

# Multimodality Molecular Imaging (PET/MRI/Optical) for Cancer Therapy

Baowei Fei, PhD, EngD

Email: [bfei@emory.edu](mailto:bfei@emory.edu)  
[www.FeiLab.org](http://www.FeiLab.org)



EMORY  
UNIVERSITY  
SCHOOL OF  
MEDICINE

Center for Systems Imaging  
Quantitative BiImaging Laboratory  
Department of Radiology  
Emory University, Atlanta, GA

# Emory Center for Systems Imaging

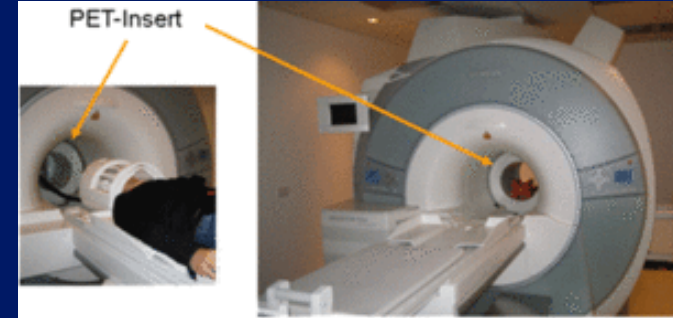
Multispectral *In Vivo*  
Fluorescence Imaging



MicroPET/MicroCT



Combined PET/MRI



MicroPET

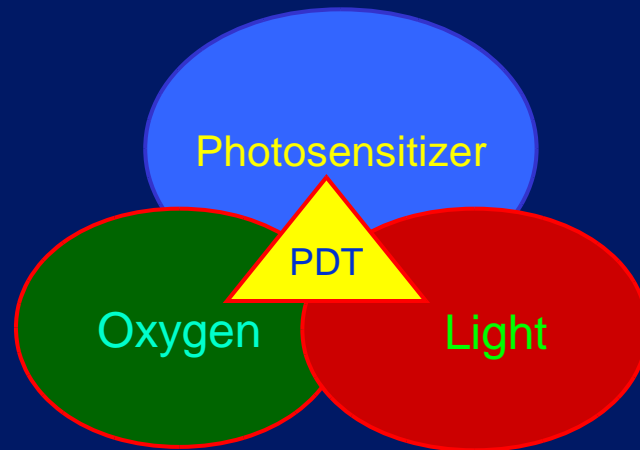
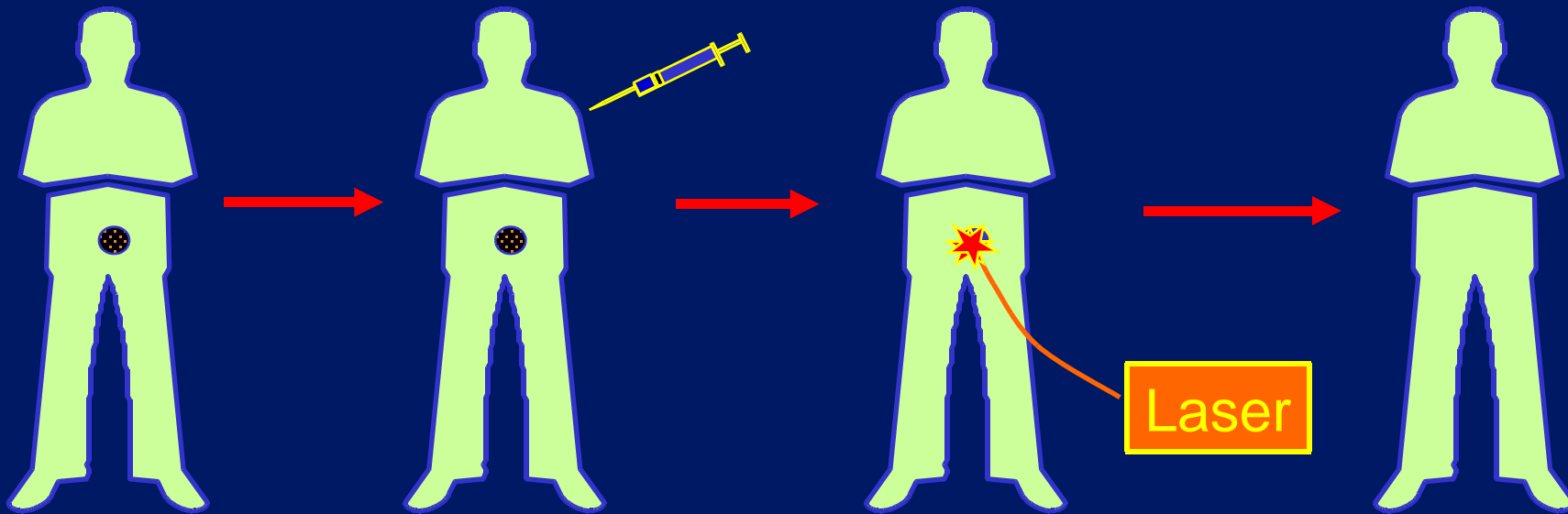


MicroMRI

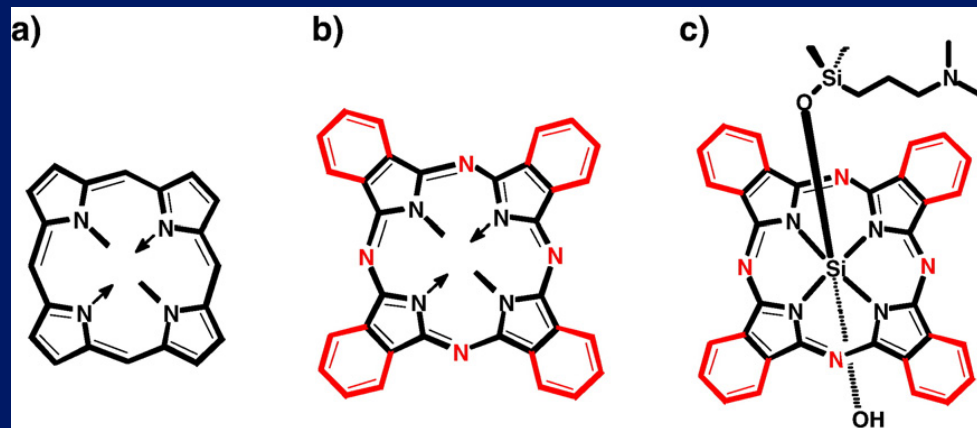


HRRT System  
High-resolution PET

# Photodynamic Therapy (PDT)



# Pc 4-mediated PDT



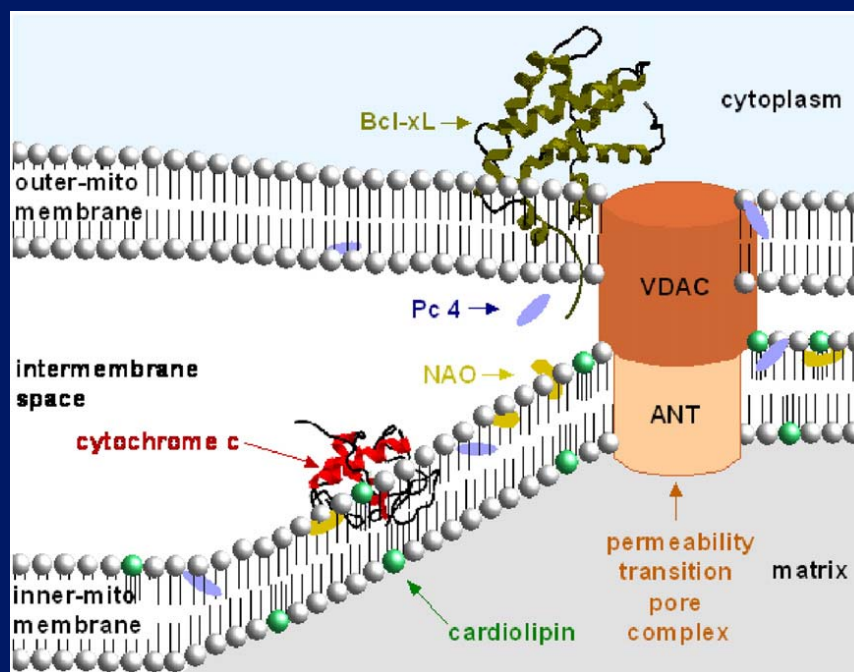
Porphyrin  
Ring

Phthalocyanine  
Ring

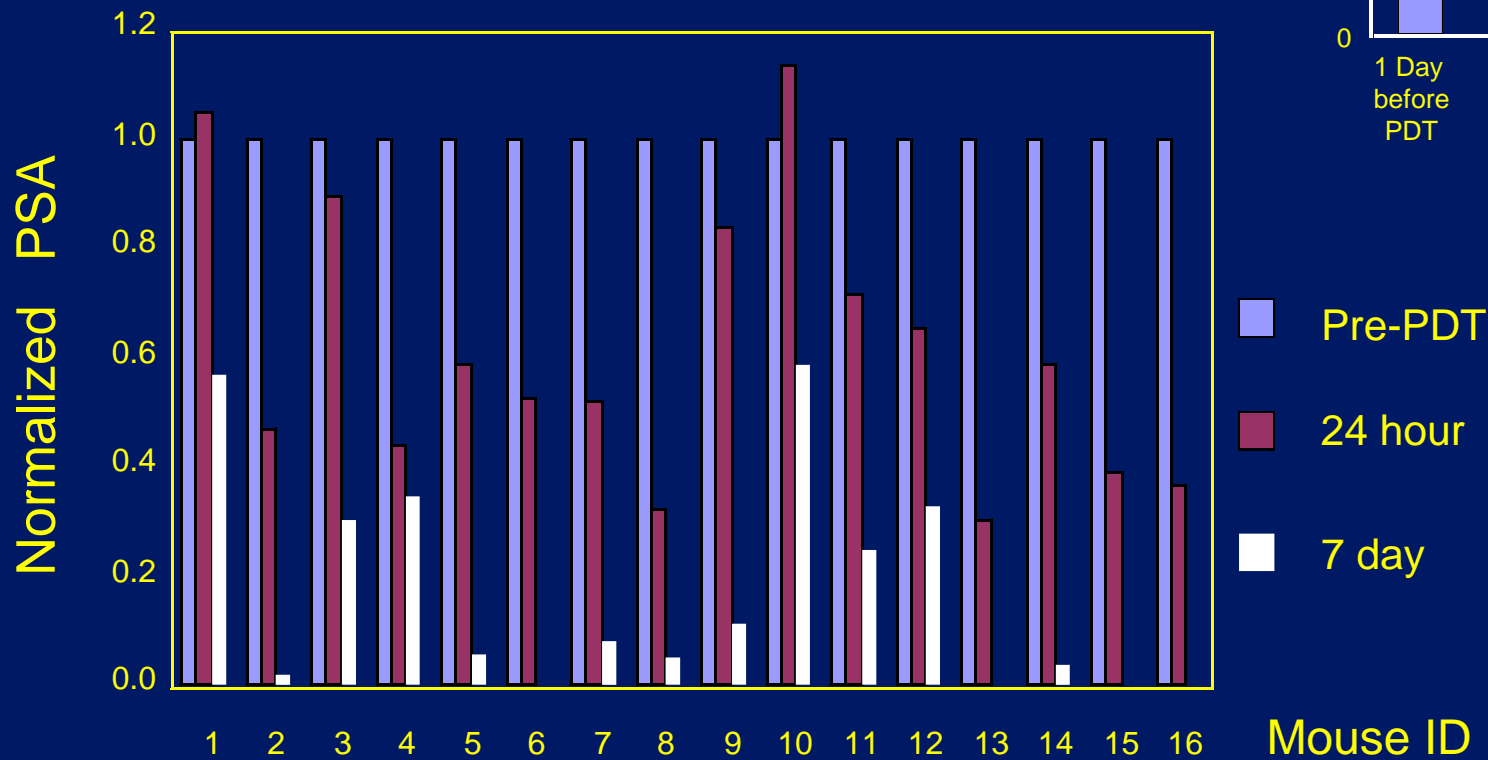
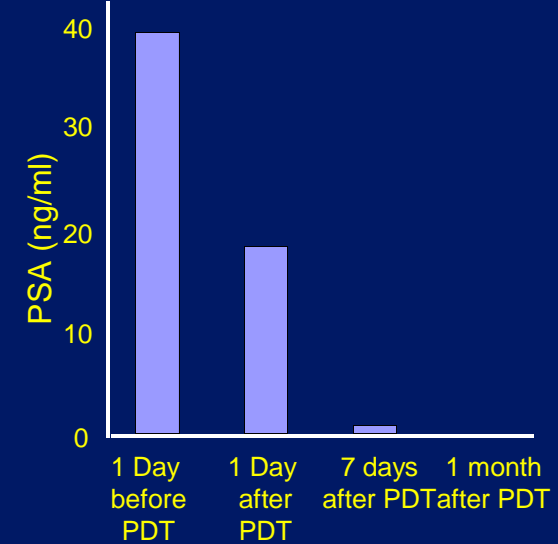
Pc 4:  
Silicon Phthalocyanine 4

## Mitochondrial Target of Pc 4-PDT

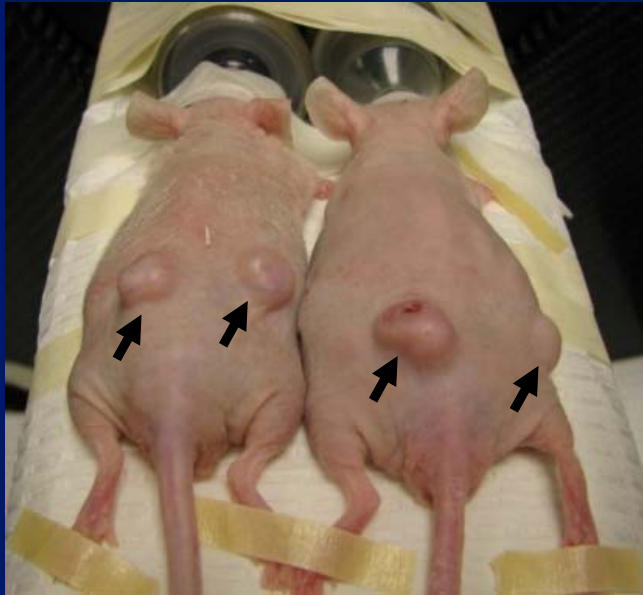
Miller *et al*, *Toxicol Appl Pharmacol.* 224(3):290-9.  
2007



# PDT for Prostate Cancer



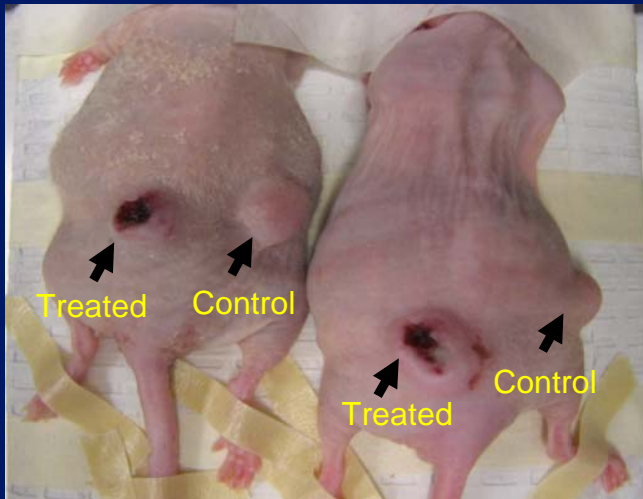
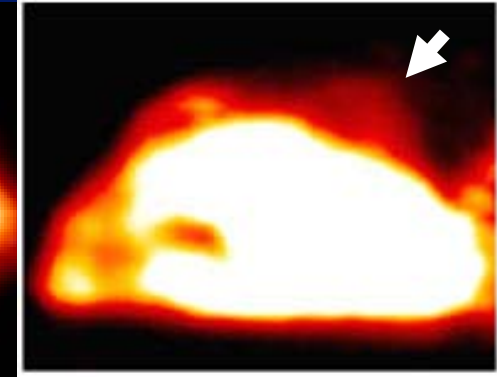
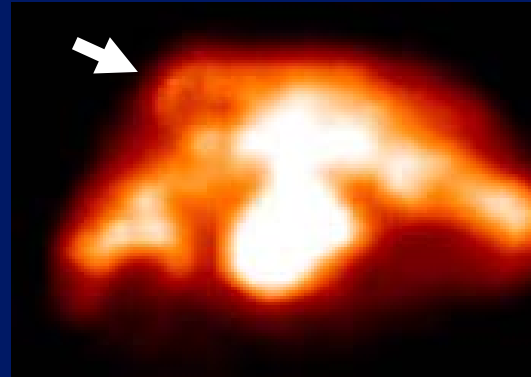
# PET Imaging for PDT



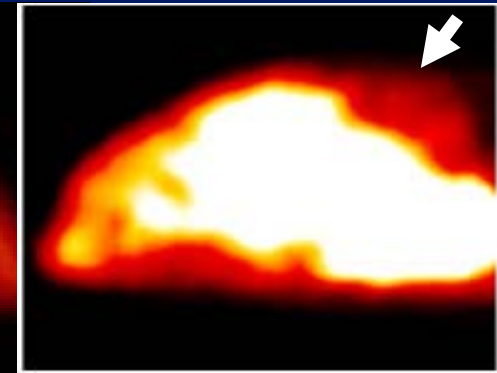
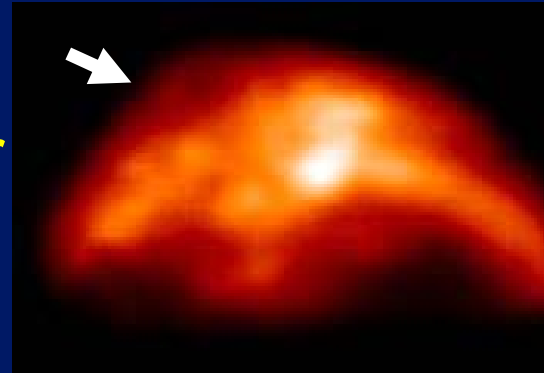
Pre  
PDT

Treated

Control

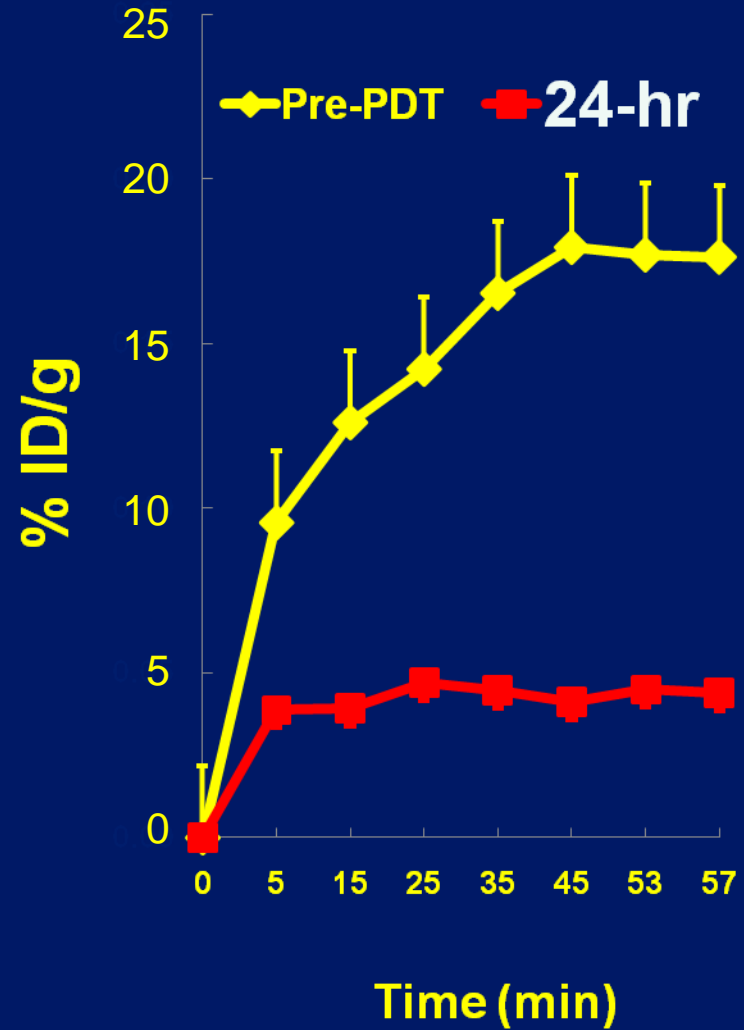
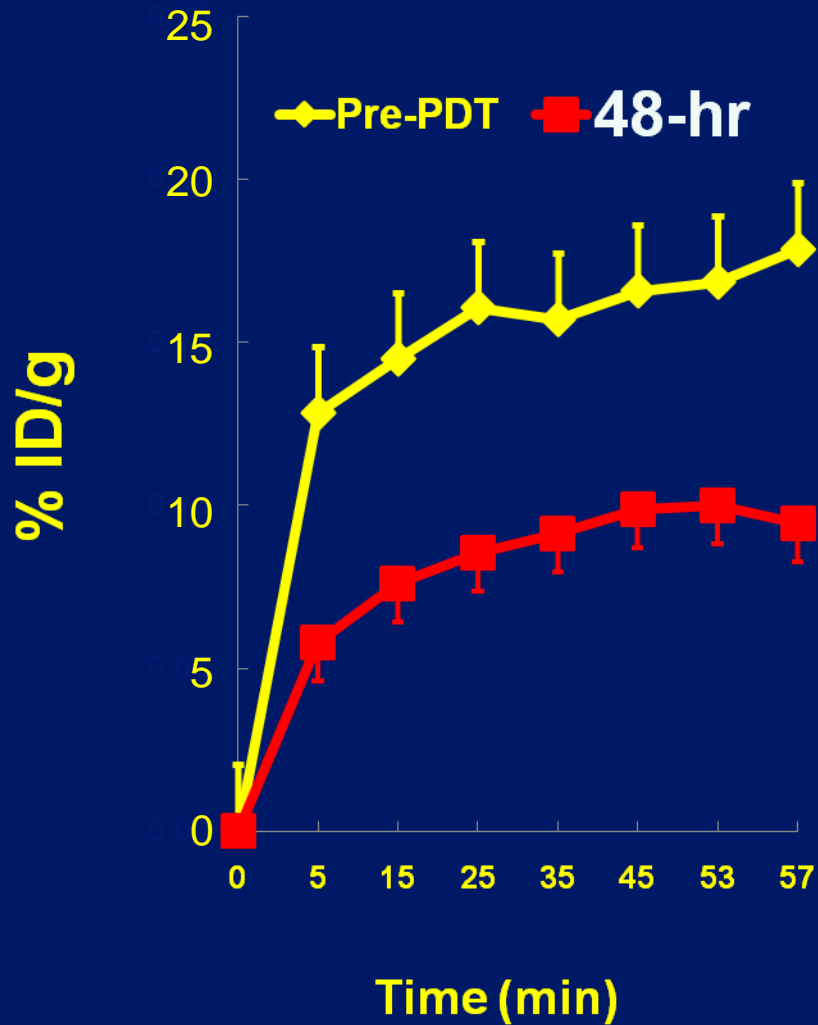


48 hr

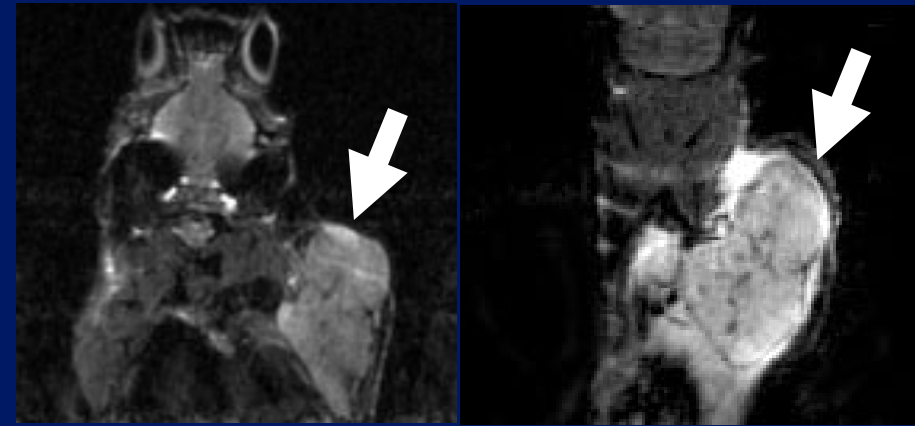


Fei et al, *J. Nuclear Medicine*, 2009 (In Press)

# Choline Uptake at 24-hr & 48-hr

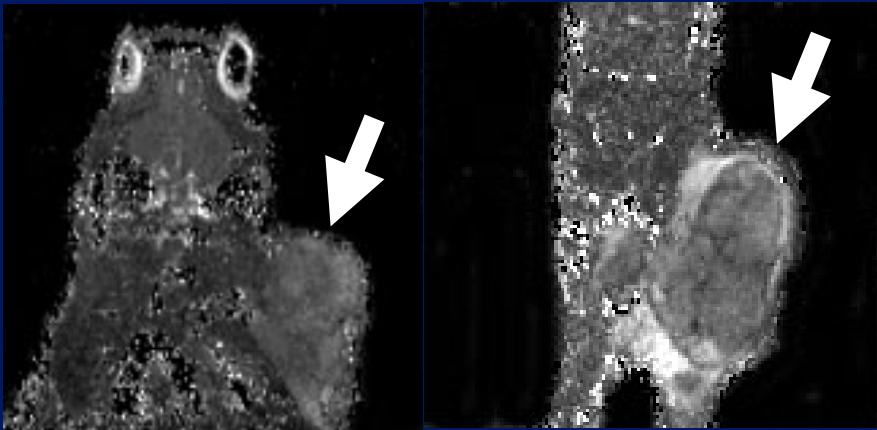


# High-resolution MRI for PDT

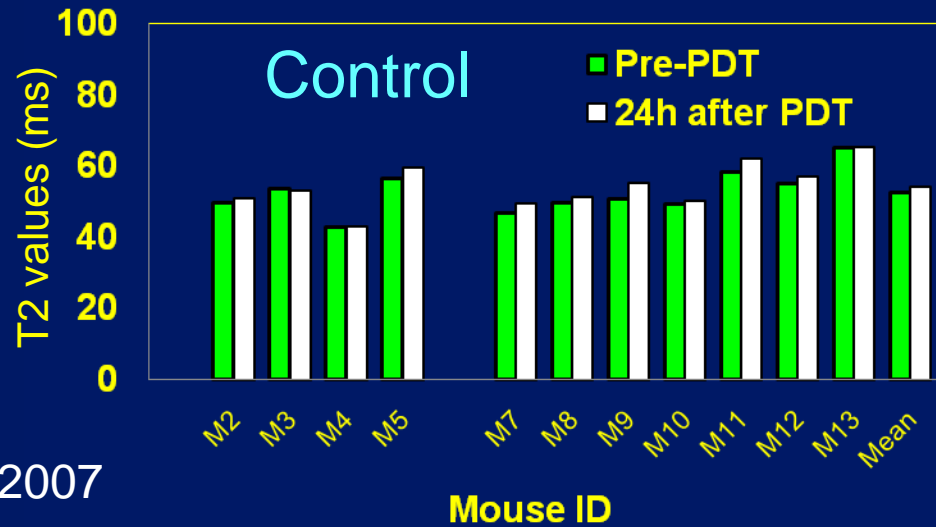
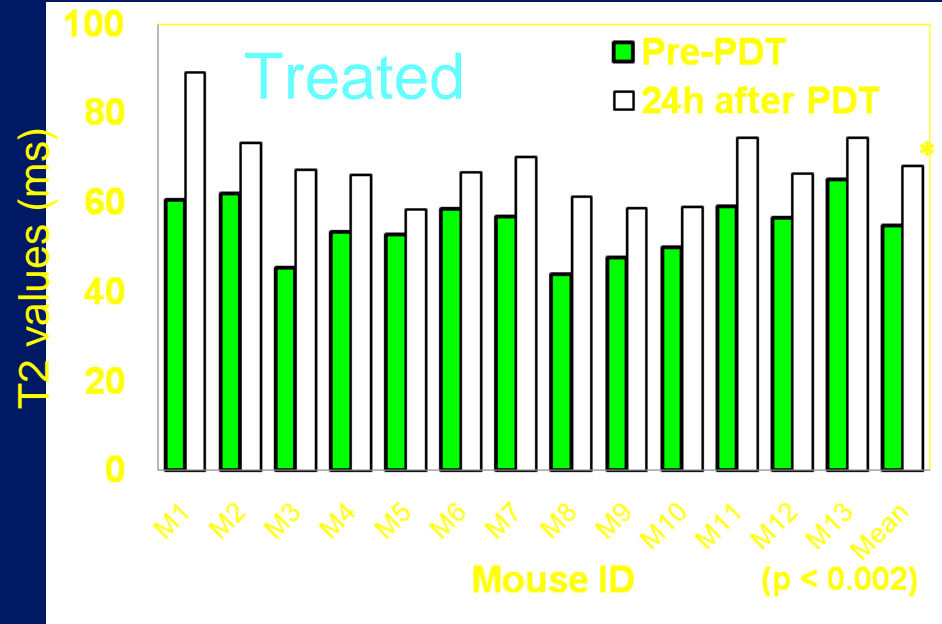


Pre

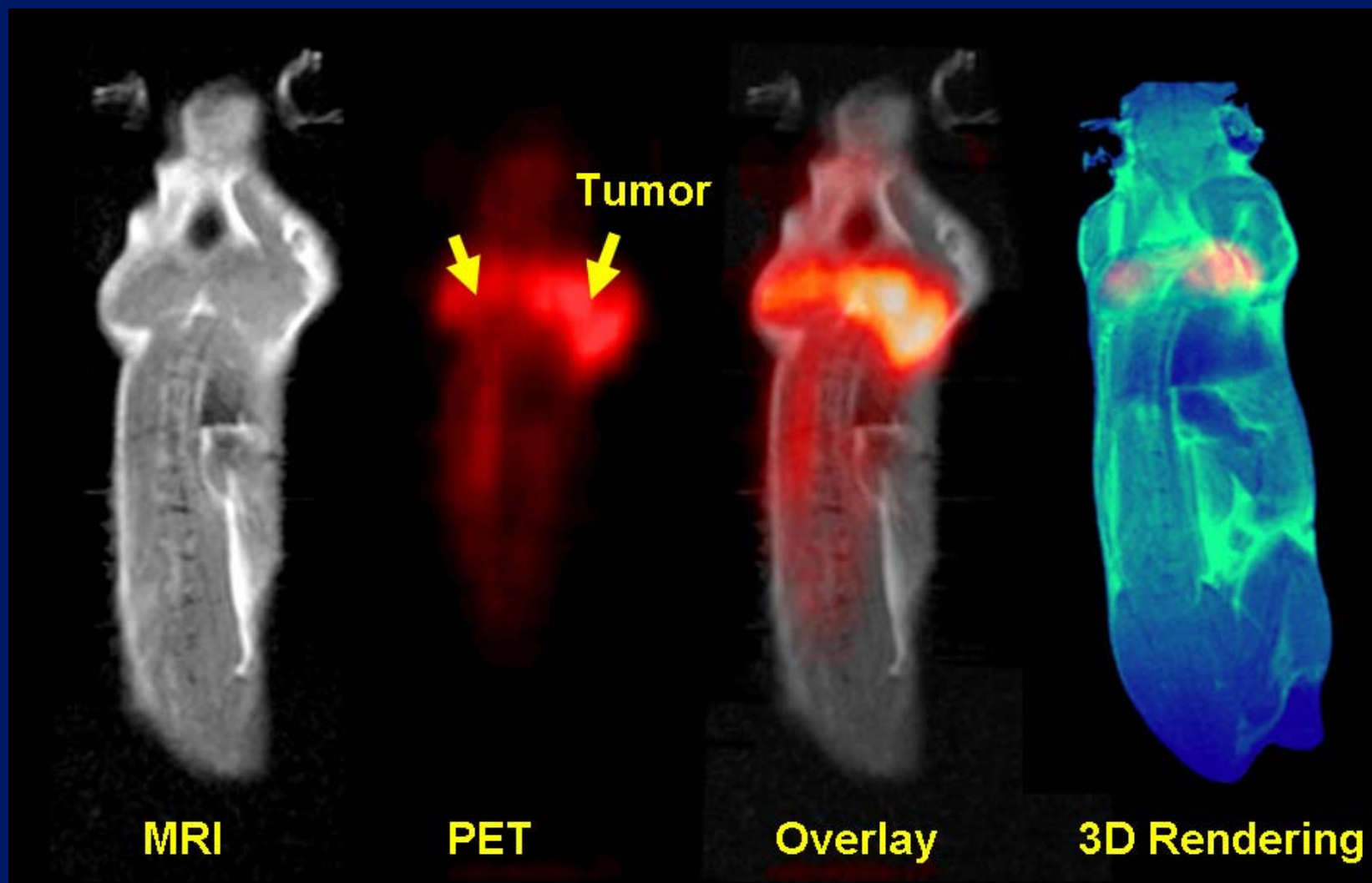
24 h



T2 Map

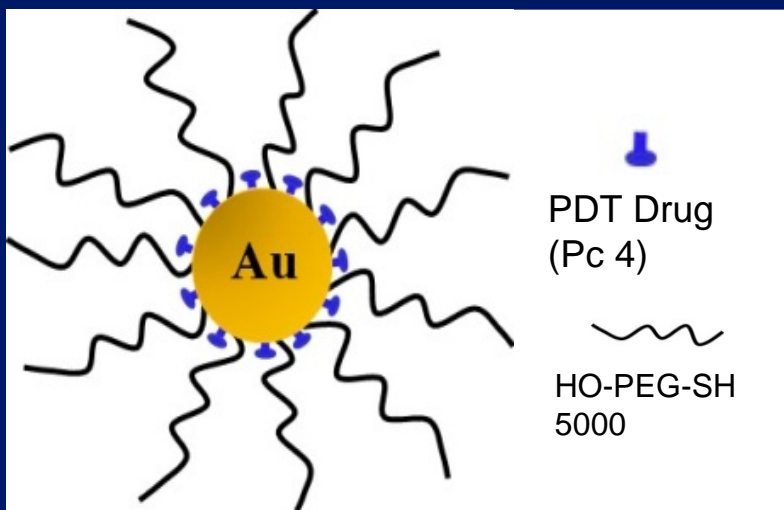


# Combination of PET & MRI

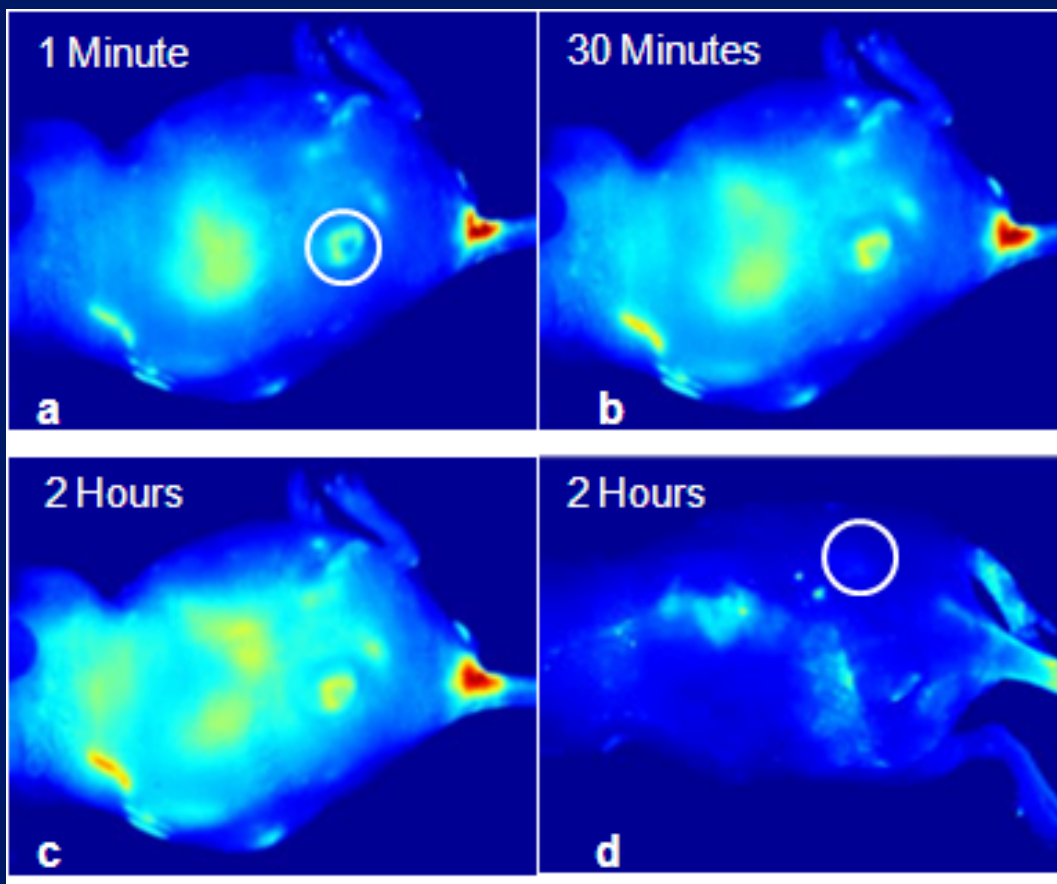


Fei, et al, *Medical Physics*, 33(3):753-60 2006

# Nanoparticle-conjugated Drug



Nanoparticle-Pc 4



*In Vivo* fluorescence image

Cheng et al, *J. Am. Chemical Society*. 130(32):10643-7, 2008

# Summary

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- **This study evaluated Pc 4-PDT for treating two human prostate cancers in animal models.**
- **PET imaging can detect the tumor cellular response to the therapy 24 hr after treatment**
- **MR imaging can quantify tumor tissue response (necrotic or residual tumor) within 1 week**
- **Fluorescence imaging can monitor the drug delivery of nanoparticle conjugated agents**

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