



Meeting Charge and Framing

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Renal Imaging Workshop, NIDDK
Natcher Conference Center
Bethesda, MD
July 12 - 13, 2018

Medical imaging

- *A set of techniques that noninvasively produce images of the internal aspect of the body*
- *The technique & process of creating visual representations of the interior of a body for clinical analysis and medical intervention,*
 - *as well as visual representation of the function of some organs or tissues (physiology).*

Utility of Renal Imaging

- Diagnostics
- Decision Support
- Evaluation of
 - Drug development
 - Medical devices
 - Structures and instruments
- Research
- Education
- Development of medical Imaging

Challenges Facing Renal Imaging Research

- Anatomic/Functional complexity of the kidney
- Define structure at an increasingly smaller scale
 - Anatomy
 - Remodeling
- Define and model a wide range of functions
 - Physiology
 - Pathophysiology
- Correlate structure/function
- Define normal/abnormal
- Image analysis algorithms for heterogeneous data
- Contrast media
- Match the goals with the tool

Risk of Contrast Media

- Effects on renal function during imaging?
- Concentrating in the kidney
- Linked to impaired renal function
 - Iodinated x-ray contrast agents
 - Nephrotoxicity
 - Gadolinium
 - Nephrogenic systemic fibrosis

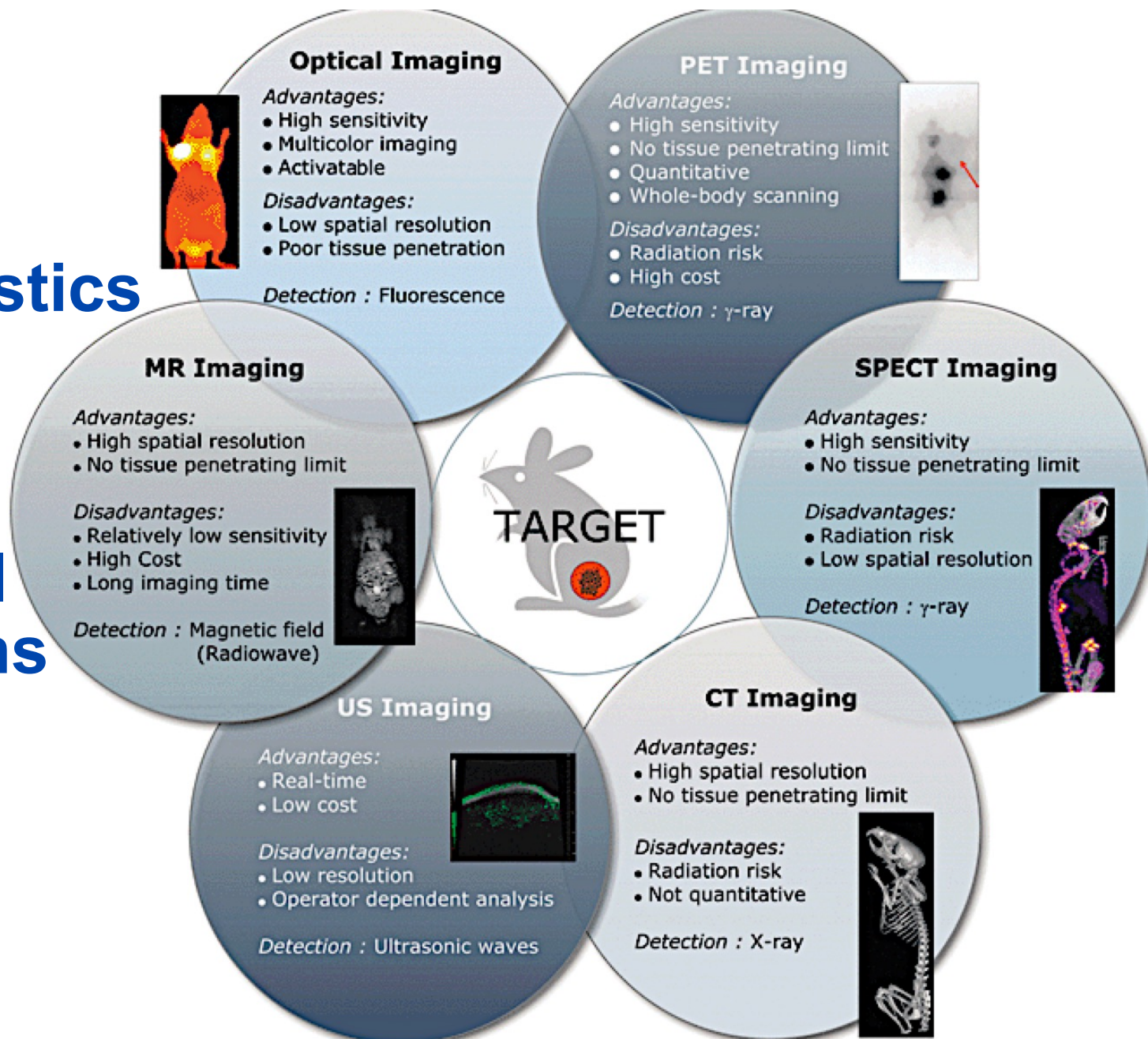
Challenges Facing Renal Imaging Research

- Match the goal with the tool

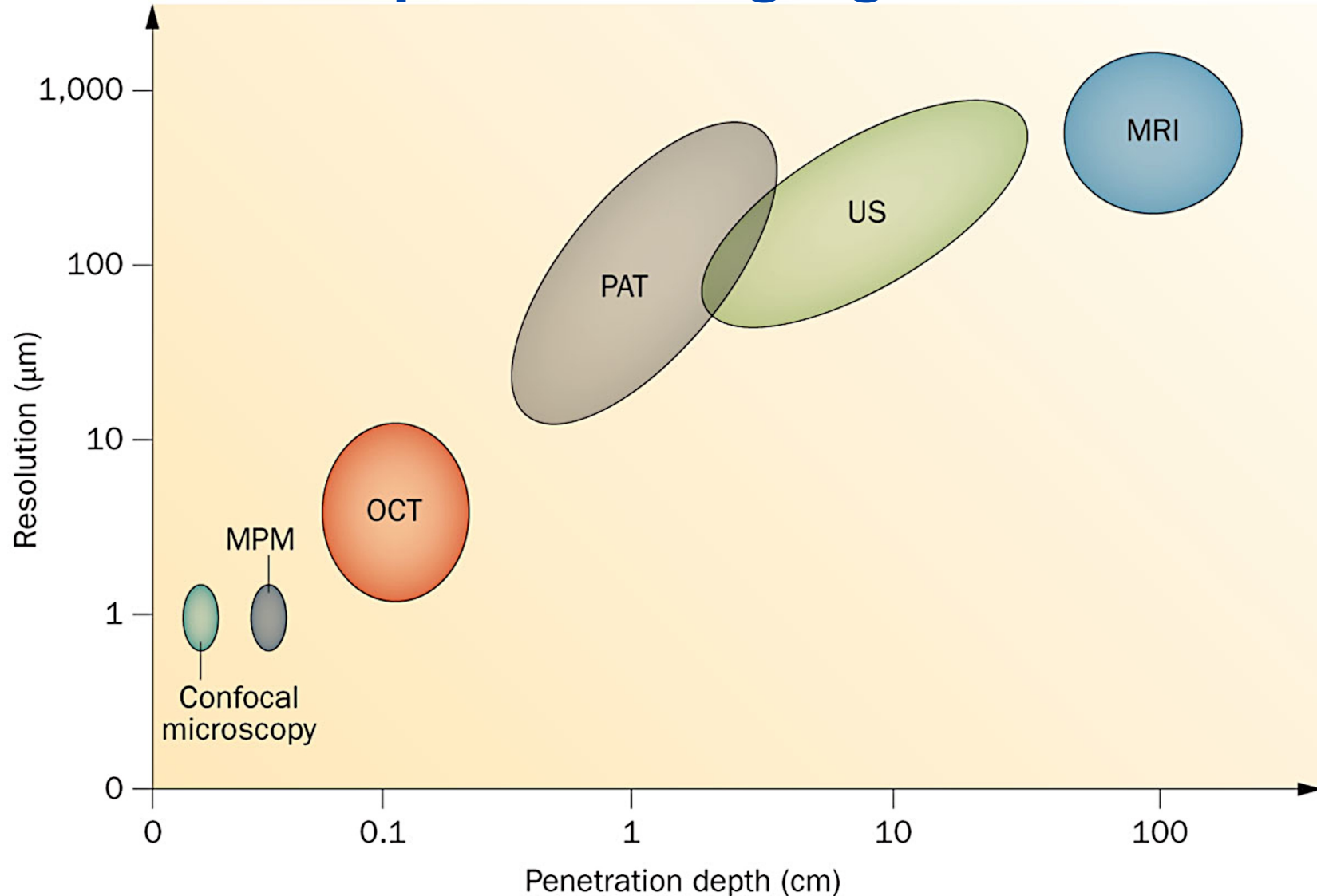
**Which Bioimaging
Modality is Right for
*You?***



Characteristics of imaging modalities used for biomedical applications



Comparative trade-off between resolution and penetration depth for imaging modalities



Funding!



Kidney Bioengineering, Biotechnology, & Imaging at the NIDDK

- The Kidney Bioengineering, Biotechnology, and Imaging program supports research and development of new technologies for the diagnosis, monitoring, or treatment of renal disease
- Research includes new methods to noninvasively measure glomerular filtration rate, renal plasma flow, and urinary protein excretion
- The program advances studies on renal biopsy, tissue assessment, and intravital real-time imaging of renal function
- The portfolio also includes work under the Small Business Program, which encourages collaboration between academic investigators and small businesses

Funding! \$\$\$

In response to the increase of \$1.2 billion, or 3.2%, in the FY 2019 Labor-HHS spending bill and the proposed 1.2% increase for the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK), the American Society of Nephrology (ASN) stated that it greatly appreciates this support and looks forward to continuing to work with lawmakers in both chambers toward a bipartisan bill that avoids problematic policy riders and provides a robust increase over inflation for NIH and NIDDK in FY 2019.

Trends in Medical Imaging

Unmet Needs

- A massive increase in volume and complexity of imaging data
 - Data archiving solutions; software
- The promise of eHealth
 - Sharing images within the system
- Demand to reduce costs and increase efficiency
 - Global market for medical imaging devices grows
 - Avoiding repetition, unlocking silos
- The rise of patient empowerment
 - Direct access to their radiology images and reports

Trends in Kidney Imaging: Where are we going from here?

- Zooming-in on the kidney structure and function
 - *Single-nephron*
 - *Cells*
 - *Molecules*
- Leveraging knowledge to study mechanisms in vivo
 - Tissue properties (e.g., elasticity)
 - Patho-mechanisms (e.g., molecular imaging)
- Teamwork; cross-disciplinary collaboration
- Development and validation of imaging biomarkers
- Clinical translation

Challenges in Renal Imaging Research: Clinical Translation

- Accuracy, reproducibility, sensitivity, specificity, safety, speed
- Development of non-contrast or safe-contrast techniques
- Efficient construction of detailed personalized anatomy and organ models
- Increasing efficiency to tackle growing volume of images
- Breaking down barriers caused by multiple IT systems
- Meeting rising quality expectations (patients, regulators)
- Championing acceptance of imaging biomarkers (PKD)
- Validation of imaging biomarkers to support diagnostics, prognostics, evaluation of treatment, decision making

CONCLUSIONS

- Exciting times for renal imaging research!
- Need continued teamwork; idea-sharing with other fields
- Collaborations among academia, industry, funding agencies
- Facilitate and expedite bench-to-bedside translation
- Stimulate innovation and breakthroughs

Renal Imaging Workshop

- The objective of this workshop is to chart a path forward to functional renal imaging.
- We plan to cover the state of the art in renal imaging and learn from other fields.
- Toward future clinical use, we will also hear about FDA qualification of imaging biomarkers and other translational challenges.

RENAL IMAGING WORKSHOP

July 12-13, 2018

Natcher Conference Center
Balcony A & B
45 Center Drive, Building 45
Bethesda, MD

NIH National Institute of Diabetes and Digestive and Kidney Diseases

MAYO CLINIC