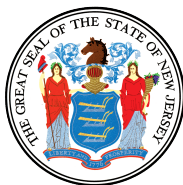


NEW JERSEY COMMISSION ON BRAIN INJURY RESEARCH

2015 Annual Report



Chris Christie, Governor
Kim Guadagno, Lt. Governor



Cathleen D. Bennett
Acting Commissioner

New Jersey Commission on Brain Injury Research

January 29, 2016

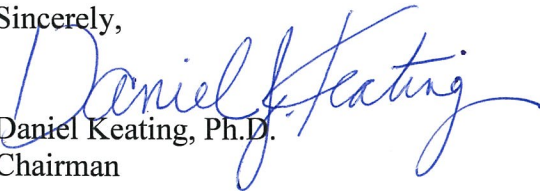
The Honorable Chris Christie, Governor
Office of the Governor
State House
PO Box 001
Trenton, New Jersey 08625

Dear Governor Christie:

On behalf of the New Jersey Commission on Brain Injury Research, I am pleased to present the Annual Report for Fiscal Year 2015. Once again, the Commission has had an active and productive year. We recently completed the ninth competition for research projects directed at mechanisms of neural regeneration and repair, and are confident that these efforts will make significant contributions to our knowledge of recovery from traumatic brain injury, the development of effective interventions, and ultimately to the improvement of the quality of life for people who have sustained catastrophic brain injuries.

I would like to acknowledge the efforts and enthusiasm of all of the Commissioners during the past year, as well as the New Jersey Department of Health for their valuable support and contributions.

Sincerely,


Daniel Keating, Ph.D.
Chairman

New Jersey Commission on Brain Injury Research

Members of the Commission

Daniel Keating, Ph.D., Chairman

Dennis Benigno

Meiling Chin, MBA

Shonola Da-Silva, M.D., MBA

Nicholas Ponzio, Ph.D.

Mark Evan Stanley, Ph.D.

Dennie Todd

Karen Tucker, M.A.

Anthony Welch

Commission Personnel

Christine Traynor, Administrator

Mary Ray, Fiscal Administrator

New Jersey Commission on Brain Injury Research

ACKNOWLEDGMENTS

The New Jersey Commission on Brain Injury Research would like to express its sincere appreciation to all present and past Commission members, to Commission staff members Christine Traynor and Mary Ray for their support, and to the New Jersey Department of Health.

New Jersey Commission on Brain Injury Research

Table of Contents

Members of the New Jersey Commission on Brain Injury Research2

Acknowledgements3

Executive Summary5

Introduction.....6

2007-2015 NJCBIR Summary and Performance Record14

2015 NJCBIR Year In Review15

Grants Program for 201616

New Jersey Brain Injury Registry17

Financial Statement19

2015 NJCBIR Research Grant Awards20

New Jersey Commission on Brain Injury Research

EXECUTIVE SUMMARY

The New Jersey Commission on Brain Injury Research, established in 2004, funds brain injury research projects in New Jersey.

❖ *Since 2007, the New Jersey Commission on Brain Injury Research (NJCIBIR) has awarded over \$31 million to individual scientists at various academic and research institutions, and approved 77 separate scientific research projects.*

- *Since 2007, twenty-seven scientific research projects have been completed.*
- *Progress made by researchers has been presented in abstracts, scientific conferences, symposia, and meetings.*
- *NJCIBIR programs have enabled wider scientific interaction and research collaborations, many with out-of-state researchers.*
- *Success in achieving NJCIBIR funding has resulted in academic and career advancement for New Jersey researchers.*

❖ *NJCIBIR offered five grant programs in Fiscal Year 2015:*

- *Individual Research Grants*
- *Programmatic Multi-Investigator Research Grants*
- *Pilot Research Grants*
- *Brain Injury Core Facilities Grants*
- *Postdoctoral and Graduate Fellowship Grants*

❖ *NJCIBIR 2015 Achievements:*

- *Fifty-one applications requesting \$22.6 million were submitted.*
- *Fifteen awards were made in 2015 totaling \$6,396,368.*
Seven Individual Research grants totaling \$3,522,996, two Pilot Research grants totaling \$354,043, one Programmatic Multi-Investigator Research Grant totaling \$1,918,684, and five Fellowship grants totaling \$600,645 were approved.

New Jersey Commission on Brain Injury Research

INTRODUCTION

N.J.S.A. 52:9ee-1, et seq

The Brain Injury Research Act created the New Jersey Commission on Brain Injury Research and the New Jersey Brain Injury Research Fund to support its activities. It resulted from the collaborative efforts of people with brain injuries and their families, clinicians, scientists, public officials, and representatives of research, rehabilitation, and non-profit organizations.

Facts & Figures

- Approximately 175,000 New Jersey residents suffer from traumatic injuries that damage the brain.
- Approximately 12,000* new injuries occur each year that require inpatient or outpatient treatment.
- The economic consequences of the resulting physical disabilities are enormous. Medical and long term care costs to the nation's economy are estimated to be \$48 billion dollars annually.
- The personal and emotional toll on individuals and families with brain injuries is incalculable.

*Based on estimates from the Centers for Disease Control and the New Jersey Department of Health Center for Health Statistics.

NEW JERSEY'S COMMITMENT TO BRAIN INJURY RESEARCH

The Brain Injury Research Act anticipates that brain injury research will lead to effective treatments and cures for brain injuries and relieve other consequences of brain injury.

New Jersey is a leader in supporting research aimed at developing effective interventions and cures for the disabilities associated with traumatic brain injury.

The New Jersey Commission on Brain Injury Research provides research grant programs for both established scientists and younger researchers committed to the goals of brain injury research. The commission also supports the New Jersey Department of Health, in establishing a database of all brain injured patients in New Jersey.

Now in its eleventh year of operation, the NJCBIR has funded 75 scientific research projects and supported individual scientists at institutions around the state. Its impartial and scientifically rigorous application and review process has helped make the commission vital to New Jersey's best researchers in their pursuit of answers and cures.

New Jersey Commission on Brain Injury Research

NEW JERSEY COMMISSION ON BRAIN INJURY RESEARCH

Created as a semi-independent public body, the New Jersey Commission on Brain Injury Research is "...allocated in, but not of..." the New Jersey Department of Health. It is subject to all the administrative rules and procedures of the Department, but is not a part of the Department, and is not included in its budget.

The New Jersey Commission on Brain Injury Research establishes and oversees the operations of the grants process and other activities that are implemented by its administrative staff. Eleven uncompensated commissioners are appointed by the Governor with the advice and consent of the Senate, and serve for three-year terms.

Two commission seats are designated by statute to represent the state's major academic research institutions and stakeholders. Public members provide a diversity of backgrounds and interests united by a shared commitment to the cause of brain injury research. The Commission will always have one or more individuals from each of the following institutions and categories:

The Commissioner of the NJ Department of Health, or designee

Rutgers, The State University of New Jersey

Eight Public Members – at least one licensed physician, an individual with a brain injury, a parent of an individual with a brain injury, one public member appointed by the President of the Senate, one public member appointed by the Speaker of the Assembly

All public members shall be residents of the state, or otherwise associated with the state, and shall be known for their knowledge, competence, experience or interest in brain injury medical research.

Any qualified person wishing to be considered for appointment may submit his or her name to the Governor's Office of Appointments. Information on how to apply can be found on the following website at <http://www.state.nj.us/governor/admin/bca>.

Public meetings are held at least four times a year. Members are recused from discussing or voting on matters in which they may have a potential conflict. A Chair and Vice-Chairperson are elected annually and preside over all formal proceedings.

The NJCBIR also maintains standing committees that meet and provide an informal structure to discuss issues on an *ad hoc* basis in advance of presenting them to the full commission.

ADMINISTRATION

The New Jersey Commission on Brain Injury Research's administrative office provides the vital linkages and machinery that implement its programs and ensure the integrity of its operations. The office staff manages the day-to-day operations, including program

New Jersey Commission on Brain Injury Research

administration, interaction with applicants and grantees, contract administration, budgeting and financial matters, record-keeping and reporting.

The office staff schedule and facilitate all activities, manages the scientific merit review process, negotiates with outside vendors, and maintains the necessary relationships within state government.

NEW JERSEY BRAIN INJURY RESEARCH FUND

The work of the New Jersey Commission on Brain Injury Research is supported entirely by a statutory one dollar surcharge on all traffic and motor vehicle fines or penalties. Similar sources of funding have been implemented successfully by several other jurisdictions – vehicular accidents are a significant cause of brain injuries.

Revenue is collected by the State Treasurer for deposit into the New Jersey Brain Injury Research Fund. All grant programs and other activities are funded entirely from this dedicated source. No part of the operating budget is paid for out of New Jersey's general tax revenue.

MISSION AND GOALS

The New Jersey Commission on Brain Injury Research's mission is to encourage and promote innovative brain injury research projects in New Jersey through the funding of approved research projects at qualifying research institutions in the State of New Jersey.

The New Jersey Commission on Brain Injury Research supports meritorious research projects that advance the understanding of traumatic brain injuries, and is committed to accelerating research to develop effective interventions and cures for the disabilities associated with traumatic brain injury.

Simply stated, the commission's goals are:

- To advance and accelerate brain injury research,
- To promote collaboration among brain injury researchers in New Jersey,
- To promote the development of brain injury researchers and their research capabilities in order that they may seek federal and other external funding, and
- To encourage innovative research.

The creation of precedent setting guidelines for the groundbreaking commission research agenda and the cutting edge and innovative science needed to accomplish commission goals is a tedious process that often requires unique and challenging solutions. Cutting edge and innovative science is urgently needed, and the task of research is more demanding than ever. Through its grants programs, the commission implements the commitment of the State of New Jersey to the international quest for treatments and cures for brain injuries and their effects.

New Jersey Commission on Brain Injury Research

The State of New Jersey benefits in savings on medical and support costs, enhancements to and further development of the state's public and private biomedical sectors, establishes leadership in the field of brain injury treatments and cures, and improves the lives of those living with brain injuries and their effects.

OBJECTIVES

The New Jersey Commission on Brain Injury Research is committed to accelerating research to develop effective interventions and cures for the disabilities associated with traumatic brain injury. Its primary objectives are:

- *To advance the field of brain cell repair and regeneration in the New Jersey research community by encouraging established scientists to apply their expertise to the brain.*
- *To foster collaborative, interdisciplinary approaches to brain injury research.*
- *To develop models of neural repair and regeneration that establishes a basis for additional scientific investigation.*
- *To develop models of neural repair and regeneration after brain injury that can lead to clinical interventions.*
- *To stimulate epidemiological analysis of the New Jersey Traumatic Brain Injury Registry data in order to improve injury prevention, develop treatment guidelines and enhance patient outcomes.*
- *To promote dissemination of the research findings generated by those scientists supported by the New Jersey Commission on Brain Injury Research.*
- *To develop and evaluate clinical interventions that lead to improved treatment and function after traumatic brain injury.*

RESEARCH FUNDING PRIORITIES

The New Jersey Commission on Brain Injury Research's Research Guidelines set forth the commission's scientific agenda, research criteria and areas of particular interest. They offer applicants detailed guidance and instruction on funding criteria and policies. The full text appears on the website at: www.nj.gov/health/njcbir.

Currently, an array of grant programs is offered including Individual Research Grants, Fellowships, Pilot Research Grants and Programmatic Multi-Investigator Research Grants. Each of these programs is designed to support and encourage brain injury research in New Jersey in a unique way.

The NJCBIR funds research activities that hold promise of developing effective interventions and cures for the disabilities associated with traumatic brain injury. The areas of research listed below highlight the focus of current emphasis and funding:

New Jersey Commission on Brain Injury Research

Basic Studies

- Studying strategies to promote neuronal growth and survival, encourage the formation of synapses, enhance appropriate myelination, restore axonal conduction, replace or regenerate injured brain cells, or otherwise improve function after brain injury.
- Evaluating efficacy of drugs and other interventions that prevent or reduce secondary neuronal injury or providing insight into the mechanisms causing progressive damage.
- Defining anatomical characteristics of brain injury in well-defined animal models and in the human brain, specifically documenting the cellular systems vulnerable to injury and the functional losses which occur as a result thereof.
- Translational research on the mechanism and interventions that promote recovery of function after brain injury.

Clinical Studies

- Demonstrating the efficacy of innovative rehabilitation strategies based on basic research that offer promise to promote recovery of function (e.g., physiologic function, cognitive impairment, activity limitation, social participation, quality of life) through their clinical application.
- Demonstrating the putative mechanisms of action of rehabilitation intervention based on changes in brain activity (e.g., functional imaging), neurocognitive function, or psychosocial factors (e.g., resilience).
- Comparative effectiveness research to evaluate the relative risks and benefits of alternative rehabilitation interventions intended to promote recovery of function.
- Epidemiological studies of the New Jersey Traumatic Brain Injury Registry data, to identify contributions of demographic and risk factors, patient transport, rehabilitation and physical therapy, and medical/surgical interventions to population treatment and outcomes.

THE NJCBIR APPLICATION AND REVIEW PROCESS

The grants review process was designed to emulate National Institutes of Health standards and procedures to provide an impartial and rigorous review. This effort has been largely successful and has earned respect from grantees and applicants.

The application process is now entirely electronic utilizing the New Jersey System for Administering Grants Electronically grants management system, and is accessible through the website.

The on-line process ensures broad access, convenience and flexibility, and greatly reduces administrative workloads for applicants, the commission office, and the Scientific Merit Review Panel.

New Jersey Commission on Brain Injury Research

The Commission's administrative staff reviews all applications for completeness and accuracy and assists applicants in correcting errors or omissions.

Relevance to the overall goals of the NJCBIR is assessed by an expert panel who also recommend reviewers for each grant from a pool of over 100 highly qualified scientists.

Each application is reviewed and scored independently by two or three peers prior to discussion at the Scientific Merit Review Panel meeting; "triaged" applications are not discussed or scored.

The remaining applications are fully discussed and scored by the entire panel and given a composite score. The panel also suggests a cut-off point for funding. The scores, comments and funding recommendations are delivered to the Commission for final consideration and vote.

The Commission makes the final decision whether to fund each application by majority vote. The commissioners pay close attention to the results of the independent scientific merit review, but retain discretion to take other factors into consideration in judging the merit of each application. Any application that was scored and not funded may be resubmitted with appropriate changes in the next grant cycle.

All applicants, regardless of the decision, receive "blinded" reviewer comments. These are often valuable and may help a researcher rethink a project or reframe a future application.

CURRENT GRANT PROGRAMS

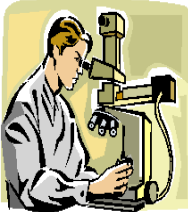
Grant programs are designed to provide opportunities attractive to a wide range of researchers. Awards are intended to promote collaboration among brain injury researchers in New Jersey and encourage innovative research, not to provide long-term support. It is expected that this initial support will lead investigators to acquire necessary levels of preliminary data so that they may compete successfully for federal grant support.

The Individual Research grant is designed to fund senior independent researchers, while the Fellowship grant offers encouragement to graduate students and post-doctoral researchers. The Multi-Investigator grant supports collaborative research from at least three investigators from different laboratories, and the Pilot Research grant enables researchers to pursue a new direction in brain injury research, or encourages new investigators who want to gather preliminary data for larger research projects. Newly offered this year, the Brain Injury Core Facilities grant was designed to make research more efficient and provides state-of-the-art equipment and highly skilled staffing to support researchers with centralized expertise.

New Jersey Commission on Brain Injury Research

Inter-institutional and/or inter-state collaboration is strongly encouraged. Complete details on all grant programs are available on-line.

Individual Research Grants



Individual Research Grants support senior scientists to explore meritorious novel scientific and clinical ideas.

Up to \$540,000 for up to three years (\$180,000 per year)

Key goal is to enable established researchers to test and develop pilot data needed for future funding.

Fellowship Grants

Postdoctoral and Graduate Student Fellowships engage promising young investigators in brain injury research.

All fellowships include an annual stipend, research allowance and travel budget.

Post-doctoral Fellowships are three year awards based on years of relevant research experience since obtaining a doctoral degree and range from \$64,550 to \$83,376 a year.

Graduate Fellowships are three year awards with a total award of \$33,500 per year.



Pilot Research Grants



Enable independent investigators to pursue a new direction in brain injury research, or new investigators who want to gather preliminary data for larger research projects.

Up to \$180,000 for a two year award (\$90,000 per year)

New Jersey Commission on Brain Injury Research

Programmatic Multi-Investigator Research Grants

Support collaborative research from at least three investigators from different laboratories.

Preference is given to proposals that demonstrate complementary approaches to addressing a research question through multi-disciplinary investigations.

Collaborations are encouraged among independent laboratories within the same institution or among laboratories from different institutions.

Up to \$720,000 per year for up to three years, maximum of up to \$2.1 million.



Brain Injury Core Facilities Grants



Brain Injury Core Facilities Grants make research more efficient and convenient by providing services and technologies that cannot be readily reproduced in individual laboratories in an efficient, cost-effective manner.

Provides state-of-the-art equipment and highly skilled staffing to support researchers.

Makes use of sophisticated technologies and equipment, in order to provide researchers with access to centralized expertise and service.

Provides education and training opportunities for aspiring researchers.

Up to \$1,500,000 to provide researchers with an opportunity to facilitate the establishment of new Brain Injury Core Facilities

New Jersey Commission on Brain Injury Research

2007- 2015 NJCBIR SUMMARY AND PERFORMANCE RECORD

Since 2007, the New Jersey Commission on Brain Injury Research has funded 77 separate scientific research projects to scientists at New Jersey academic and research institutions. These awards represent an investment in brain injury research of over \$31 million.

Approximately 49 grant applications are received annually; approval of ten or more new grant awards totaling \$3-\$4 million are made.

Due to its continued investment in brain injury research, the number of New Jersey researchers interested in the field is growing.

NEW JERSEY QUALIFIED RESEARCH INSTITUTIONS

Under the Brain Injury Research Act, funds may only go to researchers affiliated with “New Jersey Qualified Research Institutions”. The following organizations have been designated by the New Jersey Commission on Brain Injury Research. They provide a continuing source of interest and applications for funds.

University of Medicine & Dentistry of NJ	Coriell Institute for Medical Research
Rutgers, State University of New Jersey	New Jersey Institute of Technology
Kessler Foundation	Hackensack University Medical Center
Stevens Institute for Technology	International Brain Research Foundation
Princeton University	Englewood Hospital Research
Cooper University Hospital/Health System	JFK Neuroscience Institute, JFK Health
Atlantic Health Systems Hospital Corporation	System & Seton Hall University
St. Barnabas Medical Center	School Health Medical Science
Edge Therapeutics, Inc.	Rowan University
The Center for Neurological & Neurodevelopment	Morristown Medical Hospital &
Health LLC, Clinical Research Center of NJ, &	Medical Center
The Center for Neurological & Neurodevelopment	VA NJ Health Care System & Veterans
Health II, Inc. – NeurAbilities	Biomedical Research Institute
Centra State Medical Center	The College of New Jersey
Montclair State University	

The Commission is committed to broadening its portfolio of institutional grantees and increasing the size and diversity of its funding activities. Through outreach activities, the Commission encourages participation by all research organizations with an interest in brain injury research.

New Jersey Commission on Brain Injury Research

2015 YEAR IN REVIEW

The New Jersey Commission on Brain Injury Research developed policy guidelines to accommodate what promises to be an exciting research agenda for the New Jersey science community. The Commission is providing the opportunity for New Jersey to become a leader in traumatic brain injury research, as our program was the first of its kind in the nation.

As we move forward, it is our belief that the Commission will set the example for other states to follow as the search for treatments and cures begins to play a major role in medical research initiatives. Indeed, our early recognition of unmet needs in traumatic brain injury research is paving the way to develop methods of regeneration and repair.

Grant programs are designed to provide opportunities attractive to a wide range of researchers. Awarded grantees and grantee institutions have capitalized on the opportunities afforded by the availability of commission funding through advancement of individual careers, increased institutional investment, and applying for additional outside funding.

The Commission has been a major factor in fostering this interest and continued involvement in brain injury research within the State of New Jersey.

2015 Applications

2015 saw the New Jersey Commission on Brain Injury Research in its eleventh year of operation and its ninth cycle of grants.

In 2015, five types of grant programs were offered. They included Individual Research grants, Fellowship grants, Programmatic Multi-Investigator Research grants, Brain Injury Core Facilities grants, and Pilot Research grants. The NJCBIR allocated up to \$6.5 million for brain injury research projects, but it is not required to award any, or all of that amount.

A total of 51 grant applications were received. Fifteen grants were awarded totaling \$6,396,368. The grant awards included seven Individual Research grants, five Fellowship grants, one Programmatic Multi-Investigator, and two Pilot Research grants.

2015 Outreach and Development Efforts

The Commission maintains an ongoing interest in expanding brain injury research in New Jersey. Direct contacts, attendance at events and meetings, plus website and publication resources are some of the ways used to publicize grant opportunities throughout the state.

In an effort to provide opportunities for collaboration among New Jersey researchers, a one-day “Translational Brain Injury Research: Bench to Bedside” scientific meeting was held on March 17, 2015. Approximately 50 people registered to attend the event. A

New Jersey Commission on Brain Injury Research

wide range of representatives from academic institutions, non-profits, and state government were in attendance. The meeting was well received, and provided those in attendance with a national perspective on translational brain injury research.

Publication of Grant Programs

Official Notices of Grant Availability advise interested parties of the New Jersey Commission on Brain Injury Research grant programs. These notices are published annually on the Commission's website and in the New Jersey Department of Health's *Directory of Grant Programs*.

2015 Grant Cycle Information

Grant Application Deadline: October 3, 2014

Award Notification Date: April 30, 2015

Available Grant Programs:

- Individual Research Grants
- Programmatic Multi-Investigator Research Grants
- Fellowship Grants
- Brain Injury Core Facilities Grants
- Pilot Research Grants

GRANTS PROGRAM FOR 2016

For Fiscal Year 2016, the New Jersey Commission on Brain Injury Research allocated up to \$4.5 million dollars for brain injury research projects.

In 2016, three types of grant programs were offered. They included Individual Research grants, Fellowship grants, and Pilot Research grants. The NJCBIR allocated up to \$4.5 million for brain injury research projects, but it is not required to award any, or all of that amount.

2016 Grant Cycle Information

Grant Application Deadline: October 5, 2015

Award Notification Date: May 30, 2016

Available Grant Programs:

- Individual Research Grants
- Fellowship Grants
- Pilot Research Grants

New Jersey Commission on Brain Injury Research

NEW JERSEY BRAIN INJURY REGISTRY

The “Brain Injury Research Act” mandated the establishment of a central registry of people who sustain brain injuries throughout the state. This registry will provide a database indicating the incidence and prevalence of brain injuries and will serve as a resource for research, evaluation, and information on brain injuries.

The Registry, collects brain injury data from New Jersey hospitals, and provides analysis of that data for health professionals.

New Jersey Traumatic Brain Injury Surveillance System

Hospitalizations for TBI by Gender, New Jersey, 2000-2014

Year	Males		Females		Total	
	N	Rate	N	Rate	N	Rate
2000	4,934	126.7	3,070	65.3	8,004	94.8
2001	4,733	120.3	2,884	61.2	7,607	89.7
2002	4,783	120.9	2,904	60.7	7,687	89.5
2003	5,006	125.5	3,173	64.8	8,179	94.1
2004	4,986	124.8	3,219	64.9	8,205	93.8
2005	5,109	126.7	3,256	65.4	8,365	95.1
2006	5,510	135.4	3,524	70.2	9,034	102.0
2007	5,526	135.3	3,659	71.8	9,185	102.6
2008	5,556	135.0	3,786	73.3	9,342	103.3
2009	5,816	140.4	4,072	77.1	9,888	107.7
2010	5,765	137.3	3,942	74.2	9,707	104.7
2011	5,563	131.9	4,042	75.1	9,605	102.4
2012	5,893	137.7	3,963	72.6	9,856	103.8
2013	5,609	129.7	3,995	71.6	9,604	99.5
2014	5,442	124.1	4,041	71.3	9,483	96.6

Rates are age-adjusted using the 2000 US Standard Population, calculated per 100,000 population. Bridged-race estimates are used in calculations. Hospitalization data are from the New Jersey Central Nervous System Injury Surveillance, 2015.

New Jersey Commission on Brain Injury Research

Hospitalizations for TBI by Age Group, New Jersey, 2000-2014

Year	Under 15		15-24		25-44		45-64		65+		Total	
	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate	N	AARate
2000	1,010	57.4	1,236	122.4	1,932	73.7	1,345	69.8	2,481	222.6	8,004	94.8
2001	904	51.2	1,287	125.3	1,782	68.5	1,300	65.6	2,344	210.3	7,607	89.7
2002	865	48.8	1,240	118.9	1,708	66.2	1,368	67.1	2,506	224.6	7,687	89.5
2003	925	52.2	1,209	113.9	1,727	67.6	1,469	70.1	2,849	254.7	8,179	94.1
2004	821	46.5	1,211	112.3	1,664	66.0	1,548	72.0	2,961	264.5	8,205	93.8
2005	828	47.4	1,245	113.5	1,713	68.9	1,568	71.1	3,011	268.7	8,365	95.1
2006	843	48.9	1,347	121.2	1,817	74.3	1,779	78.9	3,248	288.8	9,034	102.0
2007	804	47.1	1,318	117.6	1,652	68.4	1,862	81.0	3,549	312.5	9,185	102.6
2008	827	48.7	1,167	103.5	1,717	71.9	1,923	82.3	3,708	320.2	9,342	103.3
2009	812	47.9	1,139	100.4	1,609	68.1	2,074	86.9	4,254	362.5	9,888	107.7
2010	805	47.6	1,125	98.6	1,580	67.3	2,117	87.0	4,080	342.7	9,707	104.7
2011	695	41.3	999	87.3	1,527	65.3	2,081	84.4	4,303	356.1	9,605	102.4
2012	678	40.5	1,006	87.8	1,557	66.8	2,230	90.2	4,385	350.6	9,856	103.8
2013	626	37.6	822	71.5	1,431	61.5	2,176	87.6	4,549	354.3	9,604	99.5
2014	553	33.4	763	66.2	1,292	55.6	2,108	84.5	4,767	362.9	9,483	96.6

Except where noted, rates are CRUDE RATES directly calculated using the NJ age-specific population, calculated per 100,000. Bridged-race estimates are used in calculations. Hospitalization data are from the New Jersey Central Nervous System Injury Surveillance, 2015.

Discharge Disposition of the Major Causes of Traumatic Brain Injuries, 2014

Cause of injury	Home, routine		Extended inpatient care ¹		Home, with services ²		LTC, nursing, hospice ³		Rehab		Left AMA		Dischrg/Txr w planned readmission ⁴		Died		Total
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	
Motor vehicle	1,142	66.5	172	10.0	50	2.9	15	0.9	255	14.9	16	0.9	1	**	66	3.8	1,717
Falls	2,433	41.3	1,640	27.8	445	7.5	157	2.7	793	13.5	70	1.2	10	0.2	347	5.9	5,895
Assault	504	81.8	29	4.7	3	**	1	**	29	4.7	24	3.9	0	-	26	4.2	616
Self-inflicted	13	34.2	11	28.9	0	-	0	-	6	15.8	0	-	0	-	8	21.1	38
Other and Unknown	678 ^r	55.7	207 ^r	17.0	75 ^r	6.2	29 ^r	2.4	126 ^r	10.4	16 ^r	1.3	5 ^r	0.4	81	6.7	1,217
Total	4,770	50.3	2,059	21.7	573	6.0	202	2.1	1,209	12.7	126	1.3	16	0.2	528	5.6	9,483

Hospitalization data are from the New Jersey Central Nervous System Injury Surveillance, 2015; percentages are based on New Jersey residents admitted to New Jersey hospitals, all outcomes.

** Percentages not calculated for under 5 observations.

Notes:

¹Includes: Discharges/transfers to other short term general care hospitals, skilled nursing and intermediate care facilities, federal hospitals, psych units, and critical access

²Includes: Discharges/transfers to home with either a home health service provider or IV therapy

³Includes: Discharges/transfers to long-term care facilities, Medicaid certified nursing facilities, and hospice

⁴Includes: Discharges/transfers to home/self care, short term general hospitals, skilled nursing and intermediate care facilities, custodial or supportive care facilities, cancer centers or children's hospitals, home with services, law enforcement, federal hospitals, Medicare swing-bed facilities, rehab facilities, long-term care, Medicaid-certified nursing facilities, psych hospitals, critical access hospitals, and others not elsewhere classified; with planned inpatient readmission to an acute care hospital. (New beginning in 2013)

New Jersey Commission on Brain Injury Research

FINANCIAL STATEMENT

The activities and programs of the New Jersey Commission on Brain Injury Research are supported by the New Jersey Brain Injury Research Fund as established by the Brain Injury Research Act.

A \$1.00 surcharge was added to the amount of each fine and penalty imposed and collected under authority of any law for any violation of the provisions of Title 39 or any other motor vehicle or traffic violation in the State of New Jersey. This revenue surcharge is collected and forwarded to the State Treasurer and deposited into the New Jersey Brain Injury Research Fund. Interest earned on the money collected, through the Division of Investments, New Jersey State Department of Treasury, is credited to the Fund.

The NJCBIR is committed to granting a substantial majority of the Fund each year to support as much meritorious research as possible, while retaining the ability to meet expenses.

**State Fiscal Year 2015
Fund Balance Statement:**

	SFY 2015 <i>Projected</i>	SFY 2015 <i>Actual</i>	SFY 2016 <i>Projected</i>
Opening Fund Balance: (July 1)	\$1,420,825	\$1,443,546	\$1,447,348
Revenues			
Assessments ¹	\$3,600,000	\$3,856,273	\$3,600,000
Investments Earnings - Interest ²	<u>\$20,000</u>	<u>\$15,308</u>	<u>\$12,000</u>
Total Revenue:	\$3,620,000	\$3,871,581	\$3,612,000
Total Funds Available:	\$5,040,825	\$5,315,127	\$5,059,348
Disbursements and Expenses			
Spending Plan Reduction		\$165,744	
Disbursements to Grantees ³	<u>\$3,500,000</u>	<u>\$3,625,503</u>	<u>\$4,500,000</u>
Total Disbursements:	\$3,500,000	\$3,791,247	\$4,500,000
Expenses			
Administrative & Office Expense	\$110,000	\$32,543	\$110,000
Professional Review Panel	\$50,000	\$43,989	\$50,000
NJCBIR Registry	<u>\$0</u>	<u>\$0</u>	<u>\$0</u>
Total Expenses:	\$160,000	\$76,532	\$160,000
Total Disbursements and Expenses:	\$3,660,000	\$3,867,779	\$4,660,000
Closing Fund Balance: (June 30)	\$1,380,825	\$1,447,348	\$339,348

¹Net revenue variance.

²Funds plus interest deposited annually in January.

³Funds represent 1 year of grant funding; total awarded in FY2015 was \$6,396,368.

New Jersey Commission on Brain Injury Research

2015 RESEARCH GRANT AWARDS

INDIVIDUAL RESEARCH GRANT RECIPIENTS:

Mesut Sahin, Ph.D.
New Jersey Institute of Technology
Grant Award: \$347,617

Project Title: *Electrophysiological Assessment of Traumatic Cerebellar Injury*

The main objective of the project is to understand the mechanism of traumatic injuries to the cerebellum using the electrophysiological method.

Devastating consequences of severe head injuries are well known to the American public. Scientific evidence is building up to suggest that mild head injuries, which sometimes are called concussions, can leave permanent damage in the brain especially if they reoccur before the person completely recovers from the first injury. These mild injuries are difficult to study in experimental animals because the damage may not cause the brain cells to die, but rather slow down their communication with other cells. Classical methods of studying neural damage (e.g. histology or neural imaging) are not suitable to assess the severity of such mild injuries. These types of injuries cannot be detected using behavioral measures since the impairments may be too subtle to be observed in the motor function or cognition.

Our objective is to develop a highly sensitive technique that relies on monitoring of the electrical activity from the injured brain that will correlate with the severity of injury in a reliable and reproducible manner. Developing the technique for clinical diagnostics in human patients will be the future goal.

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New Jersey Commission on Brain Injury Research

Jean Lengenfelder, Ph.D.
Kessler Foundation
Grant Award: \$506,322

**Project Title: *Treating Emotional Processing Impairments in Individuals with TBI:
A Randomized Controlled Trial***

This proposal will investigate a treatment for emotional processing deficits in TBI evaluating psychological, neuropsychological, functional abilities as well neural changes pre and post-treatment.

Individuals with Traumatic Brain Injury (TBI) experience a number of symptoms which are both physical and cognitive. Recent evidence suggests that a significant number of individuals with TBI have difficulty in emotional processing. Specifically, some individuals with TBI have difficulty correctly identifying emotions from facial expressions. Deficits in emotional processing can have a significantly negative impact on social interactions, mood, and quality of life. Therefore, treatment of emotional processing deficits is critical to improving the lives of individuals with TBI.

The current study examines a treatment for emotional processing deficits in TBI. Using an intervention that has been successful in autism and schizophrenia, the proposed study will examine the effects of an emotional processing training program in persons with TBI. The study will examine not only the effects of the intervention on emotional processing abilities, but also on psychological, neuropsychological, and functional abilities as well as neural changes using neuroimaging.

It is hypothesized that improved emotional functioning, as well as improvements in cognitive abilities, mood and quality of life will be observed following the emotional processing intervention. The current study will also use neuroimaging to examine changes in the brain that occur following an emotional processing training program.

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New Jersey Commission on Brain Injury Research

Jorge Contreras, Ph.D.
Rutgers, Biomedical & Health Sciences
Grant Award: \$540,000

Project Title: *Pannexin Hemichannels as a Therapeutic Target for Traumatic Brain Injury*

Understanding of pannexin protein function in traumatic brain injury will contribute to the development of pharmacological strategies that improve patient outcomes after brain injury.

Approximately 1.7 million people sustain a Traumatic Brain Injury (TBI) annually in the United States. It has long lasting consequences on cognitive ability, due to neuronal loss. Mechanical trauma produces a primary injury to neurons, glia and blood vessels that is followed by a delayed secondary injury, which may persist from days to years. Cellular death occurs within minutes to hours after TBI and the peri-contusional brain edema that follows TBI enhances the acute necrosis. This acutely produced cell death releases pro-inflammatory molecules including adenosine triphosphate (ATP) that initiates post-traumatic inflammatory responses. If exacerbated, this inflammatory response promotes injury progression worsening the outcome following TBI.

Recently, pannexin proteins have shown to be a channel pathway for ATP release from dying cells enhancing the inflammatory response in several injury models. Yet, the contribution of pannexin channels in neuroinflammation following TBI is not fully understood.

In this proposal we plan to test the role of pannexin in TBI using a mice model of controlled cortical impact, and hopefully, demonstrate that an increase in the activity of pannexin channels enhances neuroinflammation and neurodegeneration following brain injury. We expect to find that administration of pannexin channels blockers may be useful as therapeutic drugs to improve neurological outcomes following TBI. We hope that the pannexin blockers attenuate neurodegeneration and behavioral deficit after injury. This knowledge may lead to initiation of new pharmacological strategies that target pannexin to treat human pathologies followed by TBI.

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New Jersey Commission on Brain Injury Research

Gleb Shumyatsky, Ph.D.
Rutgers, Department of Genetics
Grant Award: \$535,000

Project Title: *The Role of Stathmin and Microtubule Stability in Vulnerability, Development and Recovery from mTBI and Accompanying PTSD*

We will examine for the first time a transgenic mouse, as a preclinical model for blast related traumatic brain injury, a signature injury associated with depression and PTSD in war veterans.

Blast related traumatic brain injury (TBI) has been a major cause of injury in Iraq and Afghanistan. Importantly, mild TBI (mTBI) has been often associated with post-traumatic stress disorder (PTSD). Because of the overlapping features of mTBI and PTSD, it has been difficult to understand the differences between the two disorders, or understand how they are linked. Thus, a preclinical model is needed to enable the characterization of unique and overlapping features and the connection between these two disorders. A preclinical model would allow for better understanding of these disorders from the anatomic, cellular and molecular perspectives.

Recently, a protein called stathmin was found to be induced in a rat model of repetitive blast-injury caused mTBI. which also leads to a variety of PTSD-related behavioral abnormalities. This finding is intriguing, because the work from our lab, as well as others, has implicated stathmin in cognition, fear and anxiety in rodents and humans. Our more recent work, where we describe a mechanism by which stathmin is directly involved in fear memory by regulating cellular cytoskeleton, will be the basis for this grant proposal. Also, our pilot data show that stathmin transgenic mice display deficits consistent with symptoms of depression. These findings are important because depression and PTSD are the most common psychiatric consequences associated with traumatic injury.

Based on these findings, we will test the hypothesis that improper stathmin function predisposes an organism to mTBI-induced PTSD symptoms. Our Specific Aims will examine this hypothesis at the transgenic, behavioral, anatomic and molecular-structural levels. Surprisingly, no transgenic models have been tested in relationship to mTBI-induced PTSD symptoms. Thus, our work is important as it will probe stathmin and its associated molecular network, using the transgenic approach for the first time in research on mTBI-induced mental disorders.

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New Jersey Commission on Brain Injury Research

Sridhar Kannurpatti, Ph.D.
Rutgers, Biomedical & Health Sciences
Grant Award: \$514,057

***Project Title: Mitochondrial Facilitation Treatment in Mild Traumatic Brain Injury
and its Integrated Translatable Monitoring***

The proposed studies will evaluate neuronal circuit reorganization after a mild brain injury and mitochondrial facilitation treatment in a manner similar to that performed on brain injured humans.

Brain injured humans are clinically monitored using radiological imaging followed by neurophysiological and behavioral testing during rehabilitation. If therapeutic agents directed against brain injury outcomes advance to preclinical phase, the therapy's efficacy has to be evaluated in a preclinical animal model. Furthermore, it is best if the animal model brain functional outcomes are measured in a similar manner as performed on brain injured humans.

Towards this goal, we pioneered the application of functional imaging (optical and magnetic resonance imaging) to map brain functional reorganization after a mild brain injury in a rat model. This pilot study funded by the New Jersey Commission for Brain Injury Research observed neuronal damage in the injured area in addition to deficiencies in the neuronal functional circuits and blood flow in adjoining regions away from the site of injury. We also discovered that facilitating mitochondrial function improved the brain injury outcome. In order to distinguish the impact of mitochondrial facilitation treatment on the neuronal and vascular (blood flow) compartments, we will image brain function and its electrical activity in brain injured rats with and without treatment. Behavioral testing of sensorimotor abilities will be obtained along with postmortem histology of neuronal survival in the brain. The imaging and electrical measures obtained in the proposed studies are similar to those currently measured in humans sustaining brain injuries.

The proposed strategy will not only lead to a new method for monitoring brain injuries, but also speed up the pipeline with the development of new medicines to treat brain injured patients. The current studies will spawn new strategies to develop better medicines and also monitor their effectiveness for the approximately 175,000 New Jersey residents who have suffered brain injuries, and future brain injury patients increasing at a rate of 15,000 per year within the state.

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New Jersey Commission on Brain Injury Research

Vineet Chitravanshi, Ph.D.
Rutgers, Biomedical and Health Sciences
Grant Award: \$540,000

Project Title: *Traumatic Brain Injury: Functional Alterations in the Brain
Cardiovascular Regulatory Areas*

In this proposal the mechanisms of cardiovascular complications accompanying traumatic brain injury and their prevention or attenuation by selected pharmacological agents will be studied.

Traumatic brain injury (TBI) is an enormous medical problem nationwide, as well as in the State of New Jersey. There is an urgent need for understanding the mechanisms of alterations of brain functions in patients with TBI so that new and effective treatments can be developed for these injuries.

Cardiovascular complications often accompany TBI. The goal of this proposal is to understand the mechanisms of these complications and test pharmacological treatments that have a potential to prevent secondary brain damage and improve the outcome of these injuries.

In this proposal, techniques that are well established in this laboratory will be used to study the mechanisms of functional alterations in the brain areas that are known to play a critical role in cardiovascular regulation. A well-established rat model, in which concussive brain injury is produced by application of a fluid pressure wave to the brain, will be used in this study. First, immediate and delayed changes in the blood pressure, heart rate and respiration produced by brain trauma will be studied. Next, the impairments in reflexes, that normally maintain cardiovascular function at optimum levels, will be studied. Finally, functional changes in the hind-brain areas that regulate cardiovascular functions will be studied.

In all experiments, pharmacological agents that have a potential to protect brain damage will be used to test if the impairments in cardiovascular functions can be prevented or attenuated. Three substances (C-type natriuretic peptide, muscimol and valproic acid) were selected because they showed some promise in preventing or attenuating undesirable cardiovascular complications of TBI in our preliminary studies. One of them, valproic acid, is used clinically to treat epilepsy. The results of the present study are likely to be helpful in understanding the mechanism of cardiovascular complications of TBI and provide a rational approach for developing new strategies to prevent them.

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New Jersey Commission on Brain Injury Research

Wilma Friedman, Ph.D.
Rutgers, Department Biological Sciences
Grant Award: \$540,000

Project Title: *Strategies for Neuroprotection from Seizures*

We will evaluate proNGF antagonists to assess their efficacy in preventing neuronal death from seizures, which are a common consequence of TBI.

One of the most common consequences of traumatic brain injury (TBI) is the development of posttraumatic epilepsy, leading to additional loss of neurons beyond the initial TBI damage, disrupting neuronal circuitry and compromising brain function yet further.

In previous work, we have characterized specific mechanisms that regulate the loss of neurons from seizures. In our current studies we have identified FDA-approved compounds that antagonize this mechanism of neuronal death, and we will investigate the efficacy of these compounds in preventing neuronal death from seizures. The ability to prevent further loss of neurons from posttraumatic epilepsy will be beneficial to prevent additional compromising of neural function for those who have already suffered neuronal loss from the initial injury.

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New Jersey Commission on Brain Injury Research

FELLOWSHIP RESEARCH GRANT RECIPIENTS:

Akshata Korgaonkar
Rutgers Biomedical & Health Sciences
Grant Award: \$100,500

Project Title: *Differential Toll-like Receptor 4 Modulation of Hippocampal Plasticity in the Normal and Injured Brain*

Identify the differences in how the innate immune receptors TLR4 act in the normal and injured brain physiology.

Traumatic brain injury (TBI) is one of the major causes of post traumatic epilepsy. TBI triggers neuronal injury which results in early activation of immune responses and cellular and synaptic changes in the hippocampal dentate gyrus. Recently, it has been identified that a class of pattern recognition receptors of the innate immune system, toll-like receptor 4 (TLR4), which can be activated by molecules released from traumatized cells, can change hippocampal excitability after brain injury. Although pharmacologically inhibiting these receptors can reduce excitability after brain injury, our studies show that the same drug increases excitability in the uninjured brain. Thus, while blocking this receptor may be effective in preventing development of neurological disorders after injury, it may precipitate diseases in the normal brain.

This study aims to identify the differences between the way these innate immune receptors act in the normal brain and in the injured brain so that the appropriate pathways can be selectively targeted to prevent memory dysfunction and enhanced seizure risk following brain injury.

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New Jersey Commission on Brain Injury Research

Cherylynn Marino
Kessler Foundation
Grant Award: \$198,645

Project Title: *Advances in Treatment: Examining the Influence of a Mindfulness Based Cognitive Therapy Program on Reducing Internalizing and Externalizing Problems Following Pediatric Traumatic Brain Injury*

This longitudinal study will examine the efficacy of a mindfulness based cognitive therapy program on improving psychosocial adaptation following a TBI. The purpose of this research is to investigate the influence a mindfulness based cognitive therapy (MBCT) intervention will have on internalizing and externalizing problems in children and adolescents that have suffered a Traumatic Brain Injury (TBI). Internalizing problems refer to a set of symptoms in which a person over-controls their emotions and results in social withdrawal, feelings of worthlessness, depression, and anxiety. In contrast, externalizing problems refer to an under-control of emotions which results in conduct problems, impulsive behavior, and aggression. Social and emotional difficulties are prominent consequences of childhood TBI. Left untreated or undertreated, these problems often persist into adulthood, producing a wide range of challenges adapting in personal and vocational domains. At present, there are minimal non-pharmacological therapeutic approaches that effectively treat deficits unique to TBI. Developing innovative, evidence based methods is essential in helping children fully recover from the injury.

In detail, the MBCT intervention promotes self-regulation of emotions and behaviors within an accepting and non-judgmental therapeutic environment. During this interactive, multi-sensory program, participants will learn strategies to help manage their emotions and thoughts and help them to develop greater insight into the influence these experiences have on their behaviors. Participants will engage in brief at home exercises to enhance their learning of these new skills.

In this study, children and adolescents struggling with internalizing and/or externalizing problems following a TBI will be randomly assigned to either the MBCT treatment or a non-therapeutic arts and crafts group. To keep materials and content age appropriate, youth will attend a group within their age range (i.e., children: ages 9 to 12; adolescents: ages 13 to 17). The groups will meet twice a week for twelve weeks. Participants will be assessed after the treatment sessions and at three and six month points after the last session. In summary, this study will test how well the intervention improves internalizing and externalizing problems in youth. The strategies taught in the program are coping skills that learners can use on their own to help them better manage negative emotions. A potential outcome of this study is to develop a new treatment that can be used to address these problems for children and adolescents following a TBI.

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New Jersey Commission on Brain Injury Research

Valentina Dal Pozzo
Rutgers, Cell Biology & Neuroscience
Grant Award: \$100,500

Project Title: *Role of Reelin in Traumatic Brain Injury*

The project is focused on understanding the function of the extracellular protein Reelin after traumatic brain injury, and determining if this can be beneficial for restoring cognitive function.

Traumatic brain injury (TBI) causes severe cognitive disability or death, resulting from common occurrences such as falls, car accidents, sport activities, or violence. Statistical data reported that in the United States 2 million people are affected by TBI annually, and approximately 15,000 people are New Jersey residents. Most of the time, the patients require long rehabilitative treatments at a high cost for the families and for the State of New Jersey. The injury results in various symptoms, such as seizure, cognitive disability, loss of memory, visual disturbances and other debilitating neurological problems. At the moment, there are limited treatments available and no effective cure for cognitive disability after TBI.

In our preliminary work, we observed a high expression of Reelin in the injury side of the brain in mice that had been subjected to TBI. In particular, Reelin was strongly induced in the hippocampus, an area of the brain that plays an important role in learning and memory. In vitro, we also observed that exogenous Reelin protects neuronal cells from the toxicity induced by high doses of glutamate, an excitatory amino acid that is known to increase rapidly in the extracellular space after brain injury. Based on these findings, we hypothesize that Reelin may be beneficial for recovery after TBI.

In this proposal, we will use in-vivo and in-vitro approaches to establish the role of Reelin as a potential factor that promotes recovery after brain tissue damage. In-vivo, we will use a TBI model in mice that mimics human brain injury, and will identify the types of cells in which Reelin expression is induced. We will perform behavioral studies in wild type and mutant mice deficient for Reelin signaling activity to determine whether Reelin is important for recovery.

In-vitro, we will investigate the potential role of Reelin in neuroprotection after exposure to the chemical damage of glutamate.

Our overall goal is to firmly establish the role of Reelin in recovery after TBI. If our hypothesis is confirmed, Reelin signaling could be a new target for pharmacological treatments aimed at improving the quality of life of people affected by TBI.

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New Jersey Commission on Brain Injury Research

Mihir Patel, Ph.D.
Rutgers, Cell Biology & Neuroscience
Grant Award: \$100,500

Project Title: *Recovery of the Dendritic Network after Traumatic Brain Injury*

This project will assess how normal dendrite branching and connectivity can be rescued after traumatic brain injury (TBI).

Traumatic brain injury (TBI) is caused by the rapid movement of the brain within the skull due to a traumatic event. TBI leads to damage of neurons in the area of impact in the brain. The death of a subset of neurons eventually leads to the death of neighboring neurons because survival of neurons depends on the signals they receive from other neurons through dendrites (neuronal processes). After injury, reestablishment of neuronal circuitry is required to rescue normal neuronal (i.e. cognitive) functions. Currently, no effective treatment is available to improve cognitive function after TBI.

We are studying neuronal cells to explore the detailed molecular mechanisms responsible for regulating neural circuitry. PSD-95 (postsynaptic density-95) is a molecular target involved in the regulation of the dendritic network. We will study the effect of altered PSD-95 expression on the dendritic network under conditions mimicking TBI. We predict that PSD-95 plays a role in repairing normal neural circuitry after injury by regulating dendrite branching and spine formation. The detailed study of this molecular target and mechanisms post-trauma will help to develop new drugs and treatments for functional recovery after TBI.

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Karla Fietze
Princeton University
Grant Award: \$100,500

Project Title: *Investigating the Role of MHCI in Excitotoxicity Following Traumatic Brain Injury*

Understanding how MHCI controls neuronal excitation following traumatic brain injury.

Traumatic brain injury (TBI) affects 1.4 million U.S. citizens each year. TBI causes two phases of brain injury: primary damage at the time of impact, and a prolonged phase of secondary damage. This secondary phase, which enlarges the area of the injury and worsens clinical outcomes, is driven by overstimulation of neurons around the injury site. Thus, even when the primary damage is done, it still may be possible to significantly reduce TBI-induced brain injury by preventing neuronal overstimulation.

We recently identified a family of proteins, called MHCI, that unexpectedly regulate the brain receptors that cause neuronal overstimulation and damage after TBI. Furthermore, the levels of these MHCI proteins rapidly and dramatically increase in the brain following TBI, suggesting they may play a key role in determining the extent of secondary damage that occurs. In order to develop therapies to exploit this natural control knob for secondary brain injury, we must first understand how, on a molecular level, MHCI regulates neuronal activation.

In the proposed research, I will use a powerful combination of electrophysiology, mass spectrometry, biochemistry, and molecular biology to identify the molecular binding partners through which MHCI controls neuronal excitation. By identifying these binding partners, and mapping the sites in MHCI where they bind, the proposed studies may lead to a new therapeutic approach to reduce the scope of the damage to the injured brain in the wake of TBI.

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New Jersey Commission on Brain Injury Research

PILOT RESEARCH GRANT RECIPIENTS:

James Sumowski, Ph.D.

Kessler Foundation

Grant Award: \$175,623

Project Title: *Randomized Controlled Trial of Retrieval Practice to Improve Academic Achievement after Pediatric Traumatic Brain Injury*

This pilot randomized controlled trial will investigate whether retrieval practice training (versus control) improves learning of academic material in adolescents with memory impairment after TBI.

Many children and adolescents suffer moderate-to-severe traumatic brain injuries (TBI), often leading to chronic learning and memory problems. Not surprisingly, learning and memory problems negatively affect academic achievement, thereby setting pediatric survivors of TBI on a negative trajectory toward lower educational attainment, limited employment options, and reduced overall quality of life.

Adolescents are charged with learning vast amounts of information across diverse topics in middle school and high school, which represents a challenge even for students without memory difficulties. It is therefore critical that we identify effective learning interventions for adolescents with TBI, to give these students their best opportunity to achieve in secondary school, and open doors to post-secondary education.

Herein we propose a pilot randomized controlled trial of retrieval practice training (RPT) versus a self-selected study (SSS) control to improve learning of academically-relevant information in adolescents with memory impairment after TBI. There is robust empirical support for retrieval practice as a learning and memory strategy among healthy college undergraduates, and we have extended these findings to memory-impaired neurologic populations, including pediatric TBI, in a series of well-controlled laboratory experiments. The time is ripe to translate these laboratory findings to a randomized controlled trial wherein adolescents learn to employ the retrieval practice strategy to learn academically-relevant material: foreign language vocabulary, geography, scientific diagrams, history, and literature.

Our findings will support RPT as an effective treatment for academic learning problems in adolescents with TBI. This strategy is simple enough to be easily employed in school and home settings, and will have positive effects on academic achievement in the short term, and higher educational attainment and employment outcomes in the longer term.

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New Jersey Commission on Brain Injury Research

Karen Nolan, Ph.D.
Kessler Foundation
Grant Award: \$178,420

Project Title: *Improving Mobility Utilizing Robotic Exoskeletons for Children with Traumatic Brain Injury*

Quantifying the clinical, biomechanical and functional effectiveness of a robotic exoskeleton early intervention gait therapy for adolescents during in-patient rehabilitation with acute TBI.

This study is relevant to the nearly 175,000 New Jersey residents currently living with disabilities from traumatic brain injuries (TBI), the majority of whom are children. Childhood TBI is a major public health concern and it is estimated that in the United States 511,257 TBI incidents occurred in children between 2002 and 2006. The two age groups at highest risk for TBI are 0 to 4 year olds and 15 to 19 year olds, and more than 20% of these patients have a moderate or severe TBI.

Mobility impairment is one of the most disabling aspects of adolescent TBI. If mobility deficits cannot be correctly detected and adequately treated, patients are expected to endure decreased functional ambulation, increased disability and decreased quality of life. This is a critical public health concern due to the 5.3 million TBI survivors dealing with the disabling effects of mobility impairment and decreased independent ambulation after TBI.

The current proposal emphasizes translational research and interventions that promote recovery of function after TBI. The outcomes of this pilot study will demonstrate the efficacy of robotic exoskeletons (RE) for early intervention gait therapy for in-patient adolescent rehabilitation. RE in-patient therapy will promote physiologic function, social participation and quality of life by facilitation recovery of motor function after TBI. This innovative pilot investigation will provide preliminary data for larger scale investigations with the potential to have a significant impact on the effectiveness of robotic neurorehabilitation for adolescents with TBI and the need for revolutionizing in-patient adolescent gait rehabilitation.

The selected outcomes of this pilot study will demonstrate the efficacy of RE early intervention gait therapy for in-patient adolescent rehabilitation to promote physiologic function, social participation and quality of life by promoting recovery of function after TBI.

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New Jersey Commission on Brain Injury Research

MULTI-INVESTIGATOR RESEARCH GRANT RECIPIENT:

Guang Yue, Ph.D.
Kessler Foundation
Grant Award: \$1,918,684

Project Title: *A Comprehensive Study of Balance Dysfunction, its Recovery Following Intervention and Underlying Neural Mechanisms in Traumatic Brain Injury*

This multi-investigator application will investigate intervention effect on posture stability, neural mechanisms of balance dysfunction and recovery in TBI, and neuroimaging–based biomarkers of Traumatic Brain Injury (TBI).

To successfully treat TBI disabilities, (1) Effective interventions are needed (treatment problem). (2) In addition, it is critical to understand neural mechanisms underlying the injury and its recovery, including location and severity of brain injury, and neuroplasticity that mediates disability and promotes recovery (mechanism problem). And (3) an objective and accurate diagnostic tool is vitally important for correct diagnosis of the injury, which is a prerequisite for targeted treatment (diagnostic problem).

As one might see, without solving the diagnostic and mechanism problems, the treatment problem cannot be adequately solved. In other words, if the injury cannot be accurately diagnosed and neurophysiological and neuromuscular contributions to the disability(s) are not understood, then the conditions cannot be treated effectively. Unfortunately, no objective diagnostic tools are available for accurate and objective detection of the injury, and very little is known regarding neural mechanisms mediating injury progression and function recovery; the diagnostic and mechanism problems limit chances of successful treatment.

Based on the above rationale, the major goals of this Multi-Investigator application are three folds: (1) develop a comprehensive computer algorithm for quick, automated, objective and accurate classification of brain injury in patients with mild, moderate and severe TBI diagnosed by clinical tools; (2) understand neurophysiological adaptations and neural plasticity in TBI and their relation with balance dysfunction and sensorimotor performance; and (3) evaluate the effect of a well thought-out intervention on remedying balance dysfunction in individuals with mild, moderate and severe TBI, and the effect of the intervention on changes in the brain and neuromuscular system and relation between the changes and sensorimotor and balance functions.

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