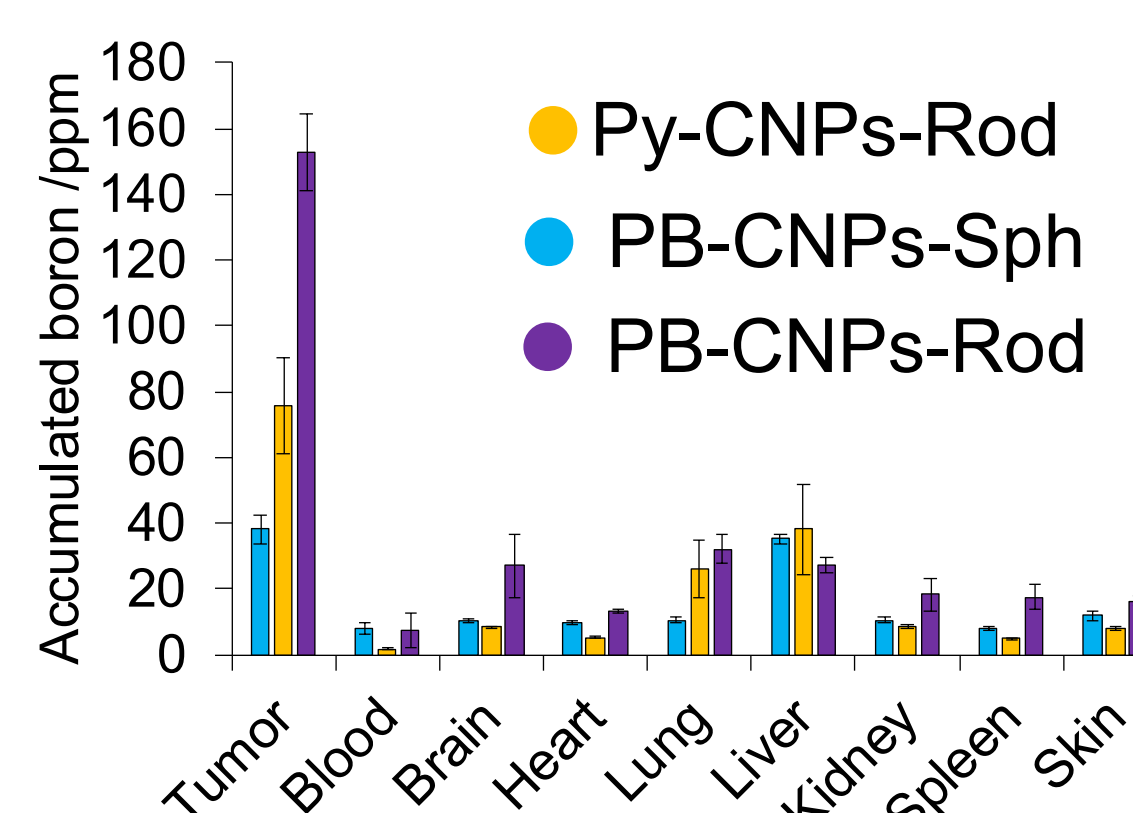
Blood Circulation



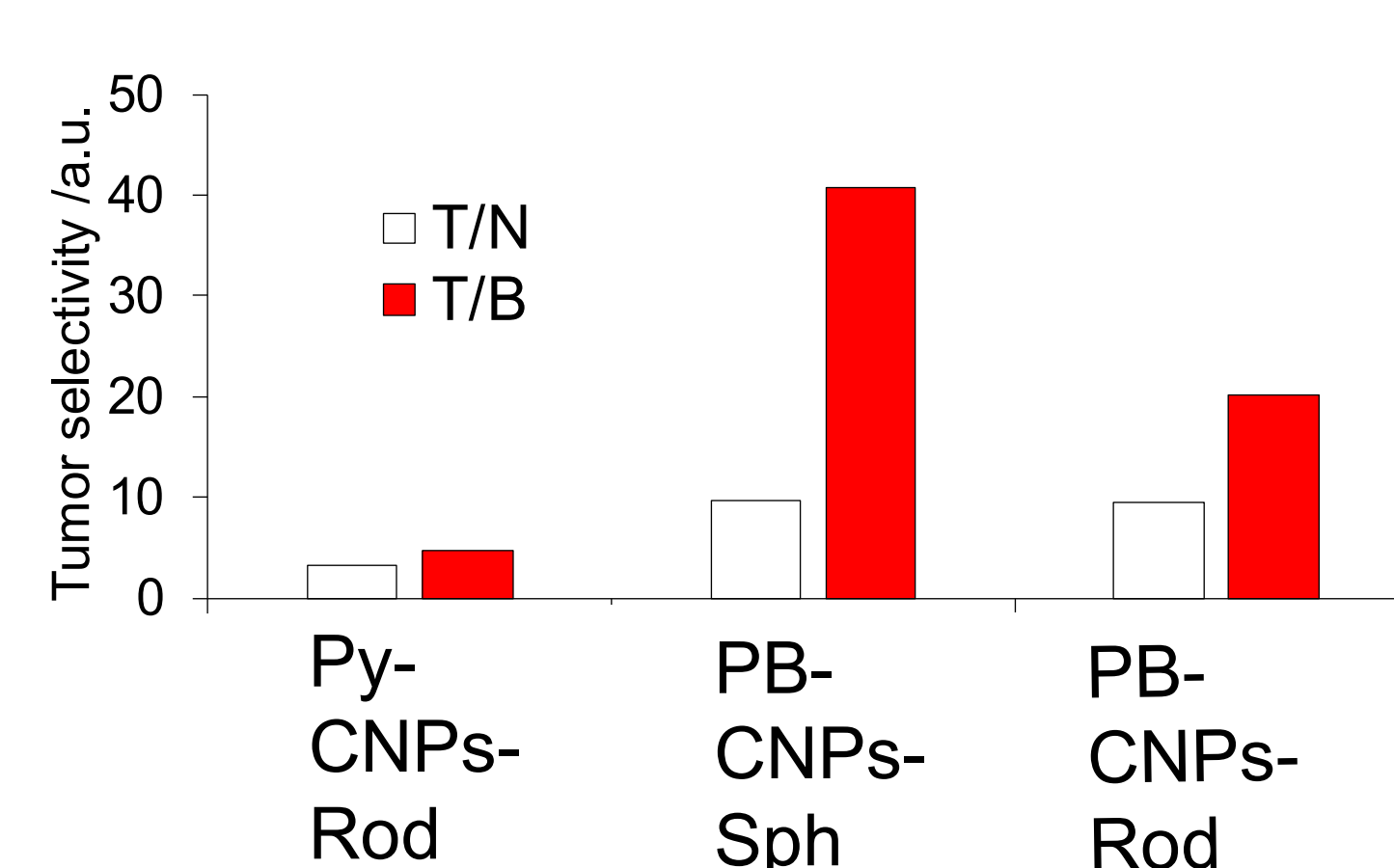
Tumor Accumulation



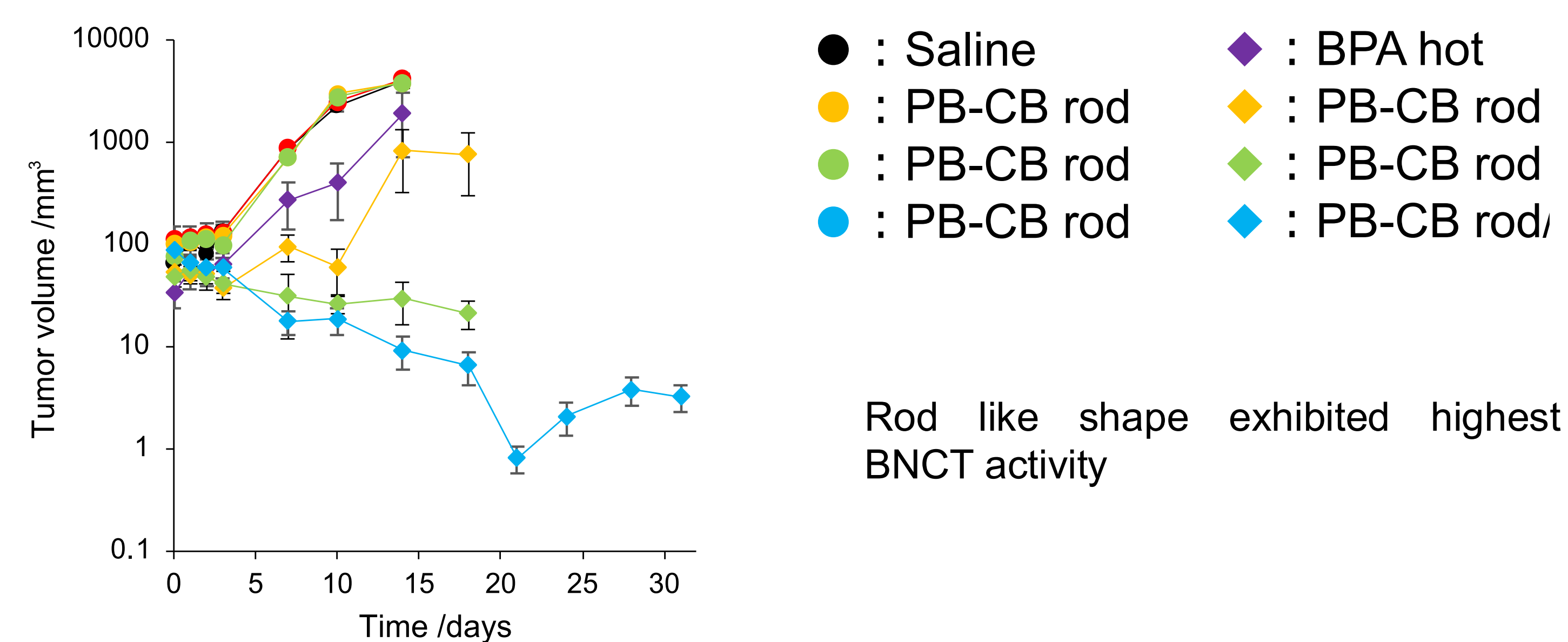
Biodistribution



Tumor Selectivity



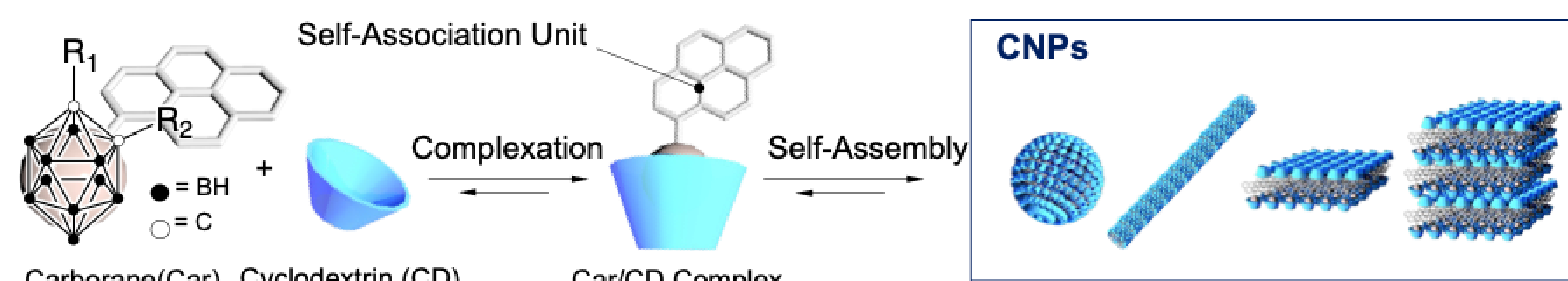
Therapeutic efficacy of BNCT using CNPs



Rod like shape exhibited highest BNCT activity

Conclusion

Self-association unit substituted carborane-cyclodextrin complex formulate nanoparticles via self-assembly.



CNPs exhibited excellent BNCT activity toward tumor xenograft model mice and rod like structure showed highest antitumor efficacy.