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The Small Animal Imaging Component of the CHDD Brain Imaging Core

by Kate Forster

Donna Cross is director of the Small Animal Imaging component of the Brain Imaging Core.

The CHDD Small Animal Imaging lab is one of several components of the larger Brain Imaging Core (BIC), part of CHDD's Eunice Kennedy Shriver Intellectual and Developmental Disabilities Research Center (IDDRC). It serves as a multidisciplinary resource for researchers who are affiliated with the IDDRC and want to use animal brain imaging as a tool for their work in understanding and developing treatments for intellectual and developmental disabilities (IDD). Researchers come from multiple departments and disciplines and have wide areas of interest, including environmental health, genetics, pharmacology, immunology, and neuroscience to name a few. The equipment in the Small Animal Imaging lab supports this research by providing standard (3T) and high energy (7T and 14T) MRI, nuclear imaging by positron emission tomography (PET), single photon emission computed tomography (SPECT), and near infrared (indocyanine green or ICG) optical imaging. Many of the past, ongoing, and planned studies seek to identify and develop new biological indicators for IDD and often are in collaboration with the new Clinical Translational Core, addressing questions that can eventually lead to better diagnosis and treatment for IDD.

Research in a preclinical setting

"One valuable function of the lab is that it allows researchers to do experiments in a preclinical setting which then can translate into clinical trials for treating IDD," said Kenneth Maravilla, M.D., professor of radiology and neurological surgery and director of the BIC. For example, Jeffrey Chamberlain, Ph.D., professor of neurology, biochemistry, and medicine, is using the MRI equipment to evaluate muscle architecture and metabolism as he works to perfect gene replacement therapy in mice with muscular dystrophy (*CHDD Outlook* 2015, Issue #2). His goal is to find an effective treatment and potentially a cure for Duchenne muscular dystrophy, the most common form of muscular dystrophy, a degenerative and debilitating developmental disability which weakens a person's muscles over time. A clinical trial is currently in progress. Another example of research supported by the Small Animal Imaging lab that is also finding success in clinical trials involves a study on finding the causes and therapies for infant brain injury resulting from inadequate oxygen supply, which can occur in premature births and may result in a wide range of neurodevelopmental disabilities. Sandra Juul, M.D., Ph.D., professor of pediatrics, is using the lab to study these types of injuries in animal models and to identify ways to treat them in

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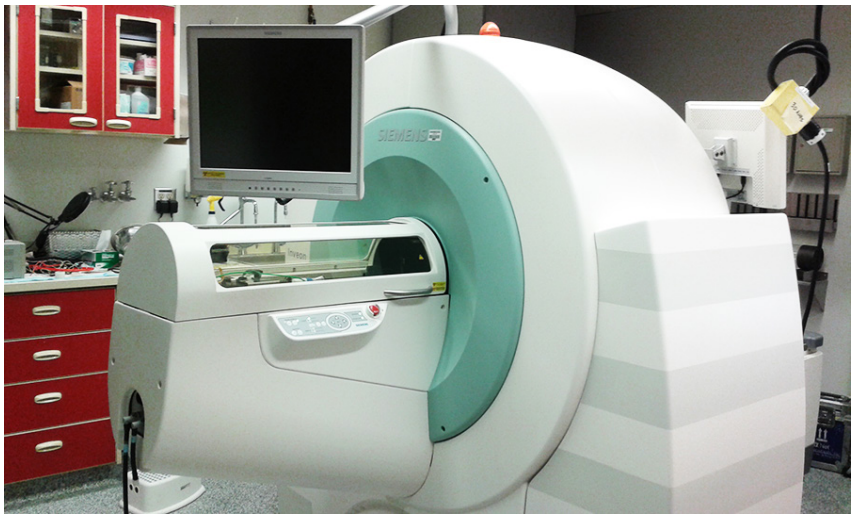
>
> *Kenneth Maravilla*

order to prevent or minimize their effects. This study is showing a lot of promise in clinical trials and could have a significant impact on how infants with brain injury are cared for and how well they recover.

Support for research

Donna Cross, Ph.D., associate professor of radiology, directs the Small Animal Imaging lab and provides expert technical and scientific guidance in many aspects of brain imaging study. As director, Cross and her associate, research scientist Gregory Garwin, M.S., collaborate with researchers who would like to use the facilities as part of their studies. “A researcher meets with us under a number of different circumstances, for example, when they haven’t used imaging before, or even when they have but are looking to use a different sort of imaging,” said Cross. “We also help researchers when they have a new project and they’re not sure which imaging tools would best support their scientific goals. We talk to them about their options, run budgets for them, and assist them in getting their research started.” Cross and Garwin also help researchers develop IACUC protocols—which address the appropriate care, use, and treatment of animals in research, and they provide assistance with grant writing by helping define methodology contributing to specific aims. When a project is ready to start, Cross and Garwin train the researchers on how to use the imaging equipment, which usually takes 10 sessions. Once the research is underway, Cross and Garwin train the researchers in data analysis. Every hour of scanner time requires approximately 10 hours of data analysis. “It’s quite specialized,” said Cross. “We don’t always know what kind of data analysis a particular project will require until we actually acquire the images and start looking at them. Sometimes it’s established, sometimes it’s not. So that part can be quite challenging, and this is a significant part of how we assist the researcher.” Cross does much of the data analysis herself.



The new Inveon MicroPET/CT for small animal PET imaging provides information on anatomical structure.

“We wouldn’t make the medical advances that we do without these resources,” said Maravilla. ”This is our tool for providing opportunity for researchers to test their theories and hypotheses, and when successful, to take them to the next stage, and hopefully into the clinic, as has happened in a number of different cases. We are focused on supporting researchers and improving opportunities for developing new ideas and techniques and bringing them to fruition so that children and adults with disabilities can benefit from them.”

CHDD is an interdisciplinary center dedicated to the prevention and amelioration of developmental disabilities through research, training, clinical service, and community outreach. CHDD includes the University Center of Excellence in Developmental Disabilities and the Eunice Kennedy Shriver Intellectual and Developmental Disabilities Research Center.

CHDD Outlook

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