addresses different secondary consequences; combining two or more of these therapies might have a cumulative effect. Therefore, the present study was designed to determine if any potential synergistic effects exist between the three approaches following TBI. Male Long-Evans rats received either a medial frontal cortex contusion injury or a sham surgery. After injury, animals were assigned to either an EE or standard environment (SE). Progesterone (10 mg/kg) or a vehicle was administered four hours post-surgery and every 12 hours after, for 72 hours. Half of the animals received ~100K eNSCs or media one week post-injury. Subjects were evaluated on the Barnes maze (BM), Morris water maze (MWM), and the rotorod (RR). Following the behavioral portion of the study, the animals were perfused, extracted, and prepared for histological investigation. The subjects that received all three therapeutic approaches performed significantly better than untreated injured subjects on all three behavioral tests. Stereological analysis revealed that animals that received eNSC and EE had greater cortical volume and the animals that received eNSC, PROG, and EE had a greater average number of cells in the hippocampus than any other treatment. Confocal immunofluorescence imaging combined with advanced optical clearing techniques (SeeDB) confirmed that eNSCs survived, migrated from the transplantation site, and expressed neural characteristics. These data suggest that a polytherapeutic approach improves recovery. However, the direct mechanism (independent or in combination) has yet to be elucidated. Future research should be focused on understanding how these approaches act together to improve recovery.

Key words

behavioral recovery, embryonic neural stem cells, enriched environment, polytherapy, progesterone, SeeDB

B1-11

IDENTIFICATION OF MILITARY OCCUPATIONS MOST LIKELY TO SUFFER MILD TRAUMATIC BRAIN INJURY (MTBI) AND RELATED SENSORY INJURIES

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Military return-to-duty decisions following mTBI are based on medical screening and physical readiness exams. Improving such decisions requires identifying occupations affected by mTBI and determining whether occupation-critical skills are disrupted.

This epidemiological study identified the occupations most susceptible to mTBI and related neurosensory problems. The team narrowed down 1,500 medical injury codes to the 25 most relevant to acceleration/blast injuries across four categories: head/brain, vision, auditory, vestibular. (These injuries will be presented since they are of interest to studies of neurotrauma and sensory disorders.) We identified the top-ten most-affected jobs in each of the 25 codes using data from the Defense Medical Epidemiology Database. The 250 most-affected jobs (with the highest rate of injured-versus-total personnel) were ranked by how frequently they occurred in the top-ten list for each injury category. These lists were used to identify the overall top-three most-affected occupations. Finally, we determined the critical skills needed to perform each job, to identify job-critical deficits.

The most relevant mTBI-related injury codes and categories were identified. We confirmed that some jobs are more likely to suffer from these injuries. The top-three most affected occupations were Infantry, Cavalry Scout, and Artillery. We determined that certain key injuries would disrupt job-critical performance of these jobs. Additionally, we found that Special Forces ranked in the top-ten for head/brain injuries but not any of the sensory injury categories, while Law Enforcement ranked in the top ten for sensory injuries but not head/brain.

mTBI and associated sensory disorders disproportionately affect certain military jobs in ways that make it difficult to perform those jobs. Certain key injuries disrupt abilities that are job-critical (e.g., firearms operation) and job-specific (e.g., Artillery gunnery); these injuries should be the focus of military neurotrauma research intended to improve rehabilitation and return-to-duty.

Key words

blast injury, fitness-for-duty, mild traumatic brain injury, military brain injury, return-to-duty

B1-12

PAIRING VAGUS NERVE STIMULATION WITH REHABILITATIVE TRAINING ENHANCES FUNCTIONAL RECOVERY AFTER TRAUMATIC BRAIN INJURY

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Traumatic Brain Injury (TBI) is one of the largest health problems in the United States, and affects nearly two million people every year. The effects of TBI, including weakness and loss of coordination, can be observed years after the initial injury. We have developed a method by which we drive cortical plasticity through stimulation of the vagus nerve during rehabilitative therapy to enhance recovery from TBI. We trained rats to perform the isometric pull task – a task that measures volitional pull strength. After animals were proficient at the task they received a controlled cortical impact in the forelimb area of left motor cortex, and were then randomized into two treatment groups. The first group of animals received vagus nerve stimulation (VNS) paired with rehabilitative therapy, while another group received rehabilitative therapy alone. We found that animals that received VNS paired with therapy achieved a full recovery of their forelimb strength, while animals that received only rehabilitative training did not significantly recover forelimb strength. Our findings indicate that pairing VNS with rehabilitative therapy enhances functional recovery, and further research is warranted to investigate how VNS may transfer to clinical settings.

Key words

vagus nerve stimulation

B1-13

WITHDRAWN