By Sophia Galvan

Neural Risk Management

Texas A&M University researchers from three colleges are seeking answers in neuroscience research to reverse the loss of function from injury, disease and aging.

If two minds are better than one, imagine what five of Texas A&M University's brightest researchers in behavioral and cellular neuroscience can accomplish for the millions of Americans affected each year by the loss of neural function from injury, disease and aging.

An outstanding team of interdisciplinary faculty, including researchers from the College of Liberal Arts, the College of Veterinary Medicine and Biomedical Sciences, and The Texas A&M University System Health Science Center College of Medicine, are combining their expertise to explore the neurobiological mechanisms that underlie the loss and recovery of function with aging, neurodegenerative disease, and neural injury.

The Recovery of Function group brings together expertise on neural injury, neurodegenerative disease, neuroimmunology, and neural plasticity and aging. Uniting these areas are two common themes: the neural environment and repair and plasticity.

"Exploration of the neural environment represents a major shift in neuroscience," says Dr. Mary Meagher, associate professor of psychology in the Behavioral and Cellular Neuroscience Program at Texas A&M. "We once focused only on neurons, but there is now an increased interest in how factors in the neurons' environment affect disease."

One example of such an environmental factor is stress. Meagher and Dr. Jane Welsh, associate professor in the College of Veterinary Medicine and Biomedical Sciences, are examining how stress alters susceptibility to infectious diseases that later result in autoimmune diseases like multiple sclerosis.

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"Theiler's virus infection in mice is used to investigate the role of psychological stress in altering the initial immune response to the acute infection and the persistence of the virus in the central nervous system," explains Meagher. "If the virus persists, it will trigger an autoimmune demyelinating disease that is similar to multiple sclerosis, where the immune system begins to attack the myelin sheath surrounding nerve cells." Using this model, Meagher and Welsh found that mice exposed to stress during early infection developed more severe signs of encephalitis and more severe demyelination and greater motor impairments during the later phase of the infection.

"We have also shown that early life stress, such a maternal separation during the first two weeks of life of an infant, increases vulnerability to virus infection later in life. This suggests that the infant's immune system is undergoing a critical period in development and that this significant early life stressor may increase vulnerability to infectious diseases later in life."

With the ability to link what is happening in a disease process at the cellular and molecular levels to behavioral and functional changes, Meagher and the other psychologists in the program, including her husband and fellow psychology department Professor Jim Grau, bring a new level of understanding beyond the cellular or molecular level of neuroscience. Linking behavioral changes to cellular mechanisms will help researchers identify treatments designed to restore neural function.

Dr. Grau, who in recent years broke new ground when he and his team of researchers demonstrated the spinal cord's ability to learn, hopes to develop new behavioral and pharmacological treatments to promote recovery of function after spinal cord injuries. His work, and that of collaborator Dr. Rajesh Miranda, associate professor in The Texas A&M System Health Science Center, contributes to the repair and plasticity aspect of the team's work. To the more than

Photo by Jim Lyle

Members of the psychology department's recovery of function team are l–r: Dr. Mary Meagher, Dr. Jim Grau, Dr. Mark Packard, Dr. Jennifer Bizon, and Dr. Barry Stelow

250,000 Americans living with spinal cord injuries, Grau's work is not only a victory for neuroscience, but also a fresh chance to regain lost faculties.

With funding from the Life Science Task Force Training Grant, the team has created the Recovery of Function Graduate Program in Neuroscience. The unique program aims to train students in basic research in pursuit of treatments that reduce neural loss and promote the restoration of function after neural injury and neurodegenerative diseases. Faculty from each of the three colleges bring their own unique abilities and perspectives to the program and its complex studies. In the future, the team looks forward to bringing new hope to patients experiencing loss of function. For now, they are busy exploring neuroscience from a whole new angle and, through the training program, fostering the next wave of groundbreakers in behavioral and cellular neuroscience.