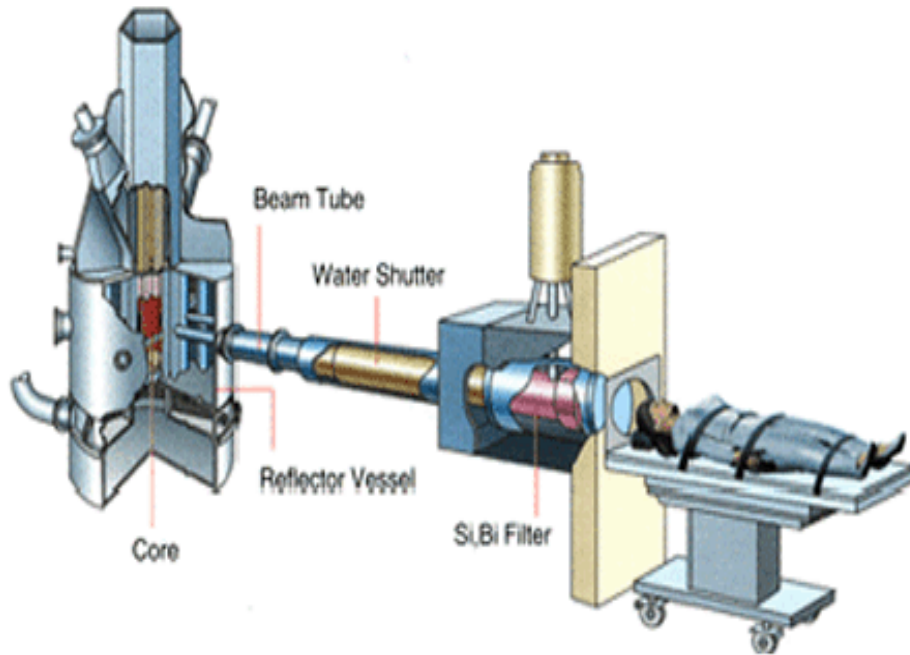


What compound should be used for **Boron Neutron Capture Therapy**?

-A comparison between **boron phenylalanine**, **sodium borocaptate** and the third generation agents

By Chunyi Wang

Basic principle



(Figure 2. A schematic diagram for BNCT application)

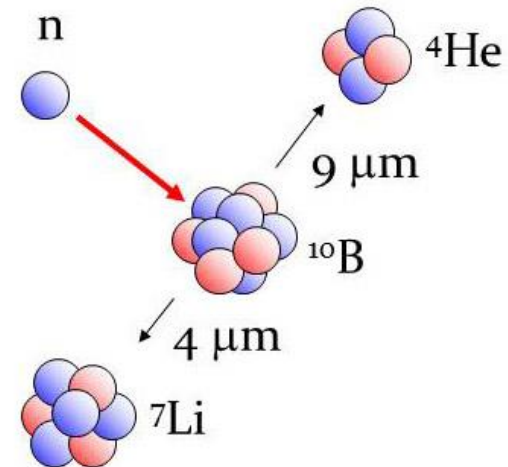


Fig. 1. Boron neutron capture reaction

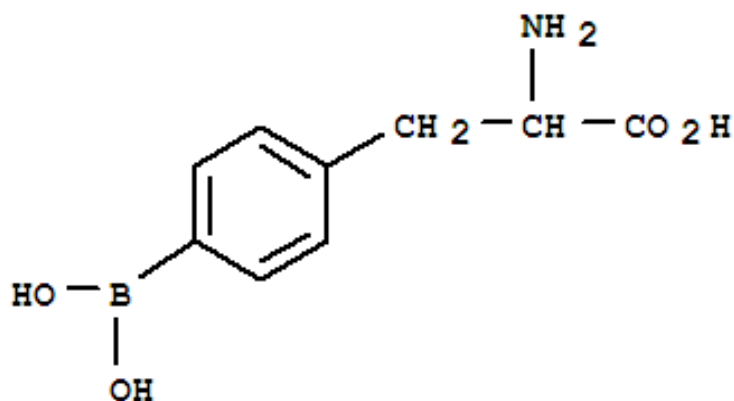
Non-radioactive isotope, ^{10}B atom, absorbs low energy ($<0.5\ \text{eV}$) neutrons (thermal neutron) and disintegrates into an alpha (^4He) particle and a recoiling lithium nucleus (^7Li). These particles deposit large energy along their very short path (less than $10\ \mu\text{m}$).

Main criteria of delivery agents

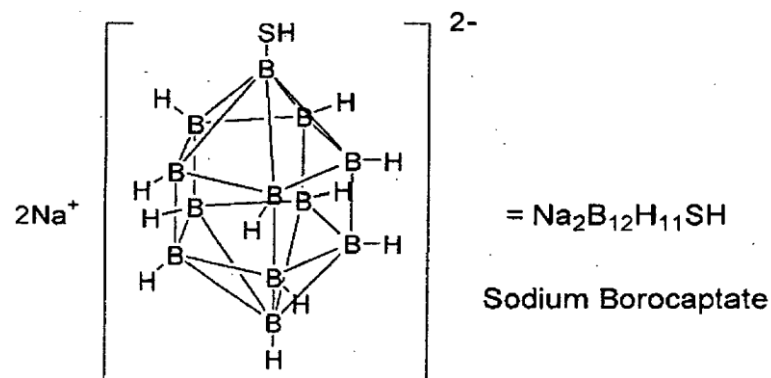


- **Toxicity**
- **Concentration of ^{10}B**
- **Tumour-blood ratio**
- **Stability**
- **Clearance time**

Second generation-BPA and BSH



Structure of L-BPA



structure of sodium
borocaptate

Third generation of agents

- **Boronated EGF or anti-EGFR monoclonal antibodies**
- **Carbon nanotube**
- **Boron nanotube**
- **Liposomes**
- **Magnetic nanoparticle**
- **Boronated porphyrin**



Comparison of agents

	BSH	BPA	Boronated EGF or anti- EGFR monoclonal antibodies	Liposome	Carbon nanotube	Boron nanotube	Magnetic nanoparticle	Boronated porphyrin
Toxicity	✗	✓	✗	✓	?	?	?	✓
Concentration of ^{10}B	✓	✓	✓	✓	✗	?	✓	✓
Tumour to blood ratio	✗	✗	✓	✓	✓	✓	✓	✓
Clearance time	✓	✓	✗	✗	✗	✓	✓	✓
Stability	✗	✓	✗	✗	✗	✓	✓	✗

Selection of the most important criterion



- **Why do I choose the boron concentration as the most important criterion?**
 1. The characteristic of BNCT-selectivity
 2. The difficulty of meeting this criterion

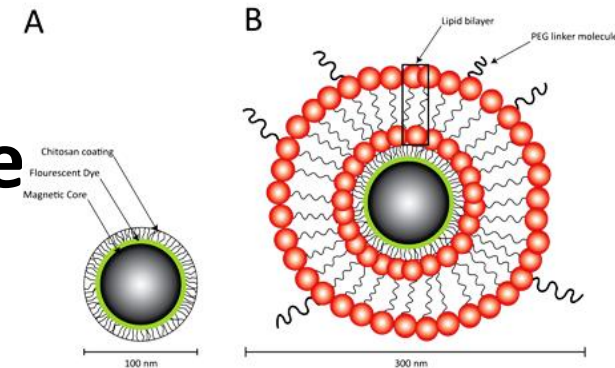
Conclusion



1. **BPA** better than **BSH**

2. Magnetic particle is the most promising one in the third generation of agents

3. We should use magnetic particle **BPA** and **BSH**



Conclusion



Why do I choose **magnetic particles**?

Limitations of the conclusion?

Further work?

Evaluation



Research progress

- Sources
- Problems and solution
- Any bias?

Any questions?



Reference:

1. Boron Neutron Capture Therapy of Cancer: Current Status and Future Prospects
2. Drugs for BNCT: BSH and BPA
3. Boron compounds: new candidates for Boron carriers in BNCT
4. Major Neutron capture(NCT)Drug prototypes
5. Boron and Gadolinium Neutron Capture Therapy for Cancer Treatment