

Le Bonheur first to install new MEG technology *TRIUX™ neo to allow testing in broader set of pediatric patients*

This fall, Le Bonheur Children's Neuroscience Institute will be the first in the world to install TRIUX™ neo, the newest generation in magnetoencephalography (MEG) technology. Le Bonheur is one of the few pediatric hospitals in the country with this level of brain mapping technology and the clinical expertise to improve outcomes for complex epilepsy patients.

Le Bonheur began offering the non-invasive MEG testing more than 10 years ago. Since then, the hospital has assembled a comprehensive team of neuroscientists who consult with pediatric neurologists and neurosurgeons on treatment plans for complex brain tumors and epilepsy cases. The team includes PhDs with extensive expertise in non-invasive brain imaging and stimulation



Magnetoencephalography (MEG) Lab Director Roozbeh Razaie, PhD, says updated hardware and software capabilities of the new TRIUX™ neo that will be installed this fall will broaden the number of patients who can use MEG technology – including those with implanted medical devices.

methods. The hospital performs about 130 MEG studies annually — around 70 percent for clinical care and 30 percent for research studies.

The team uses functional brain imaging to record sensory, motor and cognitive functions in a patient's brain. By identifying areas of abnormal activity and those responsible for specific normal functions, the team provides information, which when combined with the structural images from MRI and CT, can help guide treatment plans.

MEG is a key part of the non-invasive brain mapping capabilities at Le Bonheur. The technology has improved outcomes for children with epilepsy.

"We have developed means to test where language cortex is in children down to 1 year

Truix™ Neo

- Newest generation MEG platform by MEGIN-York Instruments
- First worldwide installation for clinical use
- Will allow for MEG studies for children with implanted devices
- Operational late fall 2018



Continued on page 2

Finding Answers

New epilepsy gene screening protocol to help Le Bonheur neurologists target treatments

Stanislas Ibled was just 10 months old when he experienced the first of what would become a series of mild seizures. Despite treatment at Le Bonheur Children's, his seizures occurred more frequently and lasted longer.

After trying a variety of medications, Stan's Pediatric Neurologist, Sarah Weatherspoon, MD, ordered a multiple-day study in Le Bonheur's Epilepsy Monitoring Unit. After stopping Stan's current seizure medication, a long seizure hit him, requiring him to be moved to the intensive care unit and intubated.

Weatherspoon's instinct said something else was going on – even after an MRI, blood and urine sample and spinal tap came back normal.

That's when Weatherspoon ordered an epilepsy gene panel – a test for more than 500 genes associated with seizures in young children. It's a test that Le Bonheur will soon offer to all children younger than 3 with a new epilepsy diagnosis. The full genome test will help neuroscientists cater treatment therapies for each



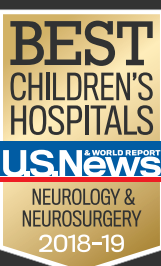
Stanislas Ibled

Continued on page 2

Referrals: 866-870-5570

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neuroscience

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of age. We can localize seizure foci and can map sensory and motor areas with MEG," said Frederick Boop, MD, chairman of the Department of Neurosurgery for the University of Tennessee Health Science Center and co-director of the Neuroscience Institute. "This has allowed us to perform surgery in children more safely and with fewer complications. It has also allowed us to extend our surgical capabilities in children with epilepsy to those who might not have been recognized as surgical candidates in the past."

Magnetoencephalography (MEG) records neuronal responses based on the magnetic fields that are produced when groups of brain cells become active. Clinical neuroscientists interpret this information to localize the origin of magnetic fields and identify areas of the brain that are active during movement, sensation and the production and perception of speech.

The TRIUX™ neo is the newest generation MEG platform by MEGIN-York Instruments and will be operational by the end of 2018. The new technology has advancements that will be beneficial for patients who have implanted devices like VNS.

"The new system will feature state-of-the-art hardware and software capabilities especially designed for the challenging populations we encounter, including previous contraindications such as implanted medical devices that precluded these patients from undergoing MEG testing," said Roozbeh Rezaie, PhD, magnetoencephalography (MEG) lab director.

Pediatric Neurologist James Wheless, MD, says the new MEG technology will allow Le Bonheur to give parents key information for risk-versus-benefit discussions before surgery – especially those with challenging neurological disorders.

"Many children with difficult-to-control seizures have other co-morbidities and, with these, other implanted devices. These can vary from baclofen pumps to VNS therapy. In the past these children could not have a MEG study, now they will be able to, which will expand the number of children who can benefit from this diagnostic test," said Wheless, MD, chief of pediatric neurology for UTHSC, director of the epilepsy program and co-director of the Neuroscience Institute.

In addition to MEG, Le Bonheur's Neuroscience Institute offers all of the known diagnostic tools to identify and treat neurological disorders. The epilepsy center is a National Association of Epilepsy Center Level IV accredited center, the highest level for pediatric patients. Transcranial Magnetic Stimulation (TMS) is a non-invasive method for detailed mapping of the motor and speech areas close to brain lesions (tumors, AVMs, etc.) that could be surgically removed.

The Clinical Neurosciences team is also leading the way in developing innovative treatments. The team has published case studies highlighting non-invasive functional brain mapping as an alternative to the invasive cortical stimulation mapping. The team documented success using transcranial magnetic stimulation (TMS) in children as young as 11 months old. Their research has been published in *Neurology*, *Journal of Clinical Neurophysiology* and *Open Access Journal of Neurology & Neurosurgery*.

Expert Imaging



Roozbeh Rezaie, PhD magnetoencephalography (MEG) lab director, performs and interprets clinical MEG studies, is involved in translational research activities



Shalini Narayana, MBBS, PhD transcranial magnetic stimulation (TMS) lab director, performs and interprets TMS studies, oversees clinical and research activities



Abbas Babajani-Feremi, PhD performs and interprets MEG clinical studies; medical image and signal processing; brain connectivity analysis using MEG, EEG, electrocorticography (ECoG) and fMRI



From left, Romain, Hugo, Audrey, and Stanislas "Stan" Ibled found answers for the cause Stan's seizures with an epilepsy gene panel. The panel revealed a gene that causes a specific type of epilepsy known as Pyridoxal 5'-phosphate-dependent (PLP) epilepsy. It is treated with a vitamin cocktail taken four times per day.

child and even allow for novel treatments with a better understanding for each case.

Full genome testing is the Neuroscience Institute's next step in using pharmacogenomics to understand how genetic variation will influence a drug response in patients. Le Bonheur will be able to test all kids with a new epilepsy diagnosis thanks to a grant from the Children's Foundation of Memphis, a private foundation committed to the health and well-being of children in Memphis. The group is the primary grantee for Le Bonheur's Children's Foundation Research Institute.

"If we can screen all children with the early diagnosis of epilepsy, we can better understand the disease for each of those children, and provide personalized, targeted care for each of those families," said James Wheless, MD, co-director of the Neuroscience Institute at Le Bonheur Children's. For Stan, the test discovered a gene that causes a specific kind of epilepsy known as Pyridoxal 5'-phosphate dependent (PLP) epilepsy. This type of epilepsy usually occurs in tiny babies, not toddlers like Stan, Weatherspoon said.

"Oftentimes in neurology, we say 'time is brain.' The quicker you get an answer, the quicker you institute a treatment, the better the outcome will be," Weatherspoon said. "Knowing the answer can change how we treat them, what meds we give them, and can make a difference between a child who lives a really normal life and a child who has a lot of medical problems."

PLP is treated with a vitamin cocktail taken four times per day. Within 48 hours of starting the vitamin combination, Stan was walking and talking again.

"Because of the testing, we knew the vitamin combination was the right thing for him," Weatherspoon said.

Epilepsy Center re-accredited as Level 4 center

Le Bonheur's Comprehensive Epilepsy Program at Le Bonheur Children's Hospital has been accredited by The National Association of Epilepsy Centers as a Level 4 Epilepsy Center for 2018-2019.



Level 4 epilepsy centers have the professional expertise and facilities to provide the highest-level medical and surgical evaluation and treatment for patients with complex epilepsy. Le Bonheur's information and 2018-2019 designation is posted on the NAEC website at www.naec-epilepsy.org.

The NAEC is a non-profit 501c6 trade association with a membership of more than 200 specialized epilepsy centers in the United States. The primary objectives of NAEC are to connect people with epilepsy to specialized epilepsy care and to support epileptologists and administrators in the operation of their epilepsy centers.

IN BRIEF

New leadership for neuropsychology, neuroscience research

Christen Holder, PhD, was recently named clinical director of Neuropsychology in Le Bonheur's Neuroscience Institute. Holder joined Le Bonheur in 2014 and has worked as a pediatric neuropsychologist within the Institute.

She specializes in high-risk newborns and neurodevelopment in children with pediatric epilepsy and hypoplastic left heart syndrome.

Tracee Ridley-Pryor, DNP, PMHNP-BC-CRC, is now clinical director of Neuroscience Research at Le Bonheur. She previously served as neuroscience research coordinator and as interim director of the Pediatric Clinical Research Unit.



Christen Holder, PhD



Tracee Ridley-Pryor, DNP, PMHNP-BC-CRC

Neuroscience Institute earns eighth-straight U.S. News honor



Le Bonheur's Neuroscience Institute has earned its eighth-consecutive "Best Children's Hospital" honor by *U.S. News & World Report* for top Neurology and Neurosurgery. The Neuroscience Institute is one of eight Le Bonheur specialties honored by *U.S. News'* 2018-2019 listing.

"The *U.S. News* badge tells parents that they can count on us because we're recognized as

providing expertise and excellence in all we do," said Le Bonheur President Meri Armour, MSN, MBA.

FedExFamilyHouse expands to triple in size

Le Bonheur's FedExFamilyHouse – a home away from home for out-of-town families – will triple in size when its expansion opens in December 2018. The house is undergoing a four-story addition connected to the



current building that will add 21 new suites and 20 new hotel-style rooms for short visits. Out-of-town families to Le Bonheur's Neuroscience Institute often stay at the FedExFamilyHouse when needed.

Save the Date

Pediatric Neurology Symposium

April 26-27

Save the Date for Le Bonheur's 13th Annual Pediatric Neurology Symposium on April 26-27, 2019, at the Guesthouse at Graceland in Memphis, Tenn. The symposium, directed by James Wheless, MD, is designed to encompass state-of-the-art practices and trends in treating pediatric neurology patients. Registration will be available in early 2019 at www.methodistmd.org/cme or by calling 901-516-8933.



Above, Symposium Director James Wheless, MD, honors Robert Clancy, MD, with the 2018 Kayden R. Vinson Distinguished Scholar Award at the 2018 Pediatric Neurology Symposium. Clancy delivered the keynote lecture on "Neonatal Seizures: What's Hot and What's Not." Clancy is professor of Neurology and Pediatrics University of Pennsylvania Perelman School of Medicine Children's Hospital of Philadelphia.

Le Bonheur
Children's Hospital

Brain Waves is a quarterly publication of the Neuroscience Institute at Le Bonheur Children's Hospital. The institute is a nationally recognized center for evaluation and treatment of nervous system disorders in children and adolescents, ranging from birth defects and learning and behavioral disorders to brain tumors, epilepsy and traumatic injuries.

Institute Co-Directors

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Sarah Weatherspoon, MD

Scan to learn
more about our
Neuroscience Institute.



Case study: Low-grade brainstem glioma

Technology improves ability to remove brainstem tumors, preserve brain function

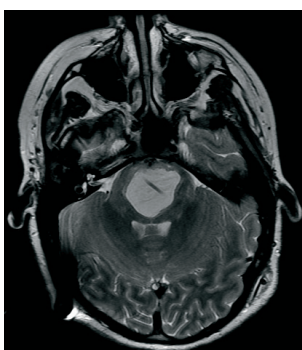
Seventeen-year-old Courtney Coit of Riverton, Ill., was at school when she suddenly felt disoriented and dizzy. Her dad, Daniel, left work immediately to pick her up. He took her to a local hospital, where an MRI revealed a tumor nestled in her brainstem.

As the Coit family waited for results from the biopsy, fluid began to build in Courtney's brain, affecting her ability to eat and speak. At one point, she even had a seizure.

"They told us it was non-malignant, but because it was in her brainstem, it was serious. The brainstem controls everything. Only Dr. (Frederick) Boop in Memphis could remove her tumor, doctors told us," said Daniel.



Patient: Courtney Coit, 17, of Riverton Ill.
Diagnosis: Low-grade brainstem glioma with underlying diagnosis of Neurofibromatosis type 1
Treatment: Surgical resection



The Coits were referred to Le Bonheur Children's Hospital, where Pediatric Neurosurgeon Boop and his colleagues have developed a precise surgical approach to treating low-grade brainstem gliomas – a type of tumor notoriously difficult to remove.

"Many of these kids are not offered a resection at other institutions and either get put on chemo or radiation or undergo multiple unnecessary surgeries," said Paul Klimo, MD, chief of Pediatric Neurosurgery at Le Bonheur.

A combination of intraoperative monitoring with a 3-Tesla iMRI and tractography, which uses MR imaging to construct a three-dimensional map of the brain's white matter, allows Le Bonheur neurosurgeons to target the tumor's precise location in the brain and map out a surgical resection that preserves vital brain function.



Advanced technology like 3-Tesla iMRI and tractography have helped Le Bonheur neurosurgeons like Department of Neurosurgery Chairman Frederick Boop, MD, (above) develop precise surgical approaches to treating low-grade brainstem gliomas.

Courtney underwent surgery on June 1, and Boop, co-director of Le Bonheur's Neuroscience Institute and chairman of the Department of Neurosurgery, was able to remove all of her tumor. She spent one week recovering at Le Bonheur before she was able to return home.

"She has partial paralysis on the right side of her face, and her vision is a little blurry, but with time and therapy, she should recover," said Daniel. "Dr. Boop is an answered prayer. I'm so thankful there was someone who could do this operation."