

Název: **Specifické cílení nanotransportérů pro teranostické aplikace**

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Název projektu: Mezinárodní spolupráce v oblasti "in vivo" zobrazovacích technik



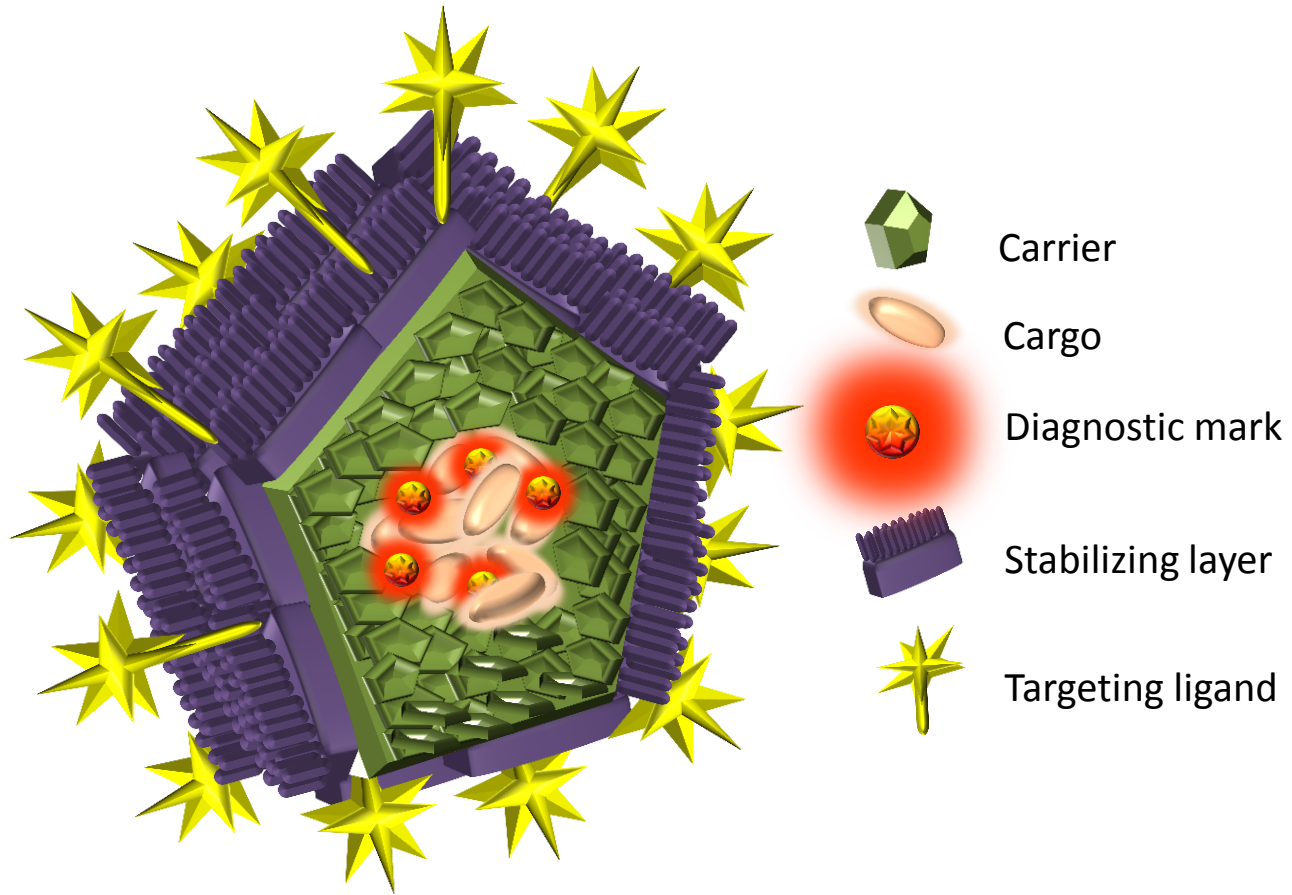


# TARGETING

- Passive – EPR – entering the tumor
- Active – targeting ligands – entering the tumor cells



# THERANOSTIC NANOCARRIER



# TARGETING LIGANDS VS. STABILIZING LAYER

- Opposite effect
- Targeting ligands: enhance cellular uptake × cause accumulation in liver and spleen
- Stabilizing layer (PEG): protects from RES × prevents cellular uptake

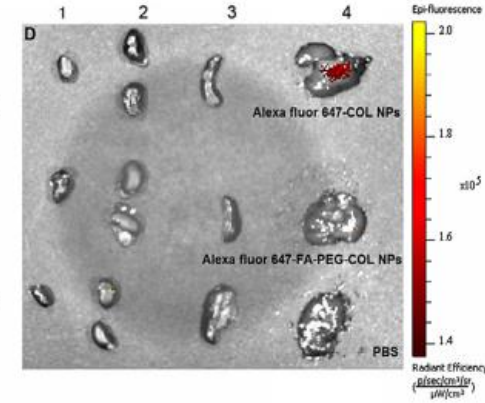
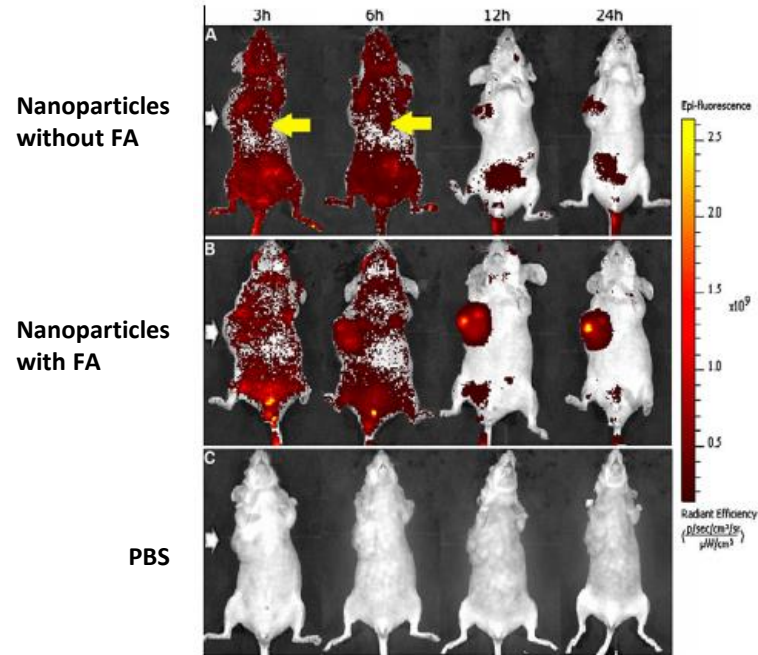
PEG can serve as spacer for joining of targeting ligands

# TARGETING LIGANDS

- Antibodies – HER-2, transferrin or PSA receptor
- Antibody fragments – Fab binding regions
- Proteins – transferrin, urokinase plasminogen activator
- Peptides – U11 peptide, RGD peptide
- Aptamers – aptamer for PSMA
- Small molecules – folic acid, anisamide

# FOLIC ACID

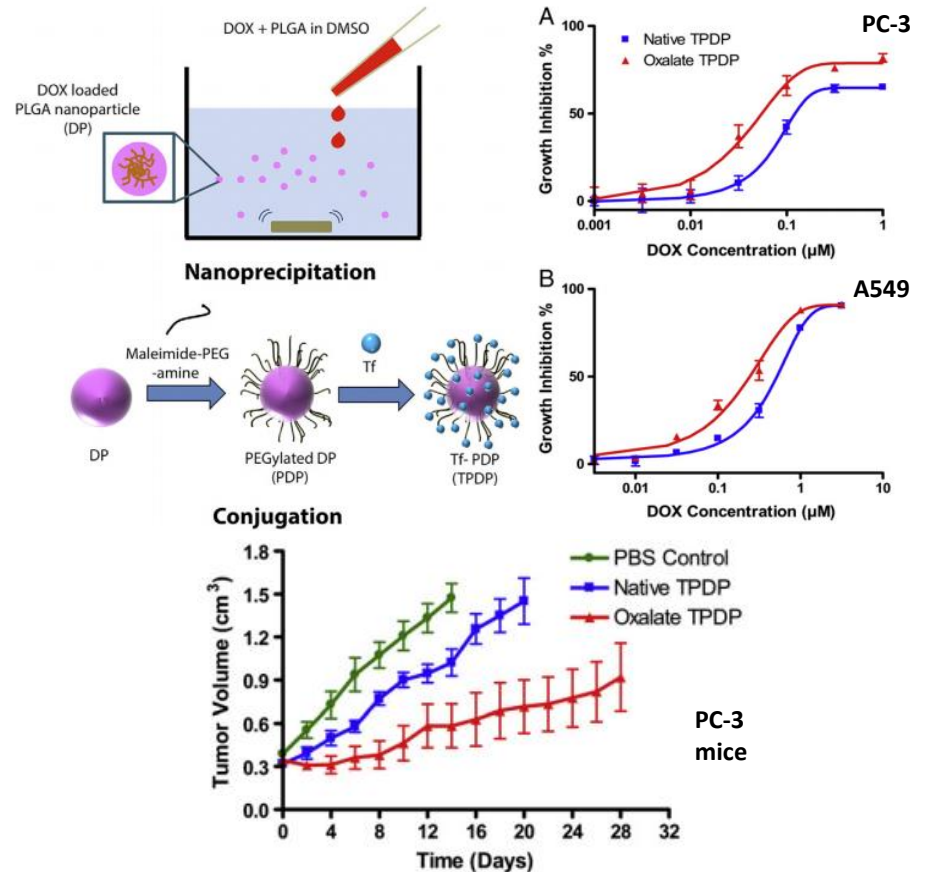
- Many cancer cells overexpress folate receptors
- Ovarian, breast, brain, head and neck tumors



Li, T.S.C., et al. Efficient siRNA delivery and tumor accumulation mediated by ionically cross-linked folic acid–poly(ethylene glycol)–chitosan oligosaccharide lactate nanoparticles: For the potential targeted ovarian cancer gene therapy. *European Journal of Pharmaceutical Sciences*. 52, 48–61 (2014).

# TRANSFERRIN

- Similar to apoferritin
- Many cancer cells overexpress transferrin receptors
- Breast, prostate, lung, thyroid, pancreas or colon cancer cells, carcinomas, sarcomas and Hodgkin's lymphomas



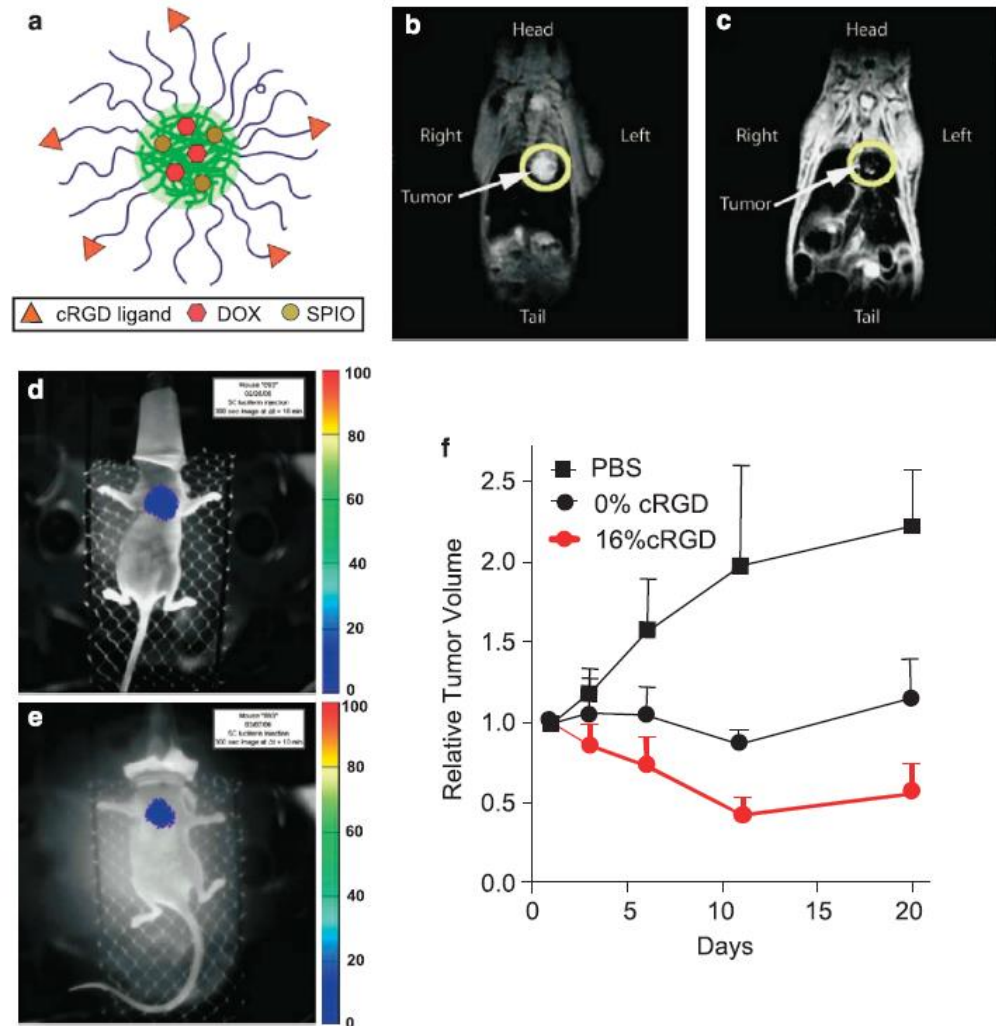
Chiu, R.Y.T., et al. Improving the systemic drug delivery efficacy of nanoparticles using a transferrin variant for targeting. *Journal of Controlled Release*. 180, 33–41 (2014).



# RGD PEPTIDE

- Arginine-Glycine-Aspartic acid
- Two internal disulfide bonds
- $\alpha\beta$  integrin receptors on angiogenic vasculatures
- No effect on the vasculature of control organs
- Breast, prostate, lung, renal, colorectal, gastric, pancreatic, ...

RGDLATLRQL(LCP) peptide  
 $\alpha\beta_6$  receptors - lung cancer cells



Nasongkla, N., et al. Multifunctional polymeric micelles as cancer-targeted, MRI-ultrasensitive drug delivery systems. *Nano Lett.* 6, 2427–2430 (2006).

# CONCLUSION

- Passive and active targeting
- Different targeting ligands, each advantages and disadvantages
- RGD peptide seems like a very promising targeting moiety

# THANKS to...

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INVESTICE DO ROZVOJE VZDĚLÁVÁNÍ



# Děkuji za pozornost