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Polyboronic acid nanoimmuno-neutron capture carrier for potentiating cancer treatment (Funding support: MOST-2124-M-007-003-)

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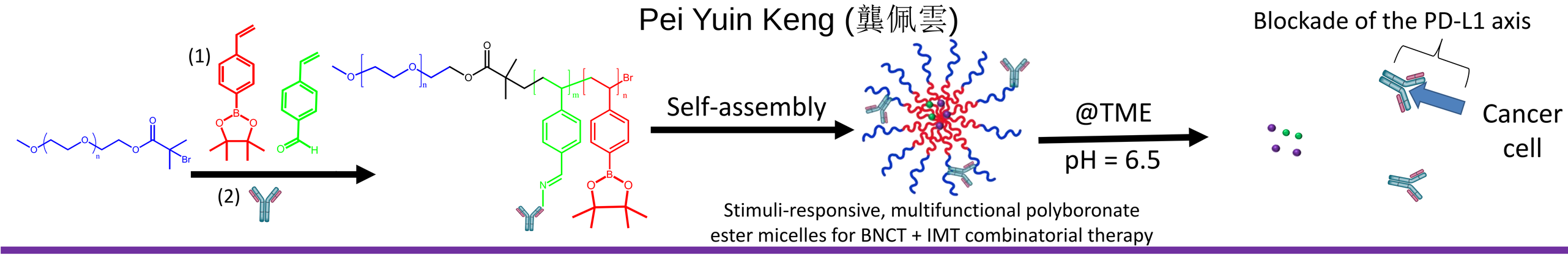
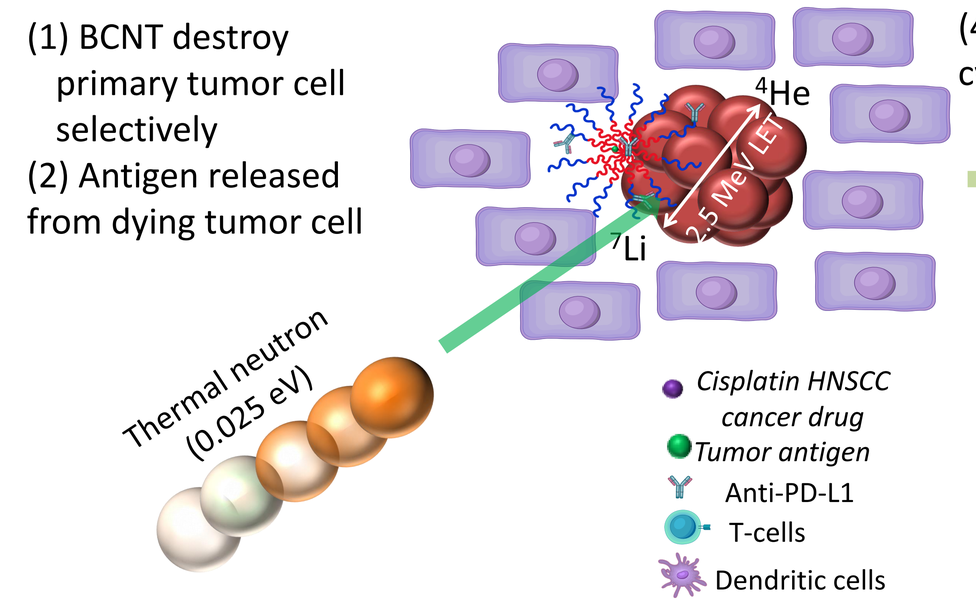


Nanoimmuno-neutron capture therapy



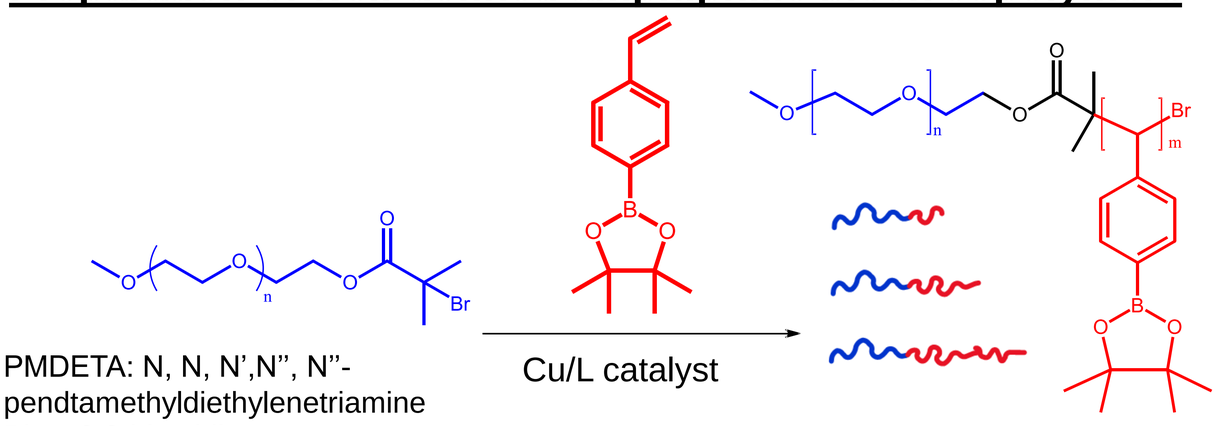
Project objective

1. To develop a boron nanocarrier based on **stimuli-responsive polyboronic acid polymer micelles** capable of delivering high loading of B-10 atom (for BNCT) and immunotherapeutic agents upon reaching the tumor microenvironment.
2. To investigate **combined BNCT and immunotherapy** as a more **effective** treatment with **less side effects** than conventional radio- and chemotherapy

Project Approach

1. Preparation of **amphiphilic PEG-b-poly(BzAld-r-PBpin)** via ATRP and **polymer micelles** with **tunable sizes**.
2. Conjugate **anti-PDL1** via a pH-responsive Schiff base bond onto the polymer micelles.
3. **In vivo studies** of the polyboronic acid block copolymer micelles in the **combined immuno-neutron capture therapy** in **syngeneic HNSCC mouse.** **(Year 2)**

Preparation of well-defined amphiphilic block copolymers

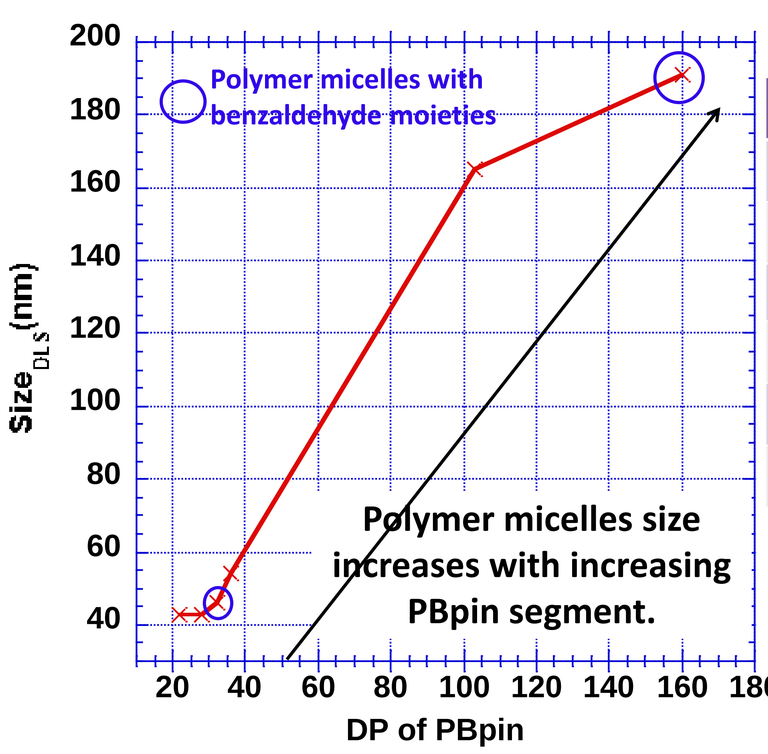


PMDETA: N, N, N',N'', N''-pendtamethyldiethylenetriamine
Bipy: 2,2-bipyridine

Optimization of PBpin chain extension from PEG-Br via ATRP

m	160	103	24	28	36	36	22
Cu/L	PMDETA	PMDETA	PMDETA	bipy	bipy	PMDETA	PMDETA
[I]/[M]	1:100	1:100	1:80	1:100	1:100	1:50	1:50
Time, h	24	1	24	24	24	24	24

Decreasing hydrophilic/hydrophobic segment ratio, increasing polymer micelles size

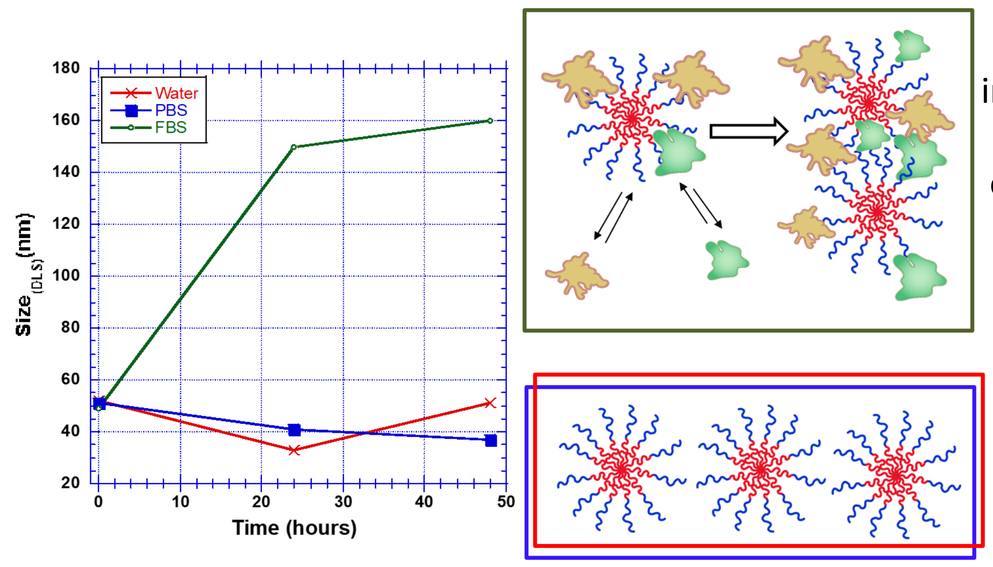


PEG_{113}-block-poly(PBpin)$_m$
PEG_{113}-block-poly[(PBA)$_l$-r-(PBpin)$_m$

PBpin , m	PBA, l	Size (nm)
160	26	199
103	-	165
36	-	54
32	5	46
28	-	43
22	-	43

Preparation of boron containing polymer micelles in tunable size by modulating the ratio of hydrophilic/hydrophobic segment

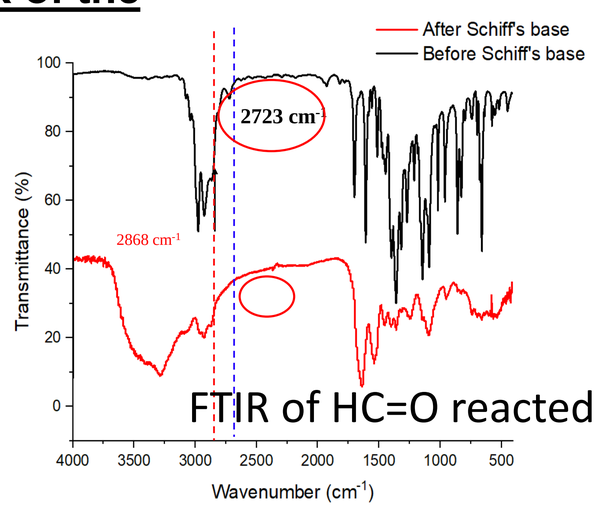
Polymer micelles are stable up to 48 h in H_2O, PBS and FBS



Micelle size increases due to protein opsonization in blood serum (FBS)

Micelles remained stable in PBS, and H_2O for 48 h

Fluorescence imaging and FTIR of the FITC@antiPDL1@micelles



FTIR of HC=O reacted

Conjugation of FITC@antiPDL1@micelles