VISUALIZING WAYS TO MAKE LIFE BETTER

Researchers at Indiana University School of Medicine use a variety of imaging sources in their work with experimental animal models for pharmaceutical and medical research. The Analyze platform serves as the central image repository and image analysis toolset for 3-D visualization, segmentation and registration.

"Advanced imaging techniques in our lab allow us to observe crucial changes at the organ, tissue, cell and molecular level and these capabilities are essential for our researchers and study sponsors. We wouldn't be able to handle the volume of imaging or the variety of imaging without Analyze."

PAUL TERRITO, PHD
Indiana University
School of Medicine

It's no surprise that Paul Territo has dedicated much of his personal and professional life to physiology. Since childhood, Territo has been fascinated with biology, and while other boys might have been drawing trucks and trains, Territo was drawing anatomically accurate cardiovascular systems.

"I've always loved biology. Even at an early age, just for fun I would study the heart, lungs, and circulation system," said Territo, Associate Professor of Research and Director of Preclinical Research at Indiana University, School of Medicine (IUSM.) "As a kid, I could draw a four-chambered heart, freehand from memory."

After Territo earned his doctorate in cardio-respiratory physiology, he was awarded a prestigious IRTA fellowship from the National Heart, Lung, and Blood Institute of the National Institutes of Health, where he studied the biophysics of cardiac metabolic regulation and control until 2001.

Once his fellowship was completed, Territo joined pharmaceutical giant Eli Lilly and Company as a research scientist and group leader in its companion animal pharmaceutical division. When new drug molecules were developed, it was Territo's job to test and analyze biomarkers – an indicator of how well a human (or animal) responds to a drug treatment for a disease or condition.

"Our focus was on preclinical trials, just before human trials, testing to see if drugs worked as they were designed to work," said Territo. "The best way to study our animal testing subjects non-invasively was through advanced imaging, using PET/CT, SPECT/CT, and MRI techniques."

Eventually, Territo joined IUSM to continue his intense focus on advanced medical imaging systems and it was there that he started to investigate analysis platforms. Territo did exhaustive research on visualization and analysis software tools that were available.

"I tried absolutely every software package for medical imaging that was on the market and walked through a demo and trial of each one," said Territo. "I evaluated each one on ease-of-use, support, and automatic segmentation and rendering tools. Analyze was the clear winner in the areas most important to us."

Refining and Validating Breakthrough Pharma Research

Territo and his colleagues at the preclinical imaging laboratory have tested the efficacy of treatments for the most serious diseases including glioblastoma, hepatocellular carcinoma, diabetes, polycystic kidney disease, atherosclerosis, and schizophrenia to name a few.

"The majority of the research/development we perform focuses on neuroscience, cardiovascular, and oncology applications" said Territo. "Given the importance of the preclinical phase of drug development, it is critical that we validate new tracer systems accurately."

AnalyzeDirect

The preclinical imaging laboratory at IUSM has become recognized as a world leader in tracer development and validation and its application to advanced medical imaging. Territo says that he and his team work better and faster with Analyze.

"The 3-D visualization, segmentation, and registration capabilities in Analyze literally bring the research to life," said Territo. "Multiple frames and images can be put into motion to show the physiology actually working such as hearts beating and lungs expanding."

Territo and his research colleagues perform experiments and image analysis projects for other institutions and private industry from all over North America. Due to the variety of projects, they have loaded thousands of small animal images from multiple sources into the Analyze software. The ability to work with any file type is an important benefit.
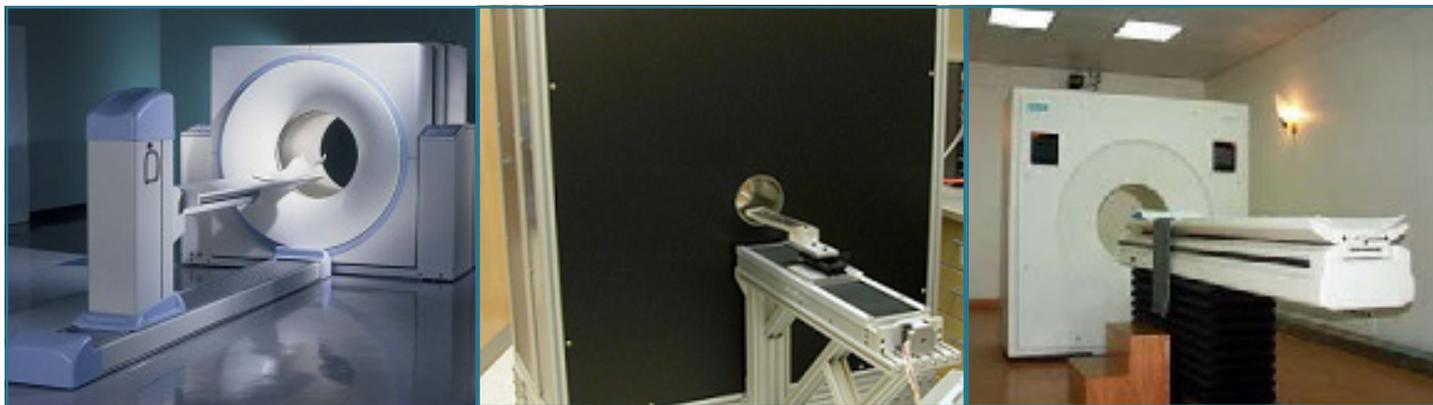
"We don't need to go through lengthy and time-consuming file conversions with Analyze," said Territo. "We can load files from native imaging systems directly into Analyze and start our work immediately."

While Territo's work is complex, his reasons for using Analyze are not.

"Not only is it the best software available in my opinion, but the commitment to support is far superior to other providers in the market," Territo said. "Analyze has a very responsive development and support team and they work with us when we have questions. They also release new versions on a regular basis."

Territo and his team are constantly exploring new ways to stay on the forefront of preclinical imaging of living systems for pharmaceutical and medical research. Top technologies and the latest tools, allow the lab to maintain a leading reputation in the field.

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The Challenging World of Small Animal Imaging

Small animal imaging presents a number of challenges for scientists, not the least of which is the much smaller anatomical structure, which requires higher spatial resolution and an associated smaller voxel size. Reduced physiological effects also require greater accuracy.

Whereas humans can be directed to hold their breath for the duration of a short scan, this is not an option with animals. Anesthesia and specially designed physiological monitoring and gating systems are also necessary to measure faster heart rates (400-600 BPM) and respiration rates in small animals.

Several imaging modalities have been developed with these needs in mind. Analyze supports this specialized research by providing users with a robust tool kit for preclinical imaging that can handle data from the following small animal scanner types:

- PET/CT
- CT
- MRI
- μCT
- μPET
- SPECT

Analyze can handle native file formats from many sources including PET/CT, CT, MRI, μCT, and μPET.