

Traumatic Brain Injury

Making a Difference Today

Whether it's from a slip on the ice, a crash into the windshield, or a collision during a football game, each year an estimated 1.5 million Americans sustain a traumatic brain injury (TBI). Characterized by a sudden blow to the head, this type of injury can brutally damage the brain and its functioning.

Some die as a result of the injury. Many others will experience significant disabilities for the rest of their lives. In fact, TBI is a leading cause of disability among American children and young adults. Survivors can experience a range of lasting impairments, including problems with communication, emotion, sensation, movement, or thinking.

The annual cost to society is about \$50 billion.

Research Equals Improved Recovery

The human brain is the body's most complicated organ and trauma is the most complicated form of injury, so it is not surprising that TBI is particularly challenging to treat. Although there are currently no approved therapies for recovery of function, thanks to research, methods are available to help stave off some of the problems caused by head injuries.

For example, improvements in imaging techniques such as computed tomography, known as a CT scan, or magnetic resonance imaging, an MRI, now allow health-care practitioners to photograph the brain and see potentially life-threatening complications. This allows them to act faster and stabilize patients quickly.

Along with measuring pressure within the brain cavity, imaging tests can identify brain tissue swelling. Many injuries trigger swelling and fluid accumulation. But unlike swelling tissue from bodily injuries, the brain, with its snug fit in the skull, has no room to expand. This makes any swelling after a head injury a serious concern.

To counter swelling, doctors have used moderate hyperventilation and now look to another advance, the use of mannitol. This drug can help draw water away from the brain and reduce the pressure of the brain against the skull. If these efforts do not reduce swelling, patients can be given drugs that put more of the brain into a deep sleep as a way to slow and conserve the brain's functioning. As a last resort, part of the skull or brain may be removed.

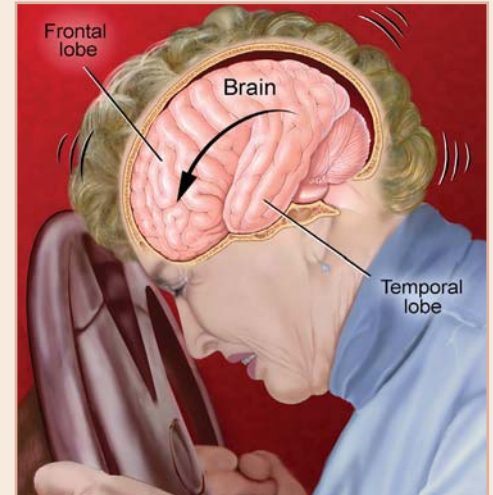
A TBI can result in much more than swelling. At the core, a head injury can damage circuits of cells in our brain tissue that transmit information and control various actions, thoughts, or sensations. As a result, disability can remain even after swelling has been reduced.

Research Leads to Better Treatments

Research funded by the National Institutes of Health (NIH) is pointing to new strategies that could take direct action against the injury and create much greater improvements in patient care. Techniques that hold promise include the use of transplanted neural stem cells. Recent animal research, sponsored in part by NIH, provides evidence that cell transplant strategies may promote the repair of an injured brain and help restore lost abilities. Still, following TBI, the environment within which these transplanted cells must survive and grow is fundamentally changed.

With continued support from NIH, researchers could overcome some of the limitations of current treatments and help improve the lives of thousands of people.

For more information please email brss@sfn.org.



A traumatic brain injury from a car crash, fall, or sports-related incident can create a variety of lasting behavioral and mental changes, depending on the areas of the brain that are injured. The frontal and temporal lobes of the brain—major speech and language areas—often receive damage. Impaired swallowing, walking, or coordination as well as changes in the ability to smell, remember, or think can all result from the injury.

Continued funding for research could lead to:

- A greater understanding of the potential of cell transplant techniques for the treatment of TBI as well as many additional ailments.
- An increase in the translation of basic research into clinical research based on positive animal studies showing improved recovery after a combination of techniques, including metabolic therapy, cell transplants, and other investigational techniques.
- New treatments that might help many people regain functions lost as a result of a TBI.



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Traumatic Brain Injury

Making a Difference Tomorrow

Traumatic brain injury (TBI) from a sudden blow to the head continues to be a major public health problem. While there has been notable progress in patient care, treatments still do not adequately treat the brain cell damage resulting from injury. Many people continue to face lasting impairment that affects their independence and daily lives.

Did you know that:

- An estimated 1.5 million Americans sustain a TBI each year.
- More than 5 million injured American men, women, and children are living with a TBI-related disability today.
- In the United States in 1995, TBI cost an estimated \$56.3 billion in direct medical costs and indirect costs, such as lost wages.

Continued funding for research could help scientists develop new therapies that reverse brain damage and significantly improve the lives and finances of numerous Americans.

Research Equals Hope for the Future

Cell transplants are one investigational technique that could potentially provide dramatic improvements in treatment. Scientists long imagined that, in the same way new bricks can repair a crumbling bridge, transplants of fresh cells might help rebuild damaged brain cell circuits that occur from a head injury. The discovery of neural stem cells, which appear to have a knack for integrating into damaged circuits and transforming into needed cell types, has given the idea some momentum. In addition, these cells might also be used to deliver small molecules that can protect the brain from further damage.

One key study, partly funded by the National Institutes of Health, recently found that stem cell transplants could develop into brain cells and be incorporated into the injured brains of mice. What's more, evidence indicated that the transplants helped the animals recover lost movement functions.

Additional work shows that other techniques under investigation for treating TBI, such as intense exercise programs and regimens that expose the injured to a highly stimulating environment, may enhance the success of transplants. Studies in animals indicate that both techniques can aid recovery from brain injury. Research also suggests that exercise as well as stimulation strategies can generate a release of growth factors, molecules that are known to help cells survive in the brain naturally. A study is under way that treats head-injured animals with both a stimulating environment and transplants.

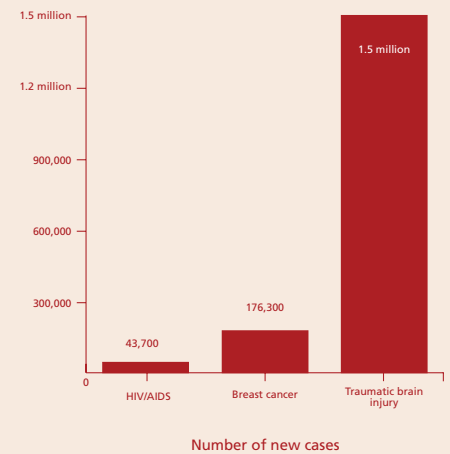
Hope for Other Diseases

Insights from this research also could improve the treatment of other disorders. For example, scientists are examining the ability of cell transplants to treat deficits in brain or spinal cord function that result from spinal cord injury, multiple sclerosis, and Parkinson's disease.

With continued funding and progress, new strategies based on this work could help cut costs to society and allow many patients to reclaim some normality in their lives.

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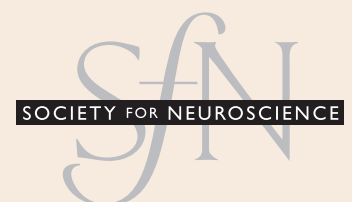
Incidence of selected health problems in the United States



An estimated 1.5 million Americans sustain a TBI each year, which is eight times the number of people diagnosed with breast cancer and 34 times the number of new cases of HIV or AIDS, according to the Centers for Disease Control and Prevention.

Already research has led to:

- The introduction of imaging techniques that allow health-care practitioners to photograph the brain and see potentially life-threatening complications from a TBI, such as brain swelling, so they can act faster to stabilize patients.
- The use of agents to counter the detrimental brain swelling that can occur after a head injury.
- A greater understanding of the potential of transplant techniques for the treatment of TBI.



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