Frederick National Laboratory for Cancer Research

Visiting Scholar Opportunity

Small Animal Imaging Program/ Laboratory Animal Science Program

Cancer Challenge

Basic discovery research has revealed that cancer is a complex disease involving a myriad of molecular pathways and cellular processes. These alterations could be exploited for therapeutic or prevention intervention and therefore, it is important to invoke technologies that can detect molecular changes. A core mission of the Frederick National Laboratory for Cancer Research (FNLCR) is the translation of "molecularly targeted therapies".

Imaging studies have provided pre- and post-treatment data on anatomical tumor growth. With an ever increasing numbers of molecules to investigate the tumor micro-environment, there is an important opportunity to integrate and exploit imaging techniques in the assessment of this process in the pre-clinical setting. Furthermore, imaging is a unique methodology that provides the capability to extract spatially and temporally defined data in context. This capability is essential for the understanding of complex systems, where few are more complex than cancer biology. Imaging and preclinical animal models, incorporating xenograft, patient derived xenograft, and genetically engineered mouse models have become integral to a research portfolio to provide an understanding of tumor biology and development of therapeutic interventions.

Visiting Scholar Opportunities

The small animal *in vivo* imaging community has achieved considerable progress in designing, developing, and implementing state-of-the-art *in vivo* imaging and analysis techniques for preclinical research. Challenges, however, remain to (i) improve multi-modality image fusion such as ultrasound-nuclear-MRI, (ii) improve rapid quantitative visualization of large pre-clinical datasets, (iii) improve and standardize quantitative assessment of therapeutic response, (iv) advance and standardize techniques for rapid *in vivo* cancer screening, (v) standardize *in vivo* and *ex vivo* correlation, and (vi) develop and standardize animal handling and *in vivo* imaging techniques for assessment of therapeutic response.

The Visiting Scholars Program invites early and mid-career investigators to submit an Expression of Interest (http://frederick.cancer.gov/VisitingScholarProgram.aspx) describing how the candidate will contribute to one of the following priority areas currently being addressed by Frederick National Laboratory for Cancer Research Small Animal Imaging Program (SAIP):

1. Improve image visualization of large pre-clinical datasets for rapid assessment.
2. Advance and standardize techniques for rapid *in vivo* imaging for pre-treatment screening.
3. Develop and standardize *ex vivo* and *in vivo* correlation.
4. Develop and standardize animal handling techniques for *in vivo* imaging for the assessment of therapeutic response.

A major challenge in the clinical and pre-clinical community is the quantitative assessment of a response to therapy. These efforts for pre-clinical must include the additional development and standardization of animal handling and monitoring techniques, the use of multiple imaging modalities for correlating anatomical and molecular imaging with correlation to standard histochemistry through the correlation of *ex vivo* and *in vivo* datasets.

Xenograft animal models have been the standard for pre-clinical assessment of response to therapy and evaluation for enrollment of an animal into a treatment cohort is a simple caliper measurement. With the advent of genetically engineered mouse models, the evaluation for enrollment is dependent on the ability to

palpate and most likely also requires multiple rapid prescreen imaging sessions. Techniques such as ultrasound elastography can be developed for high throughput image acquisition and simple analysis to reduce prescreening imaging costs.

To obtain a statistically significant quantitative assessment of a response to therapy in a pre-clinical efficacy study usually includes several cohorts each containing 5-20 mice. Evaluating this large data set is time consuming and costly. Methods should be developed and standardized for rapid, automated, quantitative analysis and visualization of large pre-clinical datasets.

The Small Animal Imaging Program (SAIP), a program within the Laboratory Animal Sciences Program Directorate (LASP), Frederick National Laboratory for Cancer Research, SAIC-Frederick, provides in vivo imaging techniques to assist researchers to investigate intact complex biological systems; characterize mouse models and molecular imaging probes for early detection and therapy, imaging disease-related biomarkers and pathways, monitor tumors in vivo, and serial imaging for pre-clinical drug efficacy studies. The SAIP imaging facility (> 7,500 square feet) incorporates several pre-clinical non-invasive *in vivo* modalities and capabilities (3T MRI utilizing specially designed rodent coils, µPET/CT, µSPECT/CT, 40 MHz Ultrasound and Photoacoustics, Bioluminescence, and 2D and 3D Fluorescence scanners), high-end image processing work-stations, several animal holding rooms, laboratories for surgery and cell work, access to expert veterinary care (Laboratory Animal Medicine/LASP), correlation to *ex vivo* pathological results (PHL/LASP), image visualization development (IVG/ABCC), and animal models (Laboratory Animal Sciences Program and the Center for Advanced Preclinical Research). Also located within SAIP, is a research radio-pharmacy (operated by Applied and Developmental Research Directorate (ADRD/SAIC-F)) capable of producing novel nuclear and optical probes to complement targeted ultrasound and optical probes that are available for advanced molecular imaging.

For more information, please contact:

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To learn more about these programs, visit:

The Small Animal Imaging Program:
http://frederick.cancer.gov/Science/LASP/Saip.aspx

The Visiting Scholars Program:
http://frederick.cancer.gov/Careers/VisitingScholar/Default.aspx

References

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