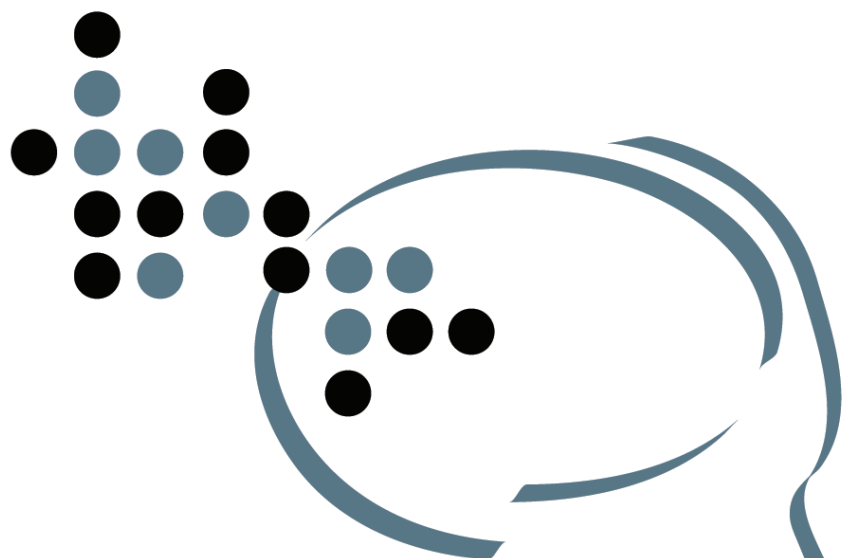
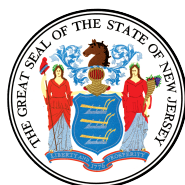




# NEW JERSEY COMMISSION ON BRAIN INJURY RESEARCH

## *2013 Annual Report*



**Chris Christie, Governor**  
**Kim Guadagno, Lt. Governor**



**Mary E. O'Dowd, MPH**  
**Commissioner**

## New Jersey Commission on Brain Injury Research

January 30, 2014

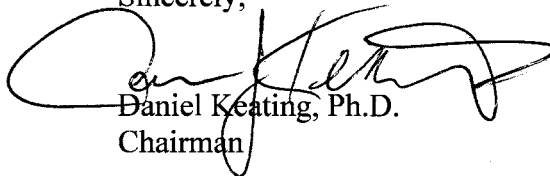
The Honorable Chris Christie, Governor  
Office of the Governor  
State House  
PO Box 001  
Trenton, New Jersey 08625

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 2013. Once again, the Commission has had an active and productive year. We recently completed the seventh 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 support of the New Jersey Department of Health for their valuable support and contributions towards the work of the New Jersey Commission on Brain Injury Research.

Sincerely,



Daniel Keating, Ph.D.  
Chairman

## **New Jersey Commission on Brain Injury Research**

### **Members of the Commission**

**Daniel Keating, Ph.D., Chairman**  
**Dennis Benigno**  
**Cathleen Bennett**  
**Meiling Chin, MBA**  
**Shonola Da-Silva, M.D., MBA**  
**Nicholas Ponzio, Ph.D.**  
**Mark Evan Stanley, Ph.D.**  
**Dennie Todd**

### **Commission Personnel**

**Christine Traynor, Administrator**  
**Mary Ray, Fiscal Administrator**

**225 East State Street, 2<sup>nd</sup> Floor West, Trenton, New Jersey 08625**  
**609-633-6465**

## **New Jersey Commission on Brain Injury Research**

### **ACKNOWLEDGMENTS**

The New Jersey Commission on Brain Injury Research (NJCIBIR) would like to express its sincere appreciation to all Commission members, and to the New Jersey Department of Health for their expertise, time, and effort that contributed to the development of this report and support of the program throughout the year.

The NJCIBIR also acknowledges the contributions of the Center for Health Statistics for the brain injury surveillance statistics, and to staff members Christine Traynor and Mary Ray for their contributions of substantial material as well as their review and valuable comment.

# **New Jersey Commission on Brain Injury Research**

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## 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 \$21 million to individual scientists at various academic and research institutions, and approved 46 separate scientific research projects.***

- *Since 2007, fourteen 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 four grant programs in Fiscal Year 2013:***

- *Individual Research Grants*
- *Programmatic Multi-Investigator Research Grants*
- *Pilot Research Grants*
- *Postdoctoral and Graduate Fellowship Grants*

❖ ***NJCIBIR 2013 Achievements:***

- *Thirty-eight applications requesting \$15.4 million were submitted.*
- *Ten awards were made in 2013 totaling \$3,813,465.*  
*Seven Individual Research grants totaling \$3,442,169, one Pilot Research grant totaling \$170,296, and two Fellowship grants totaling \$201,000 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 ninth year of operation, the NJCBIR has funded 46 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.

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

## **New Jersey Commission on Brain Injury Research**

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.

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,

## **New Jersey Commission on Brain Injury Research**

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](http://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:

#### **Basic Studies**

## **New Jersey Commission on Brain Injury Research**

- 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.

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

## **New Jersey Commission on Brain Injury Research**

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**

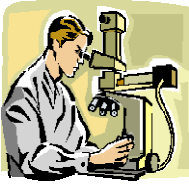
Grant programs are designed to provide opportunities attractive to a wide range of researchers. Awards are intended to promote collaboration among brain injury researchers in New Jersey and encourage innovative research, not to provide long-term support. It is expected that this initial support will 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.

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

## New Jersey Commission on Brain Injury Research

### 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)*

### 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.*



## **New Jersey Commission on Brain Injury Research**

### **2007- 2013 NJCBIR SUMMARY AND PERFORMANCE RECORD**

Since 2007, the New Jersey Commission on Brain Injury Research has funded 46 separate scientific research projects to scientists at New Jersey academic and research institutions. These awards represent an investment in brain injury research of over \$21 million.

Approximately 35 grant applications are received annually; approval of six or more new grant awards totaling between \$2.5 and \$3.5 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  
Rutgers, State University of New Jersey  
Kessler Medical Rehabilitation Center  
Stevens Institute for Technology  
Princeton University  
Cooper University Hospital Research Institute  
Atlantic Health Care System Neuro. Institute  
St. Barnabas Medical Center  
The Center for Neurological & Neurodevelopment  
Health LLC, Clinical Research Center of NJ, &  
The Center for Neurological & Neurodevelopment  
Health II, Inc. – NeurAbilities

Coriell Institute for Medical Research  
New Jersey Institute of Technology  
Hackensack University Medical Center  
International Brain Research Foundation  
Englewood Hospital Research  
JFK Neuroscience Institute  
Edge Therapeutics, Inc.  
Rowan University  
Morristown Medical Hospital &  
Medical Center

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**

### **2013 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.

#### **2013 Applications**

2013 saw the New Jersey Commission on Brain Injury Research in its ninth year of operation and its seventh cycle of grants.

In 2013, four types of grant programs were offered. They included Individual Research grants, Fellowship grants, Programmatic Multi-Investigator Research 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 38 grant applications were received. Ten grants were awarded totaling \$3,813,465. The grant awards included seven Individual Research grants, two Fellowship grants, and one Pilot Research grant.

#### **2013 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.

## **New Jersey Commission on 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*.

### **2013 Grant Cycle Information**

**Grant Application Deadline: October 3, 2012**

**Award Notification Date: April 30, 2013**

#### **Available Grant Programs:**

- **Individual Research Grants**
- **Programmatic Multi-Investigator Research Grants**
- **Fellowship Grants**
- **Pilot Research Grants**

### **GRANTS PROGRAM FOR 2014**

For Fiscal Year 2013, the New Jersey Commission on Brain Injury Research allocated up to \$6.5 million dollars for brain injury research projects.

### **2014 Grant Cycle Information**

**Grant Application Deadline: October 3, 2013**

**Award Notification Date: April 30, 2014**

#### **Available Grant Programs:**

- **Individual Research Grants**
- **Programmatic Multi-Investigator Research Grants**
- **Fellowship Grants**
- **Pilot Research Grants**

### **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 Commission on Brain Injury Research

### New Jersey Traumatic Brain Injury Surveillance System

#### Hospitalizations for TBI by Gender, New Jersey, 2000 - 2012

| 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 | 7,617 | 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 | 132.0 | 4,042   | 75.2 | 9,605 | 102.5 |
| 2012 | 5,893 | 137.8 | 3,963   | 72.7 | 9,856 | 103.9 |

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, 2013.

#### Discharge Disposition of the Major Causes of Traumatic Brain Injuries, 2012

| Cause of Injury            | Home/<br>Routine |             | Extended<br>Inpatient<br>Care <sup>1</sup> |             | Home<br>with<br>Services <sup>2</sup> |            | LTC,<br>Nursing,<br>Hospice <sup>3</sup> |            | Rehab        |             | Left<br>AMA |            | Died       |            | Total<br>N   |
|----------------------------|------------------|-------------|--------------------------------------------|-------------|---------------------------------------|------------|------------------------------------------|------------|--------------|-------------|-------------|------------|------------|------------|--------------|
|                            | N                | %           | N                                          | %           | N                                     | %          | N                                        | %          | N            | %           | N           | %          | N          | %          |              |
| Motor vehicle<br>(Traffic) | 1,449            | 65.5        | 228                                        | 10.3        | 103                                   | 4.7        | 12                                       | 0.5        | 292          | 13.2        | 28          | 1.3        | 101        | 4.6        | 2,213        |
| Falls                      | 2,241            | 41.1        | 1,535                                      | 28.1        | 447                                   | 8.2        | 144                                      | 2.6        | 688          | 12.6        | 68          | 1.2        | 333        | 6.1        | 5,456        |
| Assault                    | 630              | 82.8        | 36                                         | 4.7         | 8                                     | 1.1        | 2                                        | **         | 29           | 3.8         | 25          | 3.3        | 31         | 4.1        | 761          |
| Self-Inflicted             | 13               | 34.2        | 15                                         | 39.5        | 0                                     | -          | 0                                        | -          | 4            | **          | 0           | -          | 6          | 15.8       | 38           |
| Other/Unknown              | 833              | 60.0        | 216                                        | 15.6        | 92                                    | 6.6        | 30                                       | 2.2        | 130          | 9.4         | 26          | 1.9        | 61         | 4.4        | 1,388        |
| <b>Total</b>               | <b>5,166</b>     | <b>52.4</b> | <b>2,030</b>                               | <b>20.6</b> | <b>650</b>                            | <b>6.6</b> | <b>188</b>                               | <b>1.9</b> | <b>1,143</b> | <b>11.6</b> | <b>147</b>  | <b>1.5</b> | <b>532</b> | <b>5.4</b> | <b>9,856</b> |

Hospitalization data are from the New Jersey Central Nervous System Injury Surveillance, 2013; percentages are based on New Jersey residents admitted to New Jersey hospitals, all outcomes.

\*\* Percentages not calculated for under 5 observations.

#### Notes:

<sup>1</sup>Includes discharges/transfers to other short term general care hospitals, skilled nursing and intermediate care facilities, federal hospitals, psych units, and critical access hospitals. <sup>2</sup>Includes discharges/transfers to home with either a home health service provider or IV therapy. <sup>3</sup>Includes discharges/transfers to long-term care facilities, Medicaid certified nursing facilities and hospice.

## 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 2013  
FUND BALANCE STATEMENT:

|                                              | SFY 2013<br><i>Projected</i> | SFY 2013<br><i>Actual</i> | SFY 2014<br><i>Projected</i> |
|----------------------------------------------|------------------------------|---------------------------|------------------------------|
| <b>Opening Fund Balance (July 1)</b>         | \$5,509,431                  | \$5,622,775               | \$1,366,413                  |
| <b>Revenues</b>                              |                              |                           |                              |
| Assessments <sup>1</sup>                     | \$3,600,000                  | \$4,033,298               | \$3,600,000                  |
| Investments Earnings - Interest <sup>2</sup> | \$20,000                     | \$23,134                  | \$20,000                     |
| Total Revenue:                               | \$3,620,000                  | \$4,056,432               | \$3,620,000                  |
| <b>Total Funds Available</b>                 | \$9,129,431                  | \$9,679,207               | \$4,986,413                  |
| <b>Disbursements and Expenses</b>            |                              |                           |                              |
| Spending Plan Reduction                      | \$0                          | \$4,464,626               |                              |
| Disbursements to Grantees                    | \$6,532,500                  | \$3,792,485               | \$4,200,000                  |
| Total disbursements                          | \$6,532,500                  | \$8,257,111               | \$4,200,000                  |
| <b>Expenses</b>                              |                              |                           |                              |
| Administrative & Office expense              | \$60,750                     | \$25,265                  | \$70,000                     |
| Professional Review Panel                    | \$50,000                     | \$30,418                  | \$50,000                     |
| NJCSCR Registry                              | \$0                          | \$0                       | \$0                          |
| Total expenses                               | \$110,750                    | \$55,683                  | \$120,000                    |
| <b>Total Disbursements and Expenses</b>      | \$6,643,250                  | \$8,312,794               | \$4,320,000                  |
| <b>Closing Fund Balance (June 30)</b>        | \$2,486,181                  | \$1,366,413               | \$666,413                    |

<sup>1</sup>Net revenue variance

<sup>2</sup>Funds plus interest deposited annually in Jan.

## New Jersey Commission on Brain Injury Research

### 2013 RESEARCH GRANT AWARDS

#### **INDIVIDUAL RESEARCH GRANT RECIPIENTS:**

**Steven Levison, Ph.D.**  
UMDNJ – NJ Medical School

Grant Award: \$537,500

Project Title: *Improving Cell Replacement After Traumatic Brain Injury*

Pediatric TBI is a significant and under-appreciated problem. In the state of New Jersey the financial burden of pediatric TBI is approximately \$20 million/year in hospital costs alone (NJCBIR Annual Report). Given the enormous financial burden, the emotional burden placed on caregivers and the fact that injury evolves differently in children than adults; there is strong rationale to study pediatric TBI.

Ideally, one would want to identify a therapeutic that would both preserve injured neurons and stimulate the replacement of those neurons and glia that had been irreversibly damaged. The goal of this project is to study the regeneration of new brain cells from the precursors that reside in the Subventricular Zone (also known as the “brain marrow”) in a mouse model of pediatric TBI. Furthermore, we will test the effects of a therapeutic growth factor to determine whether the intranasal delivery of this growth factor will both reduce the extent of brain damage and also stimulate regeneration from the stem cells in the brain marrow. Analyses will be performed at the molecular, cellular, systems and behavioral levels to assess the ultimate success of our intervention.

Our ongoing studies indicate that the neural precursors of the Subventricular Zone are activated by traumatic brain injury and that their activation coincides with an increase in the growth factor, LIF, which is known to increase the production of new neural stem cells. But, the stem cell response is short lived (as is the increase in LIF); therefore, a primary goal of this research proposal is to more fully define which precursors are activated by traumatic brain injury, to establish the mechanisms that regulate their responses to injury and to test the therapeutic efficacy of intranasally administered LIF, that we predict will both preserve damaged neurons and enhance the regenerative capability of the cells of the brain marrow.

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## New Jersey Commission on Brain Injury Research

### NEW JERSEY COMMISSION ON BRAIN INJURY RESEARCH GRANT AWARDS

**Loren W. Runnels, Ph.D.**

Grant Award: \$533,240

UMDNJ – Robert Wood Johnson Medical School

Department of Pharmacology

Project Title: *Role of TRPM7 in Traumatic Brain Injury*

The overall goal of my research is to understand how misregulation of ion homeostasis contributes to the injury and ultimate death of neurons following traumatic brain injury (TBI).

TBI from falls, traffic accidents, assault, and sports affects an estimated 12,000 people in the state of New Jersey annually. However, as of now there are no specific drugs that work very effectively to limit neuronal damage in the hours and days following TBI.

Ion channels are macromolecular proteins that span the lipid bilayer of cell membranes. Long recognized for their crucial role in generating and orchestrating the signals that drive the firing of neurons, their misregulation can change the concentration of ions, such as  $\text{Ca}^{2+}$ ,  $\text{Mg}^{2+}$  and  $\text{Zn}^{2+}$  in cells, thereby increasing the stress on already injured neurons.

In a landmark 2003 publication in the journal *Cell*, the TRPM7 ion channel was revealed to be playing a critical role in neuronal cell death. Due to TRPM7's involvement in this process, the channel has been proposed as a possible drug target for the treatment of TBI. Using the well-established lateral fluid percussion (LFP) model, our aim is to evaluate whether TRPM7 may be a suitable drug target for TBI by investigating whether mice lacking TRPM7, or one of its two critical functional domains experience less injury following TBI.

We will also isolate neurons from mice lacking TRPM7, or its critical functional domains and use the isolated neurons to study how the channel is affecting the concentration of ions following injury, levels of reactive oxygen species, and cell survival. By using this genetic approach we will determine whether TRPM7 is a bona fide drug target for TBI with the goal of establishing a rationale for future drug development for TBI.

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**NEW JERSEY COMMISSION ON BRAIN INJURY RESEARCH  
GRANT AWARDS**

**William Craelius, Ph.D.**

Grant Award: \$539,000

Rutgers, The State University of NJ  
Department of Biomedical Engineering

Project Title: ***Continuous Monitoring of Hemodynamic Autoregulatory Factors  
after Traumatic Brain Injury***

Traumatic brain injury (TBI) is a devastating event which affects up to 15,000 of New Jersey children and adults, and their families each year. About 1,000 of these individuals die each year, and approximately 175,000 New Jersey individuals are currently TBI survivors with disability.

After severe TBI, the brain commonly swells uncontrollably, causing further damage to function. There are treatments to prevent swelling, but it is difficult to predict when these should be applied, since we do not fully understand what triggers the swelling. As a result, treatment often comes too late, and patients suffer further damage or death.

This project seeks to develop a method to predict the swelling event, up to an hour before it happens. The research teams, including Neurosurgeons and Biomedical Engineers, have devised a monitoring device that will use modern information technology and historical data from previous patients to predict the likelihood of swelling in the near future. This intelligent device will help Physicians make informed decisions, thereby improving patient outcomes.

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**NEW JERSEY COMMISSION ON BRAIN INJURY RESEARCH  
GRANT AWARDS**

**Frances Calderon, Ph.D.**

Grant Award: \$539,733

UMDNJ – NJ Medical School

Department of Neurology & Neuroscience

Project Title: ***Enhancement of Neural Stem Cell Survival and Transplantation  
Efficacy by Docosahexaenoic Acid and its Derivative NPD1 in  
Traumatic Brain Injury***

Traumatic brain injury (TBI) is one of the most common causes of death and disability in the United States: 220,000 hospitalizations, 52,000 deaths from head trauma, and 80,000-90,000 patients suffering from permanent disability each year.

TBI results in long lasting consequences on the cognitive ability of patients due to neuronal loss. Neural stem cells have emerged as an attractive therapeutic solution to repair the damaged brain. Despite significant progress in stem cell transplantation after brain injury, success has been limited mainly due to the low efficiency of grafted cell survival.

Here, we propose to investigate whether docosahexaenoic acid (DHA) – a natural nutritional supplement, frequently found in fish, and its derivative NPD1, can serve as potential candidates for improving the efficacy of neural stem cells transplantation in the injured brain. We will evaluate the beneficial actions of DHA and NPD1 supplementation in stem cells transplantation after TBI using a rat model of focal contusion.

We also hope to gain a better understanding of the cellular mechanisms by which DHA/metabolites can facilitate engrafting of stem cell after brain injury. The expected results may support a therapeutic value for DHA/NPD1 for TBI treatment.

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**NEW JERSEY COMMISSION ON BRAIN INJURY RESEARCH  
GRANT AWARDS**

**Smita Thakker-Varia, Ph.D.**

Grant Award: \$360,000

UMDNJ - Robert Wood Johnson Medical School

Department of Biomedical Sciences

Project Title: *Ephrin Signaling in Axon Regeneration for the Treatment of TBI*

In the U.S.A. every year, about 1.7 million people suffer brain injuries from traumatic events. Approximately 12,000-15,000 of those people are from New Jersey. About one-third of the injuries result in lifelong disabilities incurring immeasurable costs to the families and society. According to recent reports from the CDC, traumatic brain injury (TBI) contributes to about 30% of all injury-related deaths. TBI leads to many neurological defects including impaired learning and memory and motor function. However, no treatments to reverse the damage exist.

As the cellular processes and molecular factors underlying the pathology of brain injury are still unclear, it is important to define these mechanisms before specific therapies can be developed. Following TBI there is neuronal loss and axonal damage resulting in disruption of neural circuits. These damaged connections can be situated by regenerating axons. Inhibitors of axon regeneration are found in the brain, and we are proposing to study the function of one such family of molecules, Ephrins and their receptor, Eph. Using genetically modified mice that have specific Ephrin/Eph ligands and receptors deleted, we will evaluate axon regeneration and behavioral effects of TBI. These mice will also be crossed to other mice such that their neurons in cortex are labeled with a fluorescent protein, to facilitate visualization. Understanding the inhibitory role of this molecule will direct us in designing therapeutic approaches. Candidate pharmacological agents will also be tested to see if the performance in mice is improved after TBI.

As the most densely populated state with a high rate of automobile accidents, New Jersey is particularly devastated by incidences of TBI. Furthermore, the general population suffers financial consequences in supporting the victims of TBI. The pharmaceutical companies located in NJ will serve as a resource in advancing our research on Eph receptors to the next level, impacting many spheres in New Jersey.

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**NEW JERSEY COMMISSION ON BRAIN INJURY RESEARCH  
GRANT AWARDS**

**Jean Lengenfelder, Ph.D.**  
Kessler Foundation

Grant Award: \$397,941

Project Title: *Neural Substrates of Facial Emotion Processing in Individuals with TBI*

A significant number of individuals with TBI report difficulty maintaining personal relationships and social support. Previous research has demonstrated these challenges to be the result of impaired emotional processing in persons with TBI. Specifically, individuals with TBI are not able to recognize facial affect in others as well as non-injured individuals can. This can lead to difficulty in social and emotional functioning. While we know these impairments exist, we do not know why these impairments occur in TBI or how they can be treated. This study set out to answer this question.

We hypothesize that diffuse axonal injury (DAI: the primary damage in TBI) is responsible for damaging connections between regions essential for emotional processing. We will examine the extent to which emotional processing deficits in TBI are due to abnormalities in structural and functional connectivity in TBI, using 3 different neuroimaging metrics (Diffusion Tensor Imaging, resting-state Functional Magnetic Resonance Imaging, and fMRI during task performance).

We will investigate the damage to brain structures critical to emotional processing, and how they relate to brain activity during a task requiring emotional processing. By examining these three-imaging techniques we believe we can begin to understand the neural network underlying emotional processing impairments in TBI. The identification of this neural network can then be used in future research to identify effective rehabilitation techniques to improve emotional processing in persons with TBI.

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**NEW JERSEY COMMISSION ON BRAIN INJURY RESEARCH  
GRANT AWARDS**

**Jennifer Buckman, Ph.D.**

Grant Award: \$534,755

Rutgers, The State University of NJ  
Center of Alcohol Studies

Project Title: ***Developing a Comprehensive Clinical Profile of TBI in Concussed Athletes Using Advanced Statistical Approaches***

The Center for Disease Control and Prevention estimates that 173,000 nonfatal sports and recreation related traumatic brain injuries (TBI) are treated annually in the United States. College athletes are at particularly high risk for sports-related TBI due to the competitive nature of sports at this level. Treatment providers currently cannot accurately predict TBI symptom severity or recovery, yet some individuals with TBI experience sustained and debilitating symptoms while others are virtually symptom free.

The proposed research program seeks to find the best existing clinical symptom predictors of TBI severity and recovery rate in NCAA Division I athletes by assessing pre- and post-injury clinical, mental, and physical health symptoms.

The overall project will examine pre-injury data from approximately 1,000 Rutgers student athletes across three years, and post-injury data from approximately 300 incidents of mild, moderate, or severe TBI that are treated in the Rutgers Department of Sports Medicine. The goal is to identify an easily administered yet highly predictive assessment protocol that streamlines clinical assessment and begins to build objective guidelines for return-to-play decisions, as well as other life decisions.

This project has high potential “translation” impact, meaning that its results can be immediately applied to real world clinical decisions that affect the lives of student athletes at Rutgers who suffer TBIs and be shared with other colleges and high schools in New Jersey. It may also help improve the lives of others who suffer a TBI unrelated to sports.

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**NEW JERSEY COMMISSION ON BRAIN INJURY RESEARCH  
GRANT AWARDS**

**FELLOWSHIP RESEARCH GRANT RECIPIENTS:**

**Myka Ababon**

Grant Award: \$100,500

UMDNJ – Robert Wood Johnson Medical School  
Department of Neuroscience & Cell Biology

Project Title: ***Retinoic Acid Signaling, the Orphan GPCR, Gpr161, and Adult Brain Stem Cells***

Traumatic brain injury (TBI) is caused by sudden trauma to the head. Symptoms resulting from TBI can range from mild concussions to permanent debilitating disability. Another type of brain injury is stroke, which occurs when blood flow to the brain is blocked, either due to a blood clot (ischemic stroke) or a ruptured blood vessel in the brain (hemorrhagic stroke). In both cases, brain damage is irreversible and no known treatment exists.

Neural stem cells provide a therapeutic route to replace damaged neurons after brain injury. A specialized region in the adult forebrain known as the subventricular zone (SVZ) contains a population of these stem cells. Understanding the molecular mechanisms regulating the proliferation of these stem cells will help develop therapeutics to aid neurogenesis after brain injury.

Retinoic acid (RA) has been shown to enhance proliferation of SVZ stem cells. Gpr161, an uncharacterized receptor, also regulates proliferation of adult stem cells in the SVZ and spinal cord. Preliminary findings reveal that RA is sufficient to activate Gpr161 expression in neuronal cells.

This study aims to investigate whether RA and Gpr161 act together to regulate proliferation of adult stem cells. The long term goal is to manipulate these signaling pathways to enhance neurogenesis and stem cell proliferation after brain injury.

Finally, Gpr161 belongs to a class of receptors that are the targets of more than 50% of currently available drugs in the market. This makes Gpr161 an extremely amenable potential pharmaceutical target to activate SVZ stem cell proliferation after brain injury.

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**NEW JERSEY COMMISSION ON BRAIN INJURY RESEARCH  
GRANT AWARDS**

**Kate Fitzgerald**

Grant Award: \$100,500

Rutgers, The State University of NJ

Department of Cell Biology & Neuroscience

Project Title: *The Neuroprotective Effects of BDNF after TBI*

Traumatic brain injury (TBI) affects millions of people in the United States per year, and can change a life forever by causing severe functional deficits in the brain. Deficits occur because neurons, the cells responsible for communication in the brain, become damaged and are unable to communicate properly with other neurons. To communicate, neurons send and receive signals; receiving signals relies on certain features known as dendrites. If dendrites are damaged by mechanical or chemical means, such as after TBI, the neuron cannot function as it had previously. Widespread damage to many neurons leads to diminished overall functioning in the brain, which is manifested in severe cases of TBI.

As TBI is characterized by an immediate mechanical injury followed by a delayed chemical injury, our laboratory has developed methods to mimic both of these injuries. Previously, we have shown the effects of the chemical injury on neuron functionality, and this project will build on those results by also studying the mechanical component of TBI. Additionally, as several drugs recently failed clinical trials for protecting against this chemical injury, we will investigate the protective potential of brain-derived neurotrophic factor (BDNF), a growth factor also present in neurons that survive injuries. Our laboratory has previously shown that BDNF increases dendrite number. Thus, we hypothesize that BDNF will also increase neuronal electrical activity, and as it promotes survival, will protect neurons from damage by TBI.

We will evaluate changes in functionality using two non-invasive techniques: microelectrode array (MEA) technology and calcium imaging. The techniques are complementary to one another because MEAs allow for the activity of many neurons to be observed at once while calcium imaging provides detailed activity profiles of single neurons. Neuron morphology will also be taken into account as an additional parameter for evaluating BDNF's protection of neurons. Examining the protective effects of BDNF with regard to both morphology and functionality will provide a new direction for TBI research and potentially a new therapeutic target.

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**NEW JERSEY COMMISSION ON BRAIN INJURY RESEARCH  
GRANT AWARDS**

**PILOT RESEARCH GRANT RECIPIENT:**

**Victoria Leavitt, Ph.D.**  
Kessler Foundation

Grant Award: \$170,296

Project Title: ***A Randomized Controlled Trial of Aerobic Exercise to Improve Memory in TBI***

Aerobic exercise holds a multitude of health benefits. Studies in mice have shown that aerobic exercise improves memory, and increases the volume of the hippocampus, the brain's primary memory center. Only two studies to examine this have been conducted in humans, healthy elders and schizophrenia patients. There has never been an aerobic exercise trial in traumatic brain injury (TBI) patients looking at hippocampal volume and memory.

This project is a randomized controlled trial of aerobic exercise in persons with TBI. We have collected strong pilot data showing the efficacy of a 12-week program of aerobic exercise (stationary cycling), versus a control condition of stretching in memory-impaired multiple sclerosis patients. Like TBI, multiple sclerosis generally affects people in early adulthood, and memory impairment is a cardinal symptom.

The primary goals of the proposed intervention are to: a) increase hippocampal volume, and b) improve memory. Importantly, our pilot data also show benefits of aerobic exercise on the level of brain function. Specifically, we looked at 'functional connectivity,' which refers to how efficiently remote regions of the brain 'talk' to each other. After taking part in the aerobic exercise program for 12 weeks, greater connectivity was observed across brain regions. TBI is an ideal population to benefit from aerobic exercise, given the early age of diagnosis, which allows for benefits of aerobic exercise to be maximally realized in a population with sufficient neurofunctional reserve. The expected benefits of aerobic exercise (increased hippocampal volume, improved memory) from this intervention stand to have a meaningful impact on people with TBI, including improved health, productivity, independence, and quality-of-life. And, unlike current treatments for memory impairment (e.g., pharmacological agents, cognitive rehabilitation), aerobic exercise is a cost-effective, all natural, readily-available treatment for memory problems.

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