



## Pre-clinical, Pig Model of Traumatic Brain Injury

**Invention:** University of Georgia investigators have developed a pig model of controlled cortical impact traumatic brain injury (CCI TBI). The pig CCI TBI model has been optimized to generate mild to severe traumatic brain injury with fine control of penetration depth and impact velocity. Magnetic resonance imaging (MRI) demonstrated characteristic brain lesioning, midline shift, loss of white matter integrity and altered cerebral blood flow in the CCI TBI pig model consistent with human patients. Quantitative, computational motor function and behavior tests demonstrate a direct correlation between injury and changes in gait kinetics and kinematics, learning and memory.

### Applications

- Pre-clinical testing of therapeutic drugs and devices
- Biomarker identification for diagnosis, progression and therapeutic efficacy
- Evaluation of non-invasive diagnostic imaging techniques (MRI)
- Identification of mechanisms associated with TBI

### Advantages

- Predictive model of brain injury pathophysiology and recovery
- Similar brain development to humans
- Developed and optimized MRI strategies to longitudinally monitor changes in lesion size, edema, hemorrhage, brain swelling, atrophy, midline shift, white matter integrity, and other clinically relevant metrics utilizing human MRI systems increasing translational value
- Established cognitive testing
- Utilize a gait walk way system similar to those used in human patients
- Injury and recovery biomarker profiling in tissues and blood
- Comprehensive histopathologic and morphometric analyses of brain tissues

**Stage of Development:** Pre-clinical validation. [Journal of Neurotrauma Stroke. 2018 May; 49\(5\):1248-1256](#); [Brain and Behavior 2018 Apr 18;8\(5\)](#); [Scientific Reports 2017 Aug 30;7\(1\):10075](#).

**Background:** TBI is a major contributor of long-term disability and a leading cause of death worldwide. A series of secondary injury cascades can contribute to cell death, tissue loss, and ultimately to the development of functional impairments. Despite the devastating impact of TBI, there are currently no Food and Drug Administration approved treatments for TBI. Rodent models have been traditionally used for the study of TBI. However, unique differences between rodent and human brains make the rodent system less than ideal for study. The pig model has recently come to the forefront as the pig brain is closer in size, structure, and composition to the human brain, making it an ideal large animal model to study TBI pathophysiology and therapeutic testing. The recent development and optimization of MRI, functional tests and molecular biology assessment tools by our team has now made the pig an even more attractive model for TBI research.

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