

Public release date: 1-Nov-2010



Contact: Jane Kollmer

[jkollmer@snm.org](mailto:jkollmer@snm.org)

703-326-1184

[Society of Nuclear Medicine](#)

# What happens after traumatic brain injury occurs?

## Molecular imaging technique pinpoints critical changes that take place in the injured brain

Reston, Va.— Results from a study published in the November issue of *The Journal of Nuclear Medicine* (JNM) show that powerful imaging techniques—positron emission tomography (PET) fused with magnetic resonance imaging (MRI)—are helping researchers better understand the long-term functional and structural changes that take place after traumatic brain injury (TBI).

"The results provide new insights into the progressive nature of the brain changes occurring following TBI, demonstrating that changes in brain structure and function after TBI are dynamic and continue to progress and evolve for months," said Viviane Bouilleret, MD, PHD, Univ Paris-Sud, one of the authors of the study, "Progressive Metabolic and Structural Cerebral Perturbations After Traumatic Brain Injury: An In Vivo Imaging Study in the Rat."

The paper reports the first study to use repeated PET and MRI of live animals to characterize the long-term progressive functional and structural brain changes that occur following experimental TBI. The model used is the lateral fluid percussion injury model in rats, the most widely utilized and validated animal model in basic TBI research. The images were assessed using a variety of sophisticated, state-of-the-art image analysis approaches.

Widespread decreases in brain functioning were seen in specific brain regions, many of which are remote from the site of direct trauma and unaccompanied by signs of injury on the MRI. The hippocampus, a brain structure critical to memory and emotion, is the key area of these changes. This may have implications for the pathophysiology of some of the long-term neurological and psychiatric morbidity, seen following TBI, even when abnormalities are not obvious on structural MRI. The severity of the

neurological deficits and changes on MRI soon after the injury is predictive of severity of long-term neurodegenerative changes.

Traumatic brain injury is a leading cause of death and disability in children and young adults around the world. Long-term disabilities following TBI include: cognitive disabilities such as disorders in attention, memory, learning and executive functioning; psychiatric and behavioral problems including depression, anxiety, aggression, agitation and social inappropriateness; and epilepsy. Currently there are no effective interventions to reduce the incidence or severity of these problems.

The findings of this study indicate that secondary structural and functional changes in the brain continue to occur for many months post-TBI, which has implications for understanding the mechanisms underlying the long-term neurological and psychiatric consequences. Importantly, these findings indicate that there is a time window during which intervention could modulate these processes and mitigate against these disabling consequences of TBI.

This study has also provided a practical paradigm for testing the biological effectiveness of potential therapies prior to embarking on expensive and lengthy clinical trials. "The approach would also be applicable to the study of other neurological diseases, such as stroke, dementia, multiple sclerosis brain infections and epilepsy, which are associated with long-term progressive degenerative changes in the brain," Boullieret said.

###

Authors of the scientific article, "Progressive Metabolic and Structural Cerebral Perturbations After Traumatic Brain Injury: An In Vivo Imaging Study in the Rat," include: Ying R. Liu, Lisa Cardamone, Amelia Koe, Nigel C. Jones, Damian E. Myers, Terence J. O'Brien, and Viviane Boullieret, Department of Medicine (RMH), University of Melbourne, Victoria, Australia; R. Edward Hogan, Department of Neurology, Washington University, St. Louis, Missouri; Marie-Claude Gregoire, Australian Nuclear Science and Technology Organisation, New South Wales, Australia; John P. Williams, Small Animal MRI Facility, Florey Neurosciences Institute, Victoria, Australia; Rod J. Hicks, David Binns, Centre for Molecular Imaging, Peter MacCallum Cancer Centre, Victoria, Australia; and Viviane Boullieret, and Department of Neurophysiology and Epilepsy, APHP, CHU Bicêtre, Paris, France.

Please visit the SNM Newsroom to view the PDF of the study. To schedule an interview with the researchers, please contact Jane Kollmer at (703) 326-1184 or [jkollmer@snm.org](mailto:jkollmer@snm.org) or Rebecca Maxey at (703) 652-6772 or [rmaxey@snm.org](mailto:rmaxey@snm.org). Current and past issues of *The Journal of Nuclear Medicine* can be found online at <http://jnm.snmjournals.org>.

**About SNM—Advancing Molecular Imaging and Therapy**

SNM is an international scientific and medical organization dedicated to raising public awareness about what molecular imaging is and how it can help provide patients with the best health care possible. SNM members specialize in molecular imaging, a vital element of today's medical practice that adds an additional dimension to diagnosis, changing the way common and devastating diseases are understood and treated.

SNM's more than 17,000 members set the standard for molecular imaging and nuclear medicine practice by creating guidelines, sharing information through journals and meetings and leading advocacy on key issues that affect molecular imaging and therapy research and practice. For more information, visit <http://www.snm.org>.

