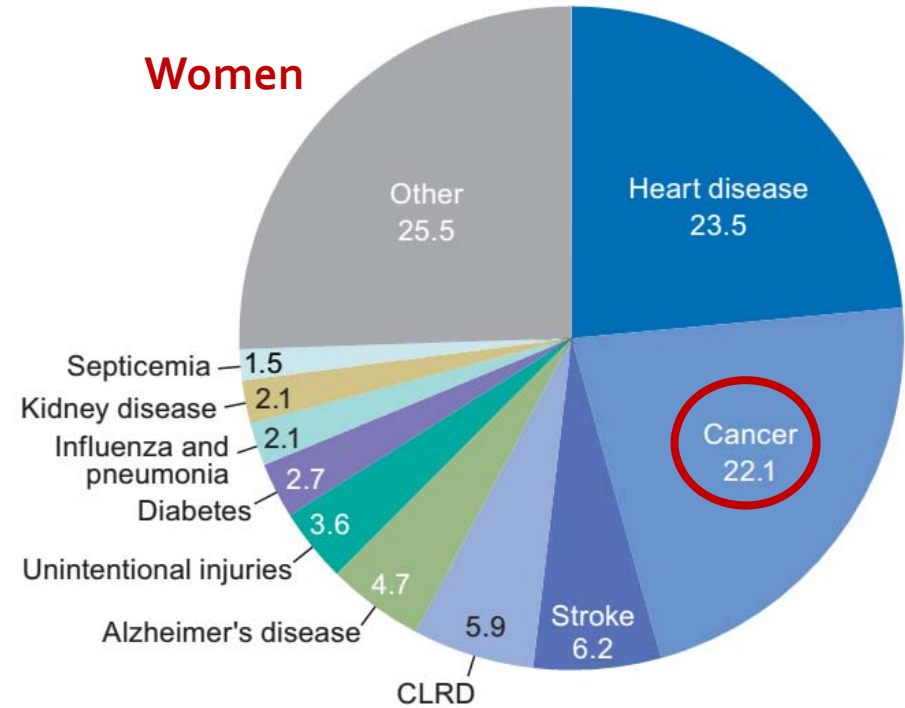
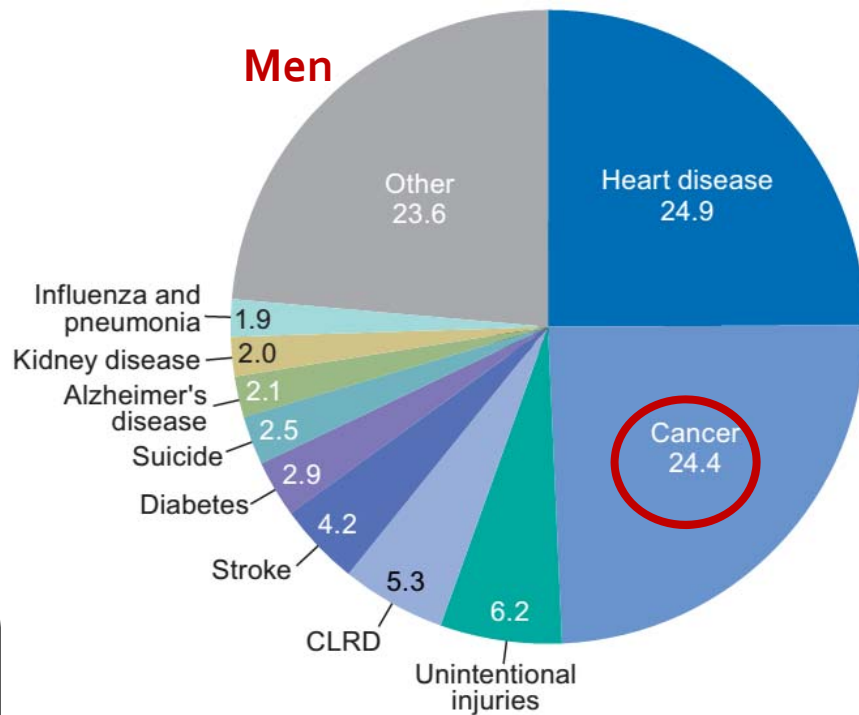




Hybrid Lipid-Coated Silver Nanoparticles for Drug Delivery.

Sven Burke and Marilyn R. Mackiewicz, Ph.D.

What is the driving force behind our research?



NOTES: CLRD is Chronic lower respiratory diseases. Values show percentage of total deaths.
SOURCE: CDC/NCHS, National Vital Statistics System, Mortality.

Cancer is 2nd deadliest disease in America

How is Cancer currently being treated?

Current Therapeutic and Diagnostic Methods

3

X-ray Image using Ioversol



Diagnostic Challenges

- Short retention in the body
- Contrast agents can be expensive
- Not specifically targeted

Paclitaxel for Breast and Ovarian cancer

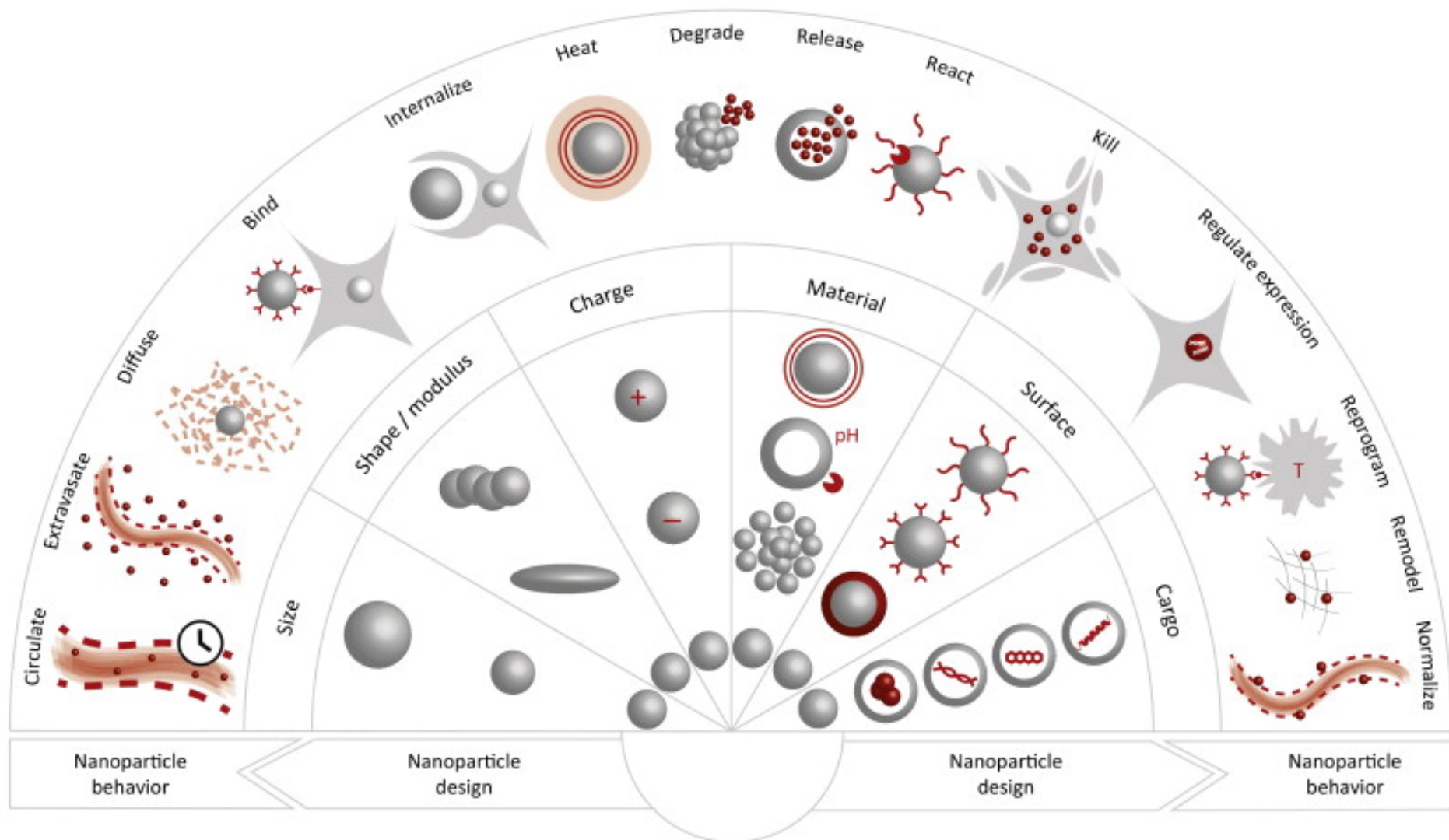


Challenges in drug delivery

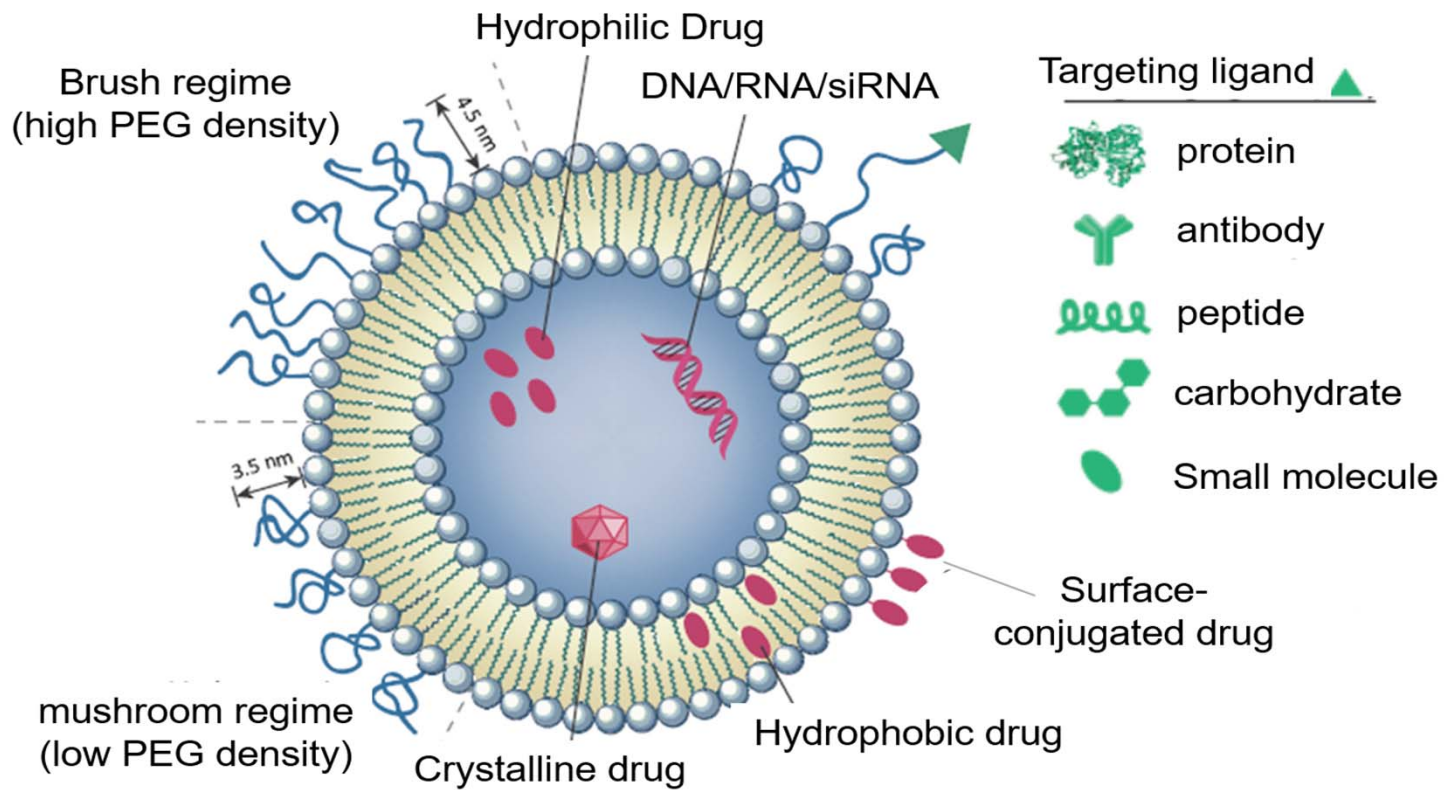
- Immune response
- High clearance rate
- Non-specific targeting
- Administration is limited by solubility

How we improve diagnostic imaging and drug delivery to improve patient outcome?

Nanotechnology to Enhance Imaging and Drug Delivery



Liposome-based Nanoparticles for Drug Delivery



Limitations

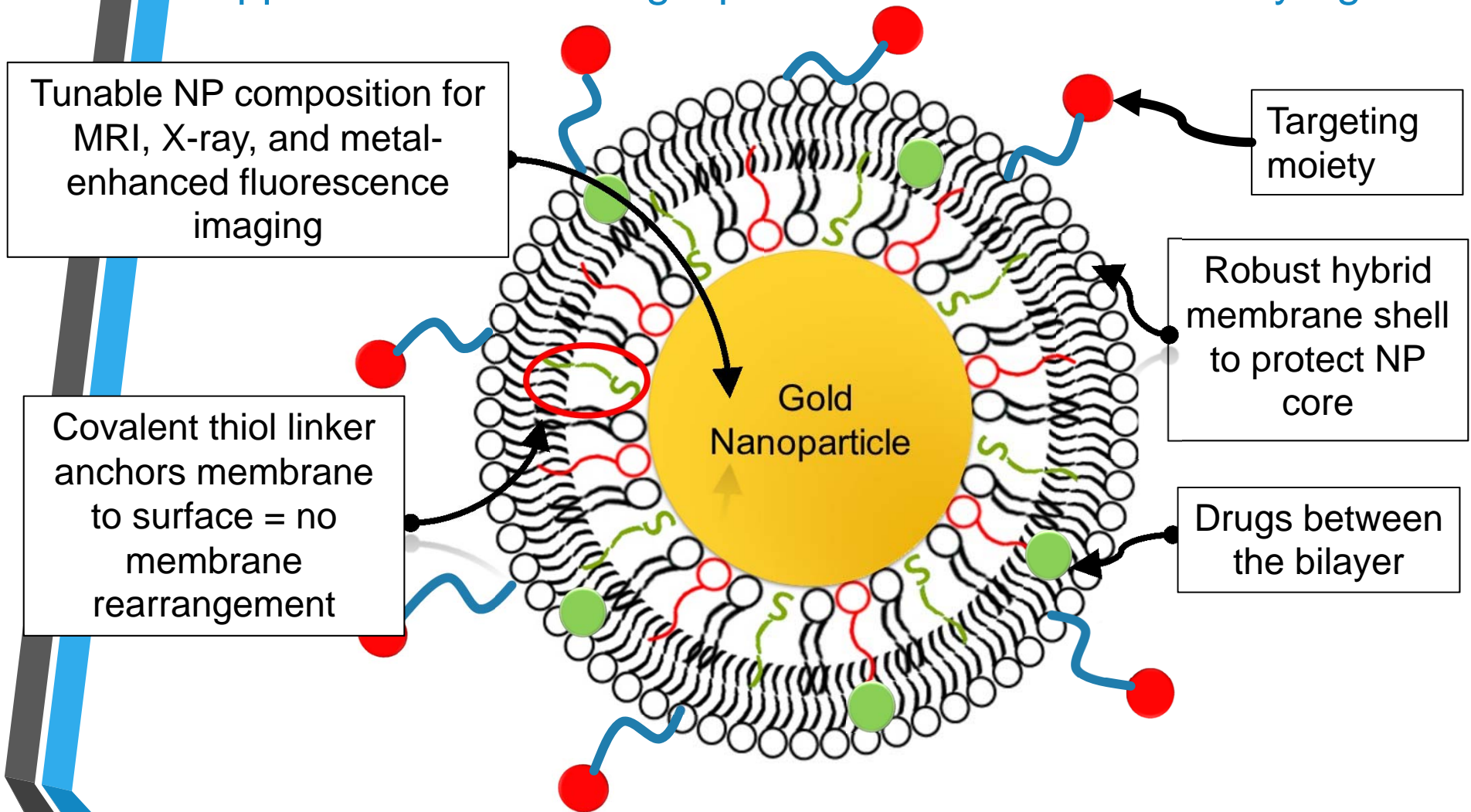
- Prone to restructuring
- Drug leakage

Targeting advantages

- Targeting reduces non-specific interactions with healthy cells

How can we stabilize liposome technology to improve their performance?

Approach to Stabilizing Liposome-based Nanodelivery Agents

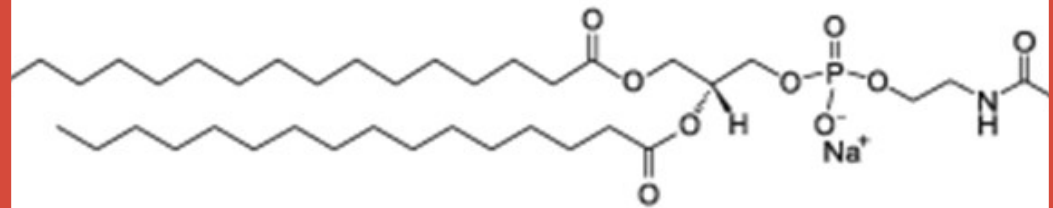


- Targeting has a greater effect with these more robust particles

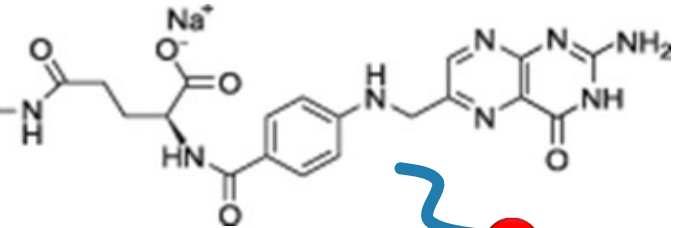
How does one tailor these for cancer cell targeting?

My Project – Targeting the Folate receptor

1,2-dipalmitoyl-*sn*-glycero-3-phosphoethanolamine (PE)



Folic Acid
(FA): Targeting Moiety



1,2-dipalmitoyl-*sn*-glycero-3-phosphoethanolamine-N-(6-((folate)amino)hexanoyl) (sodium salt)
PE-FA

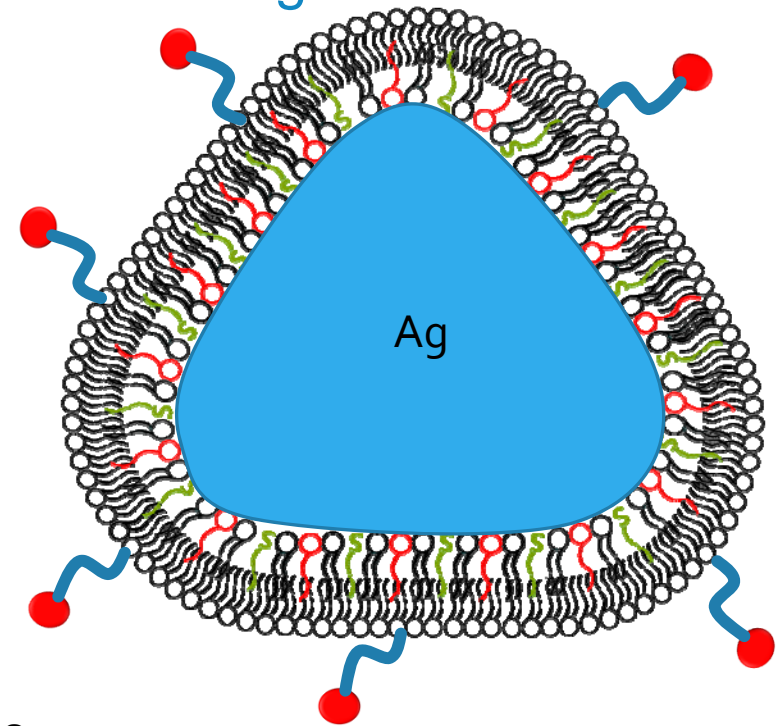
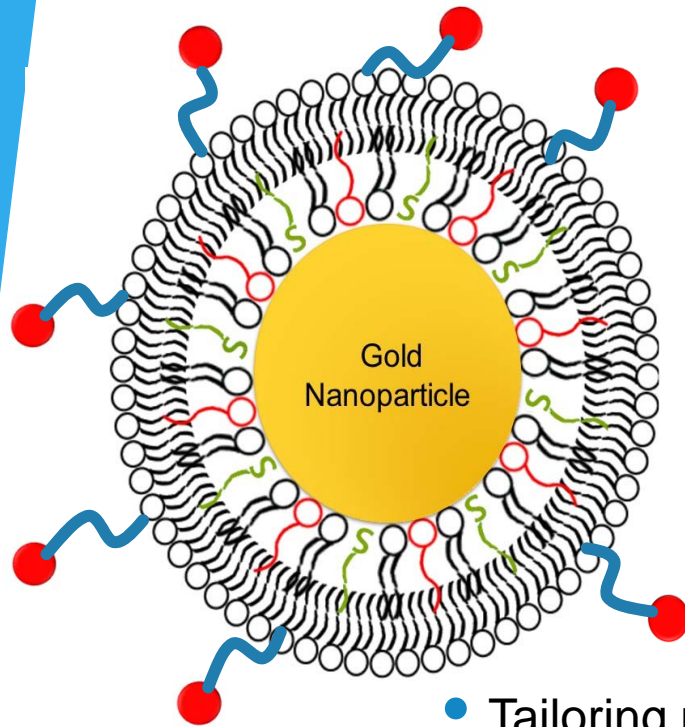
overexpressed folate receptors

- Present in many cancer cells and M2 macrophages
- This allows them to be targeted by a folate



-<http://immuno-oncologynews.com/2015/04/17/therapeutic-nanoparticles-found-to-induce-an-effective-antitumor-immune-response-at-a-specific-temperature/>

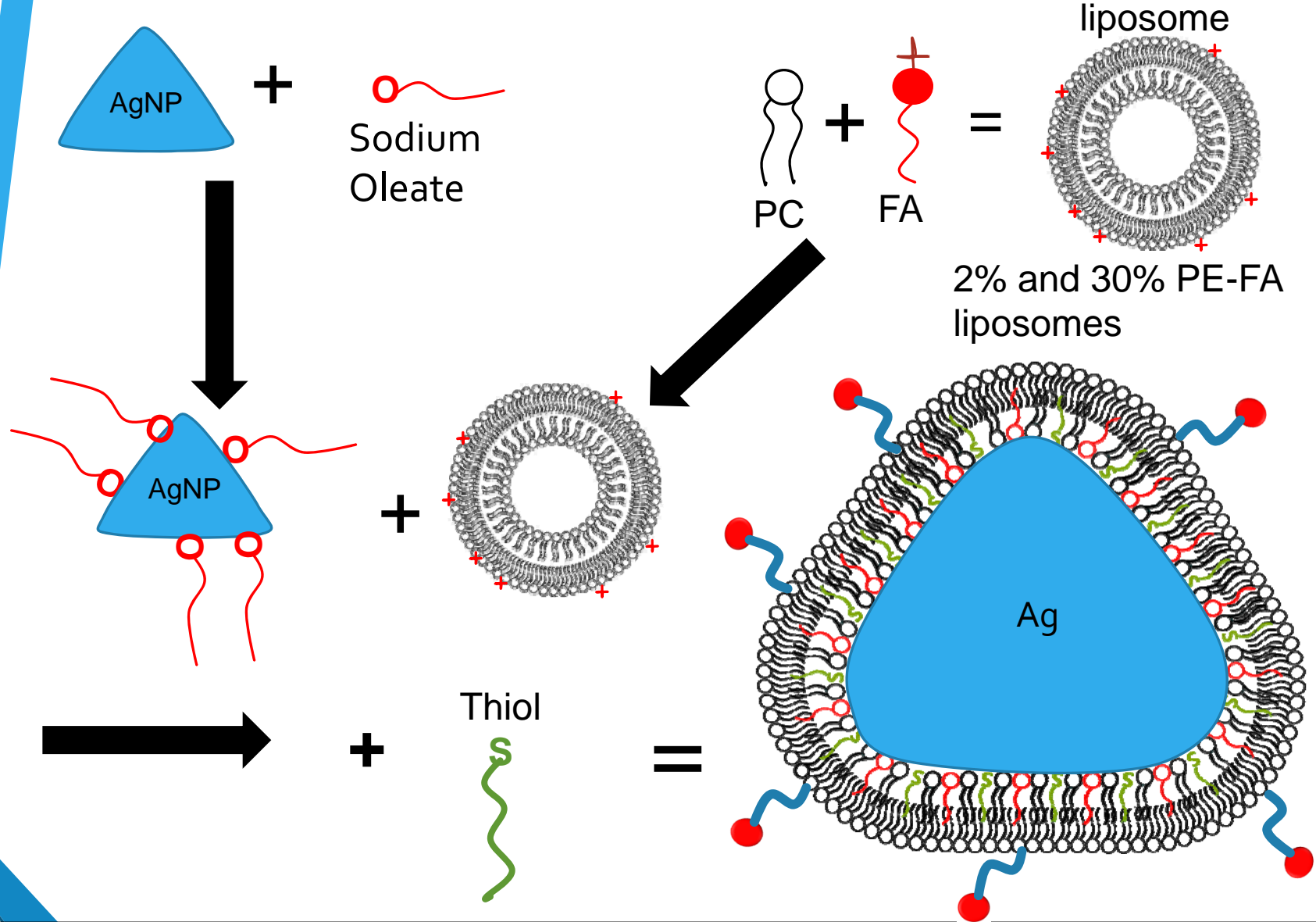
Why silver is what we are using



- Tailoring metallic cores
- Changes shape for uptake
- Changes optics for imaging
- Near infrared region of light
- Deep tissue penetration (OCT)

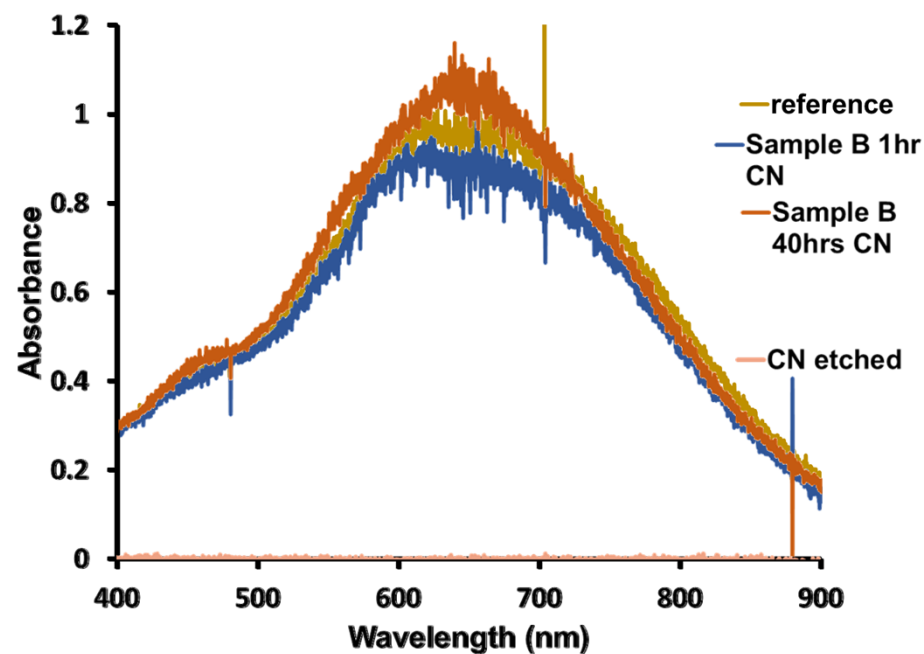
How does one synthesize these nanoparticles?

Synthesis of Targeted Hybrid Lipid-coated AgNPS



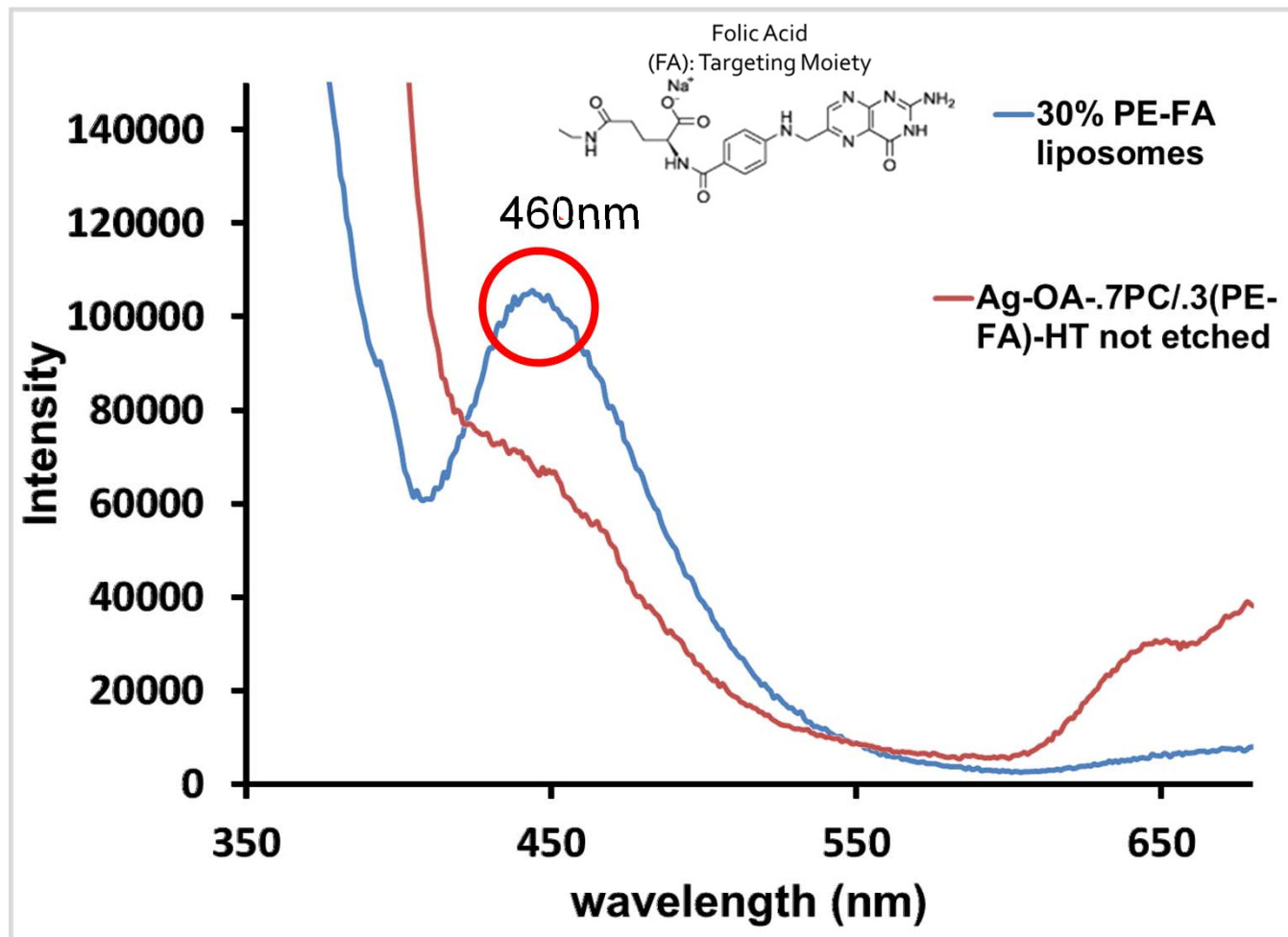
How do we know that the liposome is encapsulating the silver?

Preparation and Stability Test with Hybrid Lipid-coated AgNPs with Varying Folic Acid Composition



How do we know where the folated lipids are located in the liposome?

Confirmation of FA-PE location in liposomes using fluorescence



- Decrease in emission intensity demonstrates FA proximity to the silver

Summary and Future Directions

Stability

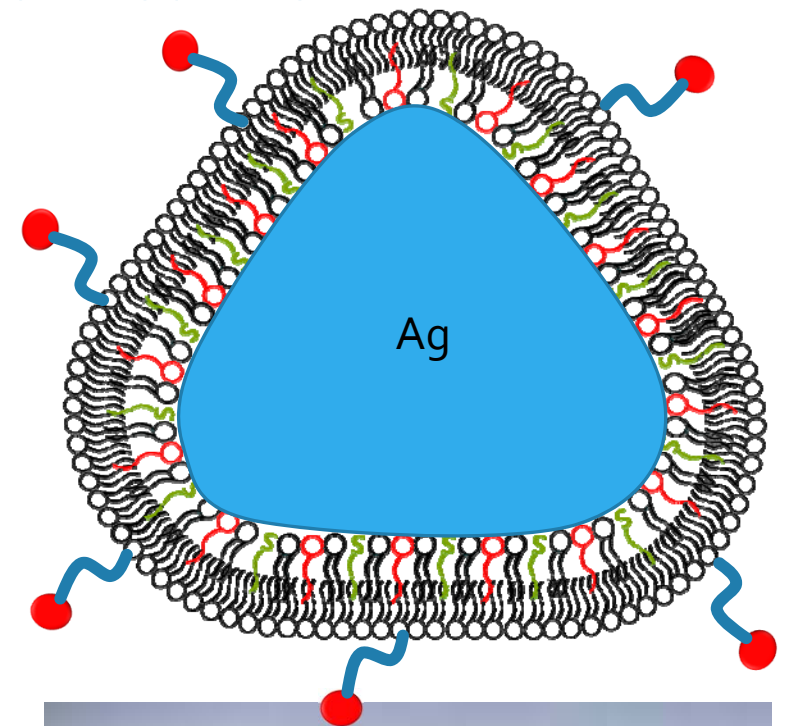
- Stable in Cyanide

Targeting

- FA location is correct for targeting
- Maintains stability with varying FA%

Next Steps

- *in vitro* studies through OHSU
- *In vivo* with zebra fish through Stacy Harper from OSU



Zebra Fish

Acknowledgements

Thank you to Dr. Marilyn Mackiewicz for the opportunity to work in your Lab. Thanks to my wonderful lab mates for teaching me the ropes.

Thank you to the REU program, NSF, and PSU for providing me with the ability to be in the REU program.

Funding

National Science Foundation REU program

PSU Faculty Enhancement Grant

