Cancer: how to deal with it?

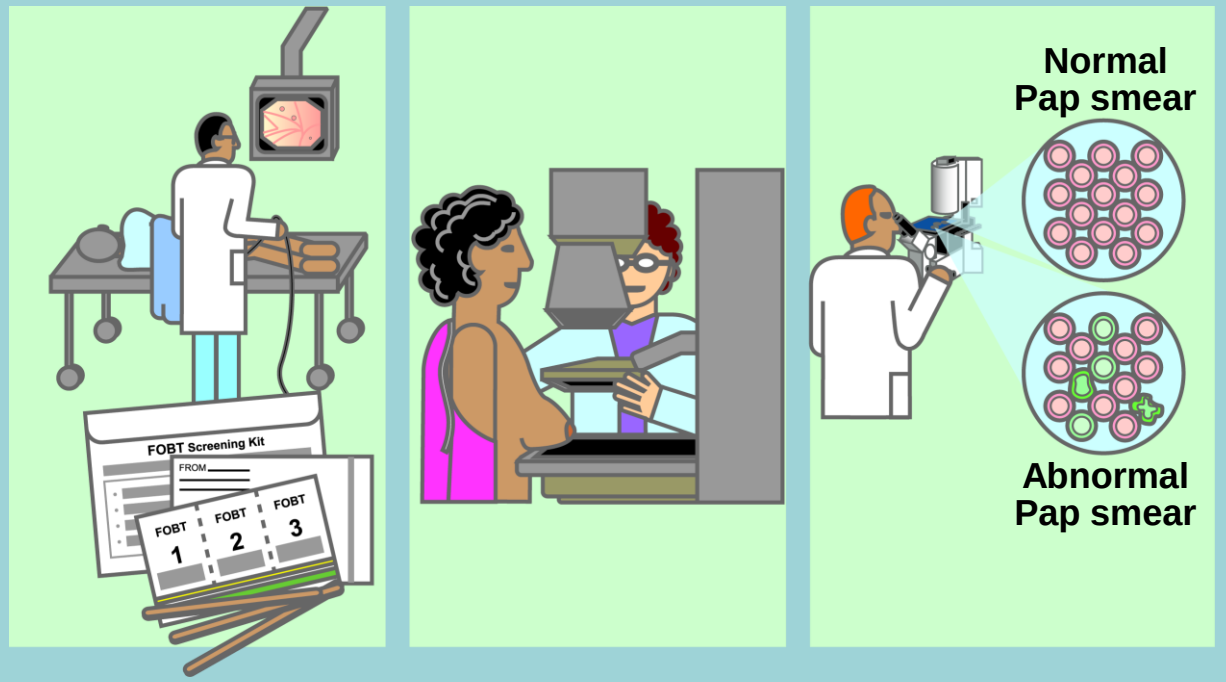
Diagnostics (*in vitro*, *ex vivo* & *in vivo*) to know what is going on

Therapy (systemic & targeted) to inhibit it

Surgery (conventional & fluorescent-assisted) to eradicate it

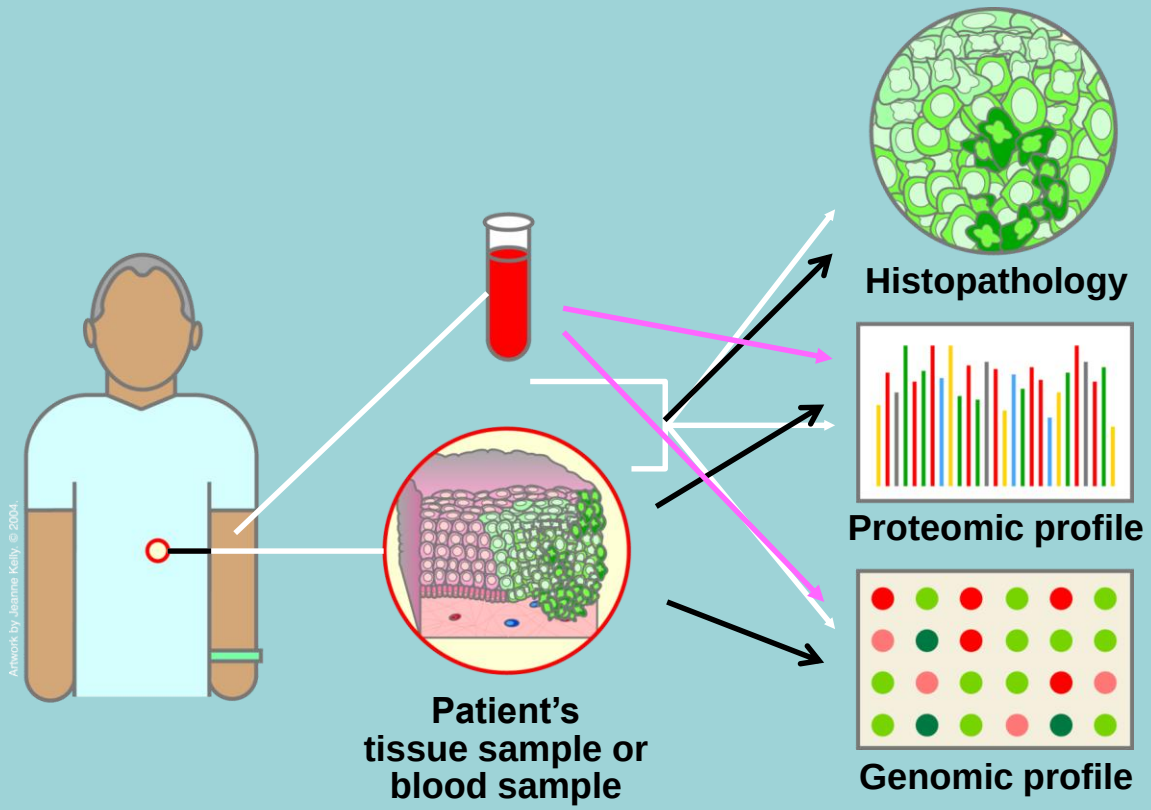
Cancer Screening for Early Detection

Diagnostics is instrumental for rational downstream actions



- Reliable markers
- Costs
- Feasibility
- Invasiveness

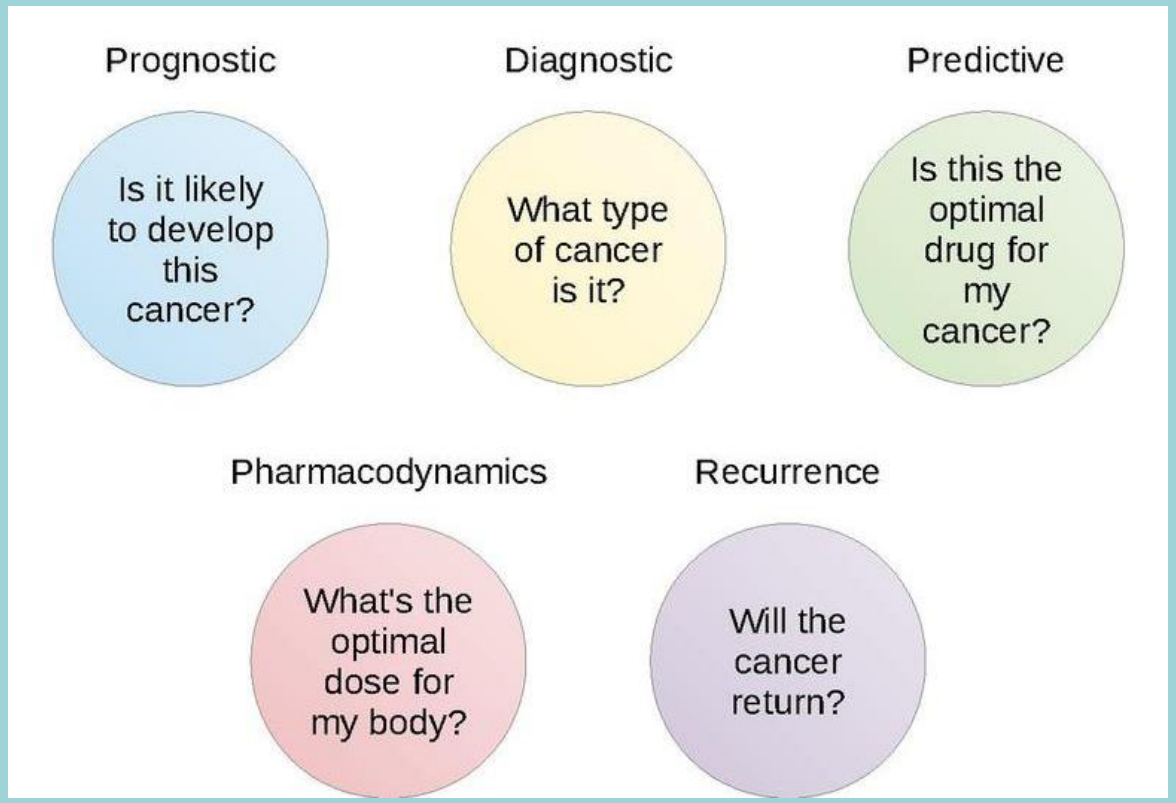
Biopsy (conventional & liquid)



Liquid Biopsy

Looking for suitable circulating biomarkers:

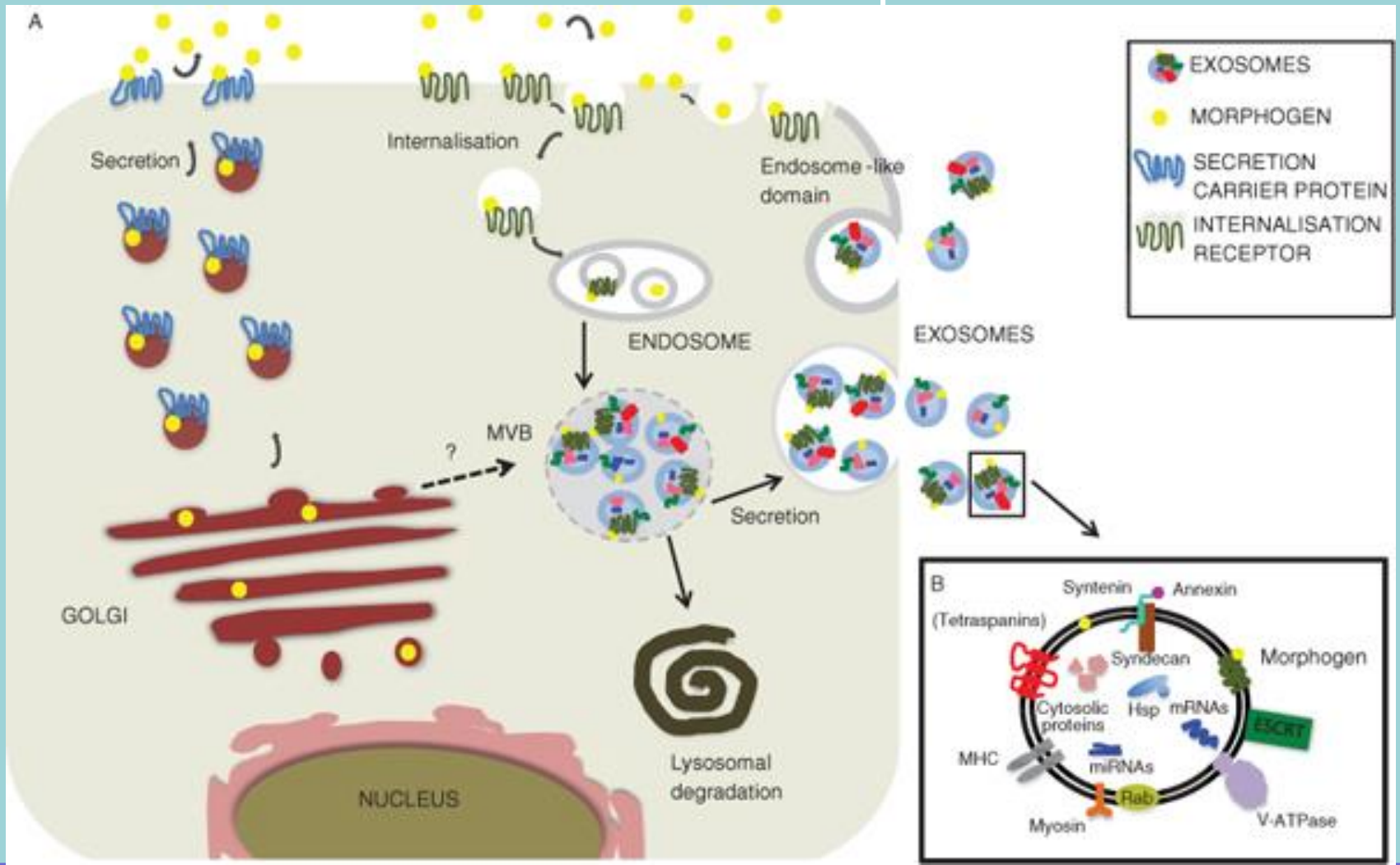
- **Proteins**
- **Nucleic acids**
- **Lipids**
- **Metabolites**



Liquid Biopsy

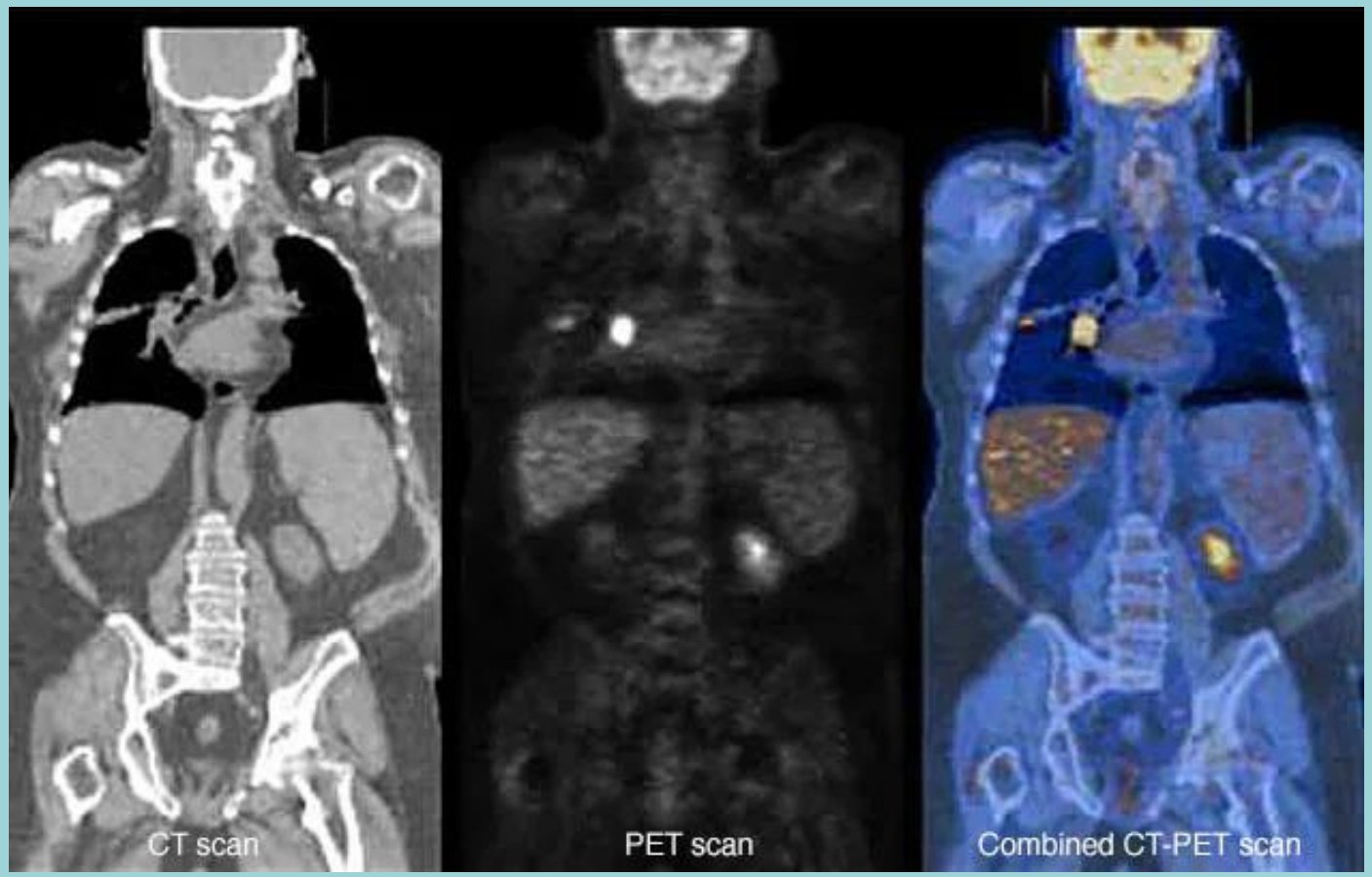
Looking for suitable circulating biomarkers:

- **Exosomes and extracellular vesicles**



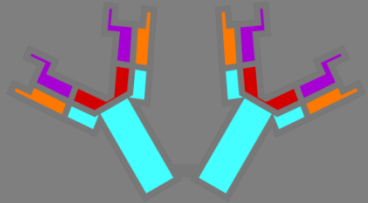
In vivo imaging

Conventional & Ab-dependent: signal-to-noise ratio

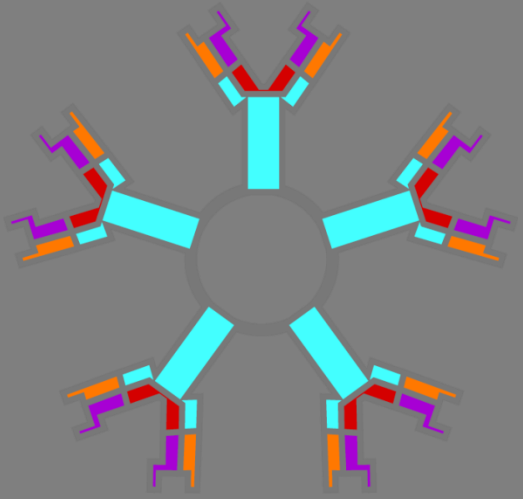


Immunoglobulins

IgG, IgD, IgE, and IgA

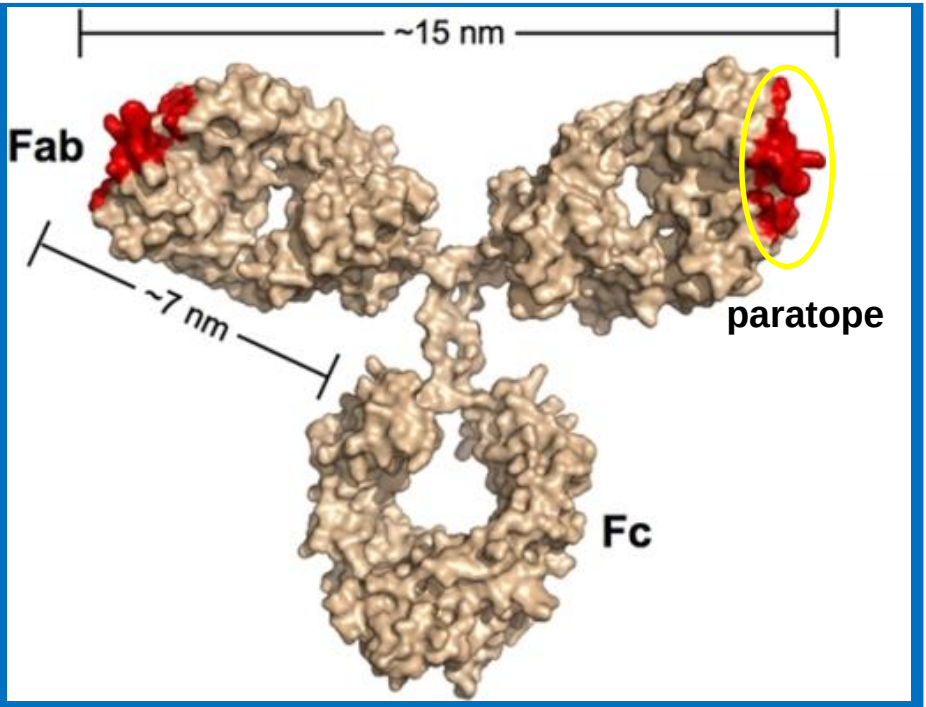


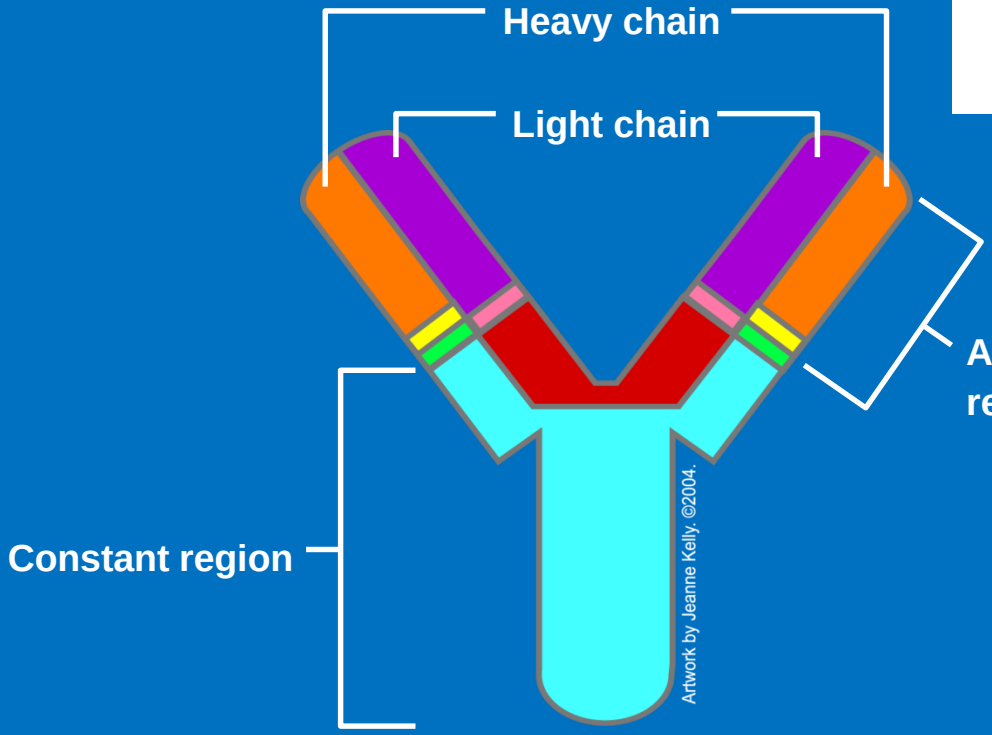
IgA



IgM

IgG Antibodies

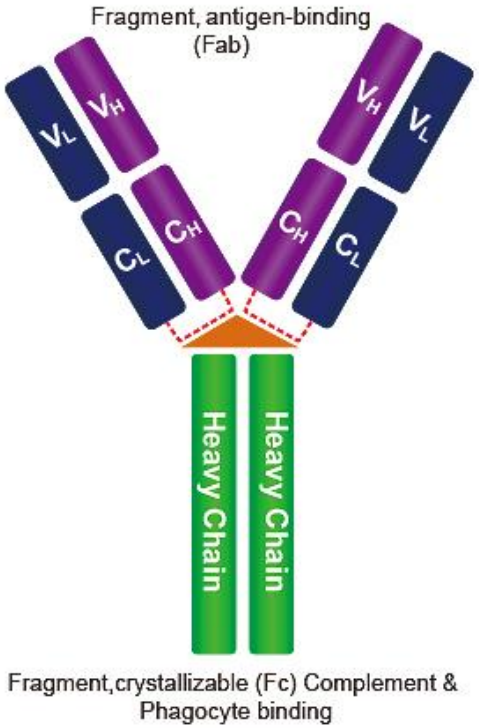


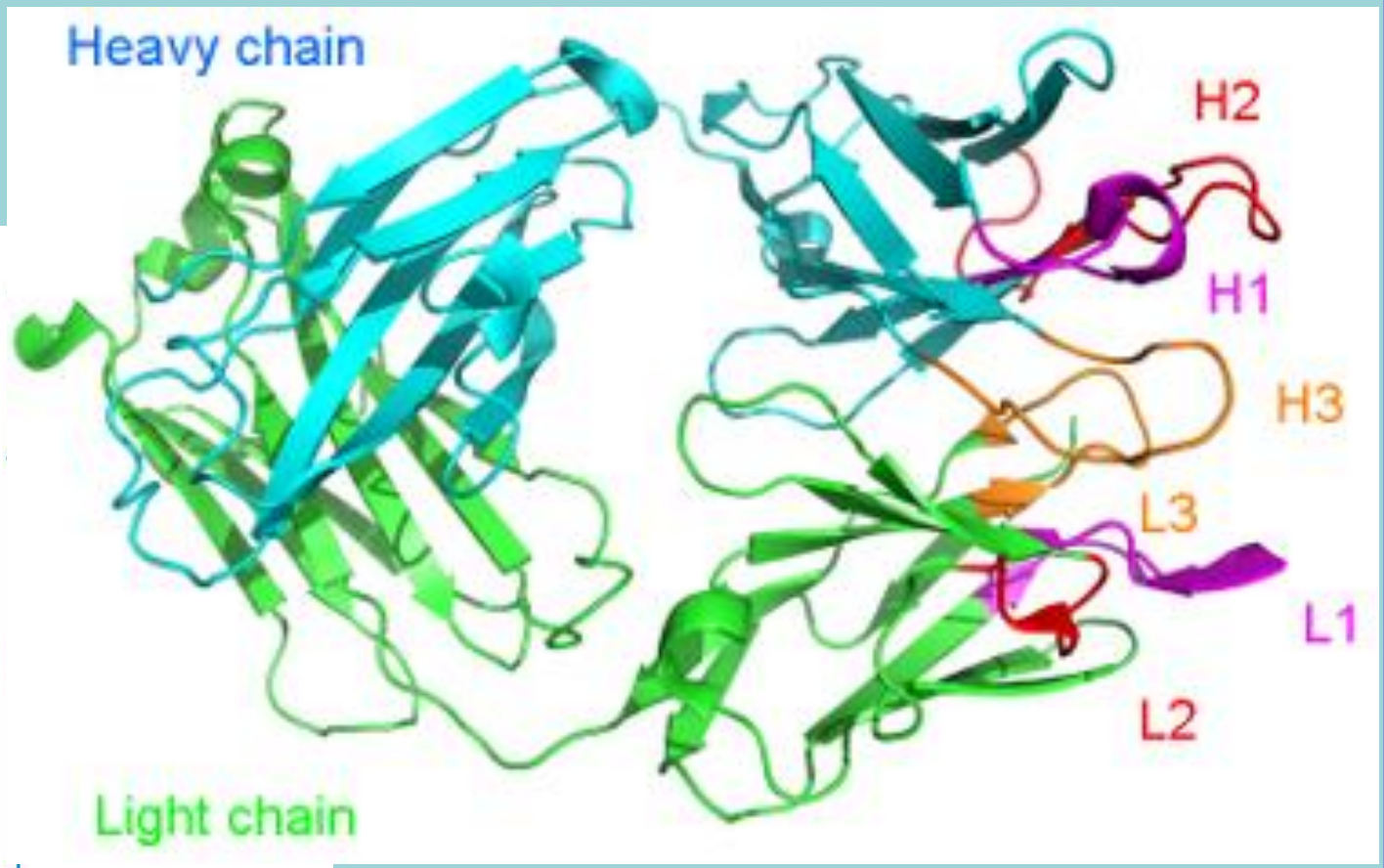


Assembled antibody molecule

IgG antibodies

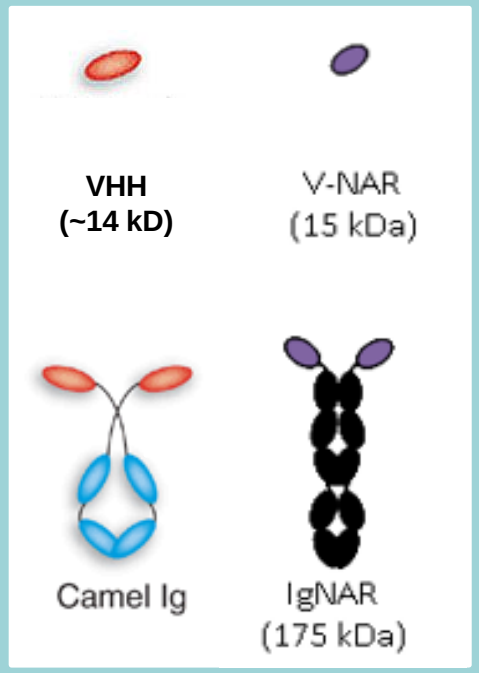
6 loops, corresponding to the 3 CDRs of each variable region, form the (flat) paratope of a conventional IgG antibody

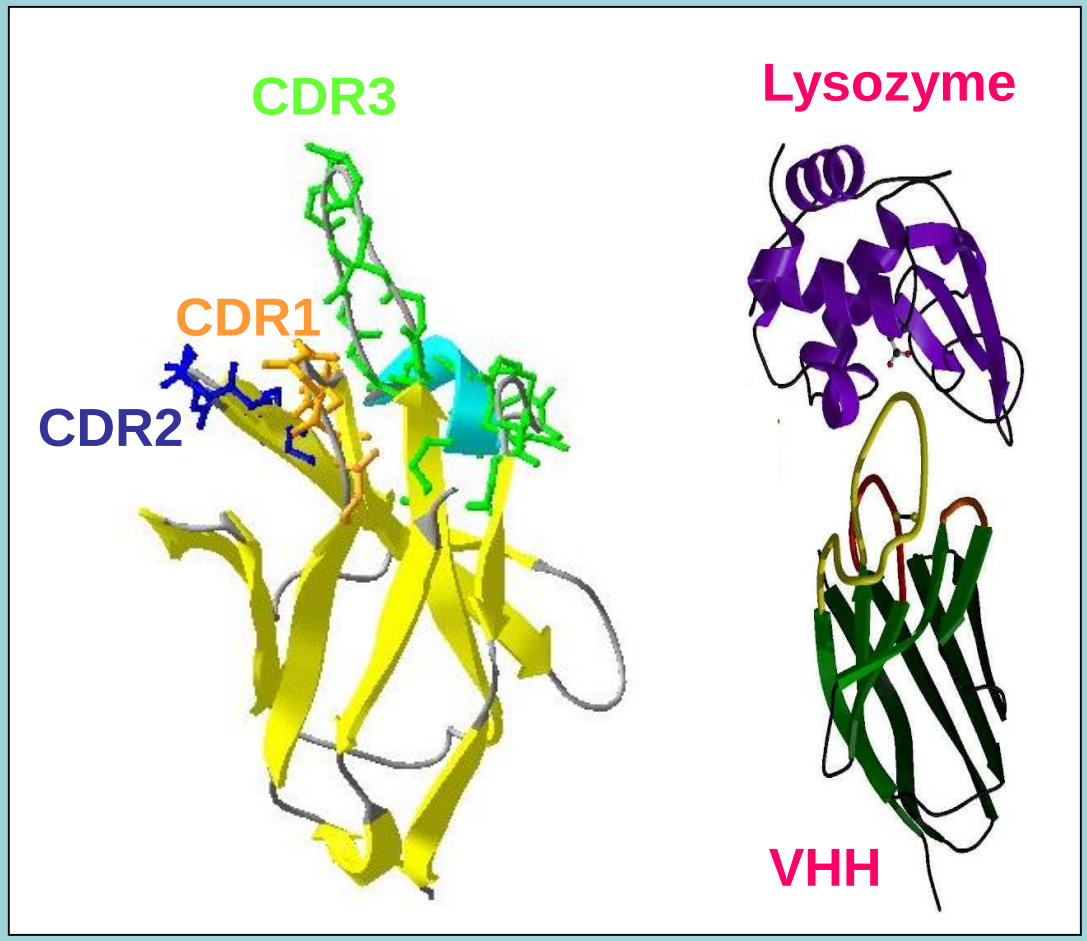




Antibody fragments

Camelidae & shark antibodies (but also alternative scaffolds) are suitable for molecular recognition and binding

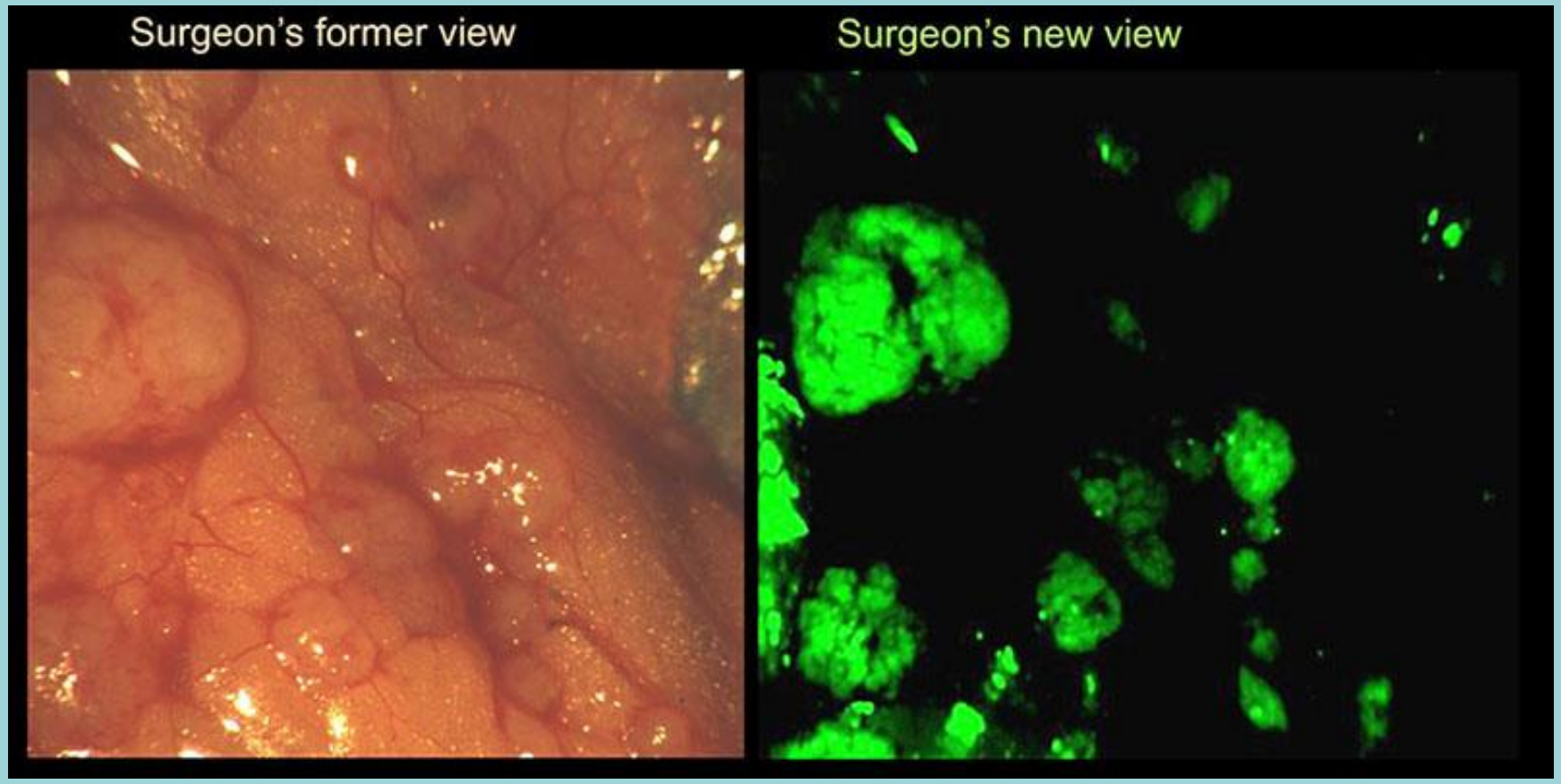




Epitope characteristics & multiple binding

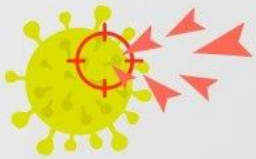
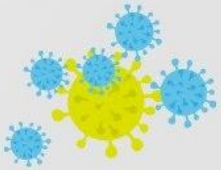
Fluorescence-assisted surgery

Why? To identify the tumor margins



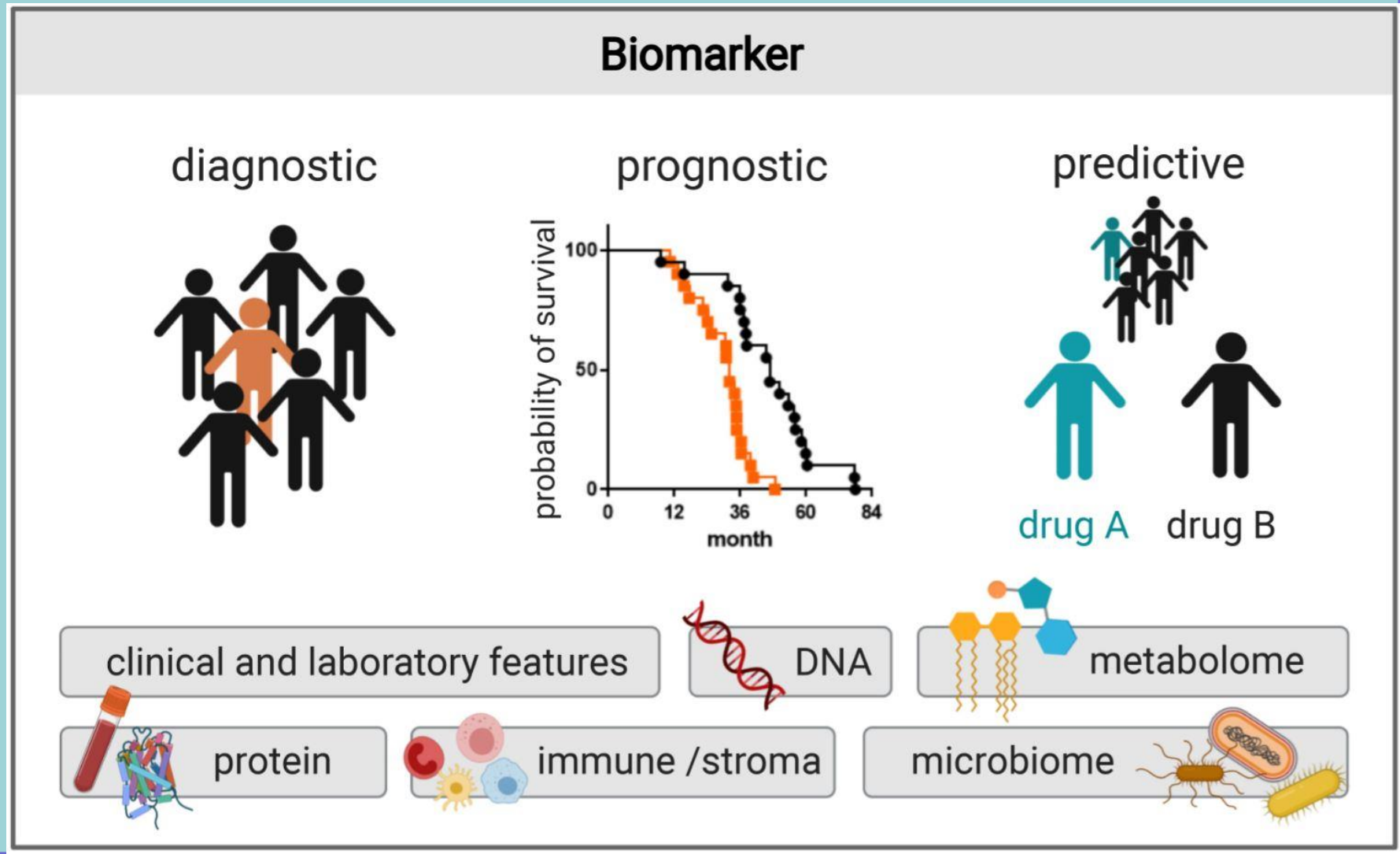
Targeted therapy

Why? To reduce toxicity due to unspecific activity

	How does it work?	Side Effects	Limitations
 Chemotherapy	Targets rapidly dividing cells (mostly cancer cells)	Hair loss, intestinal damage, nausea	Cancer cells develop resistance to chemotherapy, not specific
 Targeted Therapy	Targets Proteins required for cancer growth	Liver problems, diarrhea, skin rash	Cancer cells develop resistance
 Immunotherapy	Uses our immune system against cancer	Autoimmune effects	Tailored and expensive

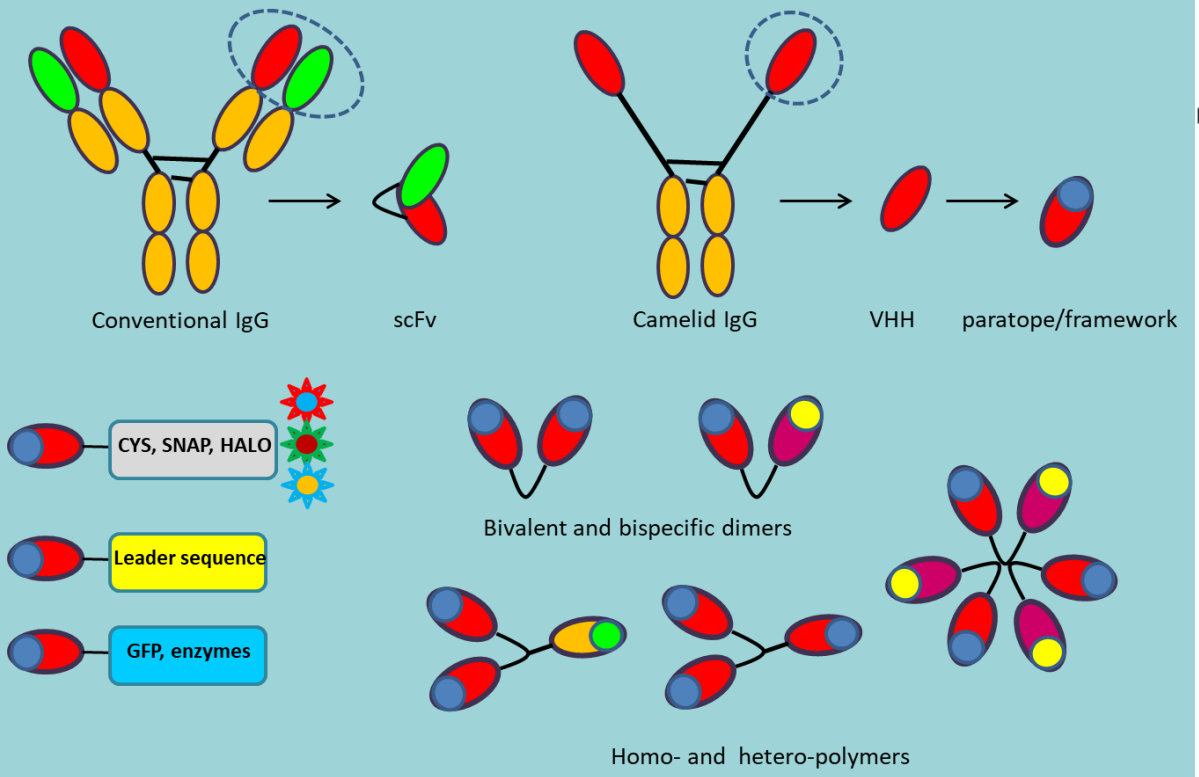
How to target tumors?

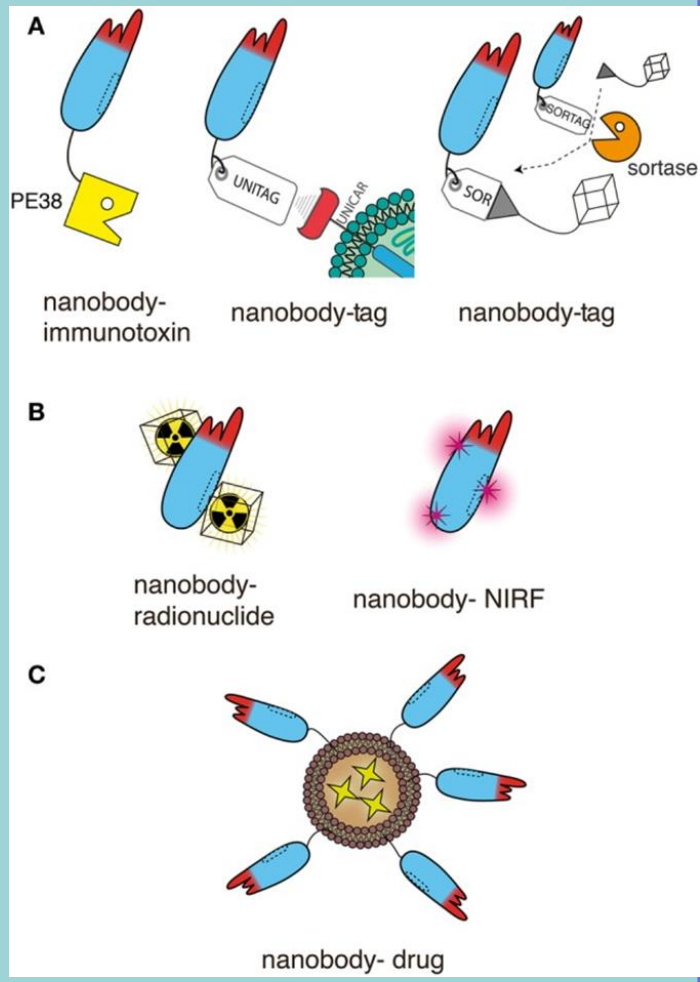
Exploiting the Biomarkers (molecules present only in the tumor cells) for selective delivery



Our contribution

Binders and reagents – optimization and functionalization





Our contribution

Alternative scaffolds