The human digestive tract contains as many neurons as a cat’s brain. This mesh-like system of neurons within the intestinal wall, called the enteric nervous system, is responsible for controlling gastrointestinal functions.

Brian Gulbransen and his team are studying this “gut-brain” to identify causes of gastrointestinal (GI) motility disorders such as constipation, diarrhea and irritable bowel syndrome. GI motility disorders affect approximately 25 percent of humans worldwide and can be debilitating, embarrassing and extraordinarily expensive. There currently are no treatments for these disorders.

“We are interested in how these glial cells affect neuron function in health and during disease.”

“An underlying cause of GI motility disorders is inflammation in the gut, but little is known about how inflammation affects the enteric nervous system,” said Gulbransen, an assistant professor in the Department of Physiology and MSU’s Neuroscience Program.

The enteric nervous system is made up of neurons and non-neuronal cells called enteric glia. These glial cells were originally thought to function as support cells but Gulbransen’s research has shown that they can “talk” to neurons and vice versa, forming signaling loops.

“We are interested in how these glial cells affect neuron function in health and during disease,” said Gulbransen, who is also a member of MSU’s Molecular Metabolism and Disease research program.

His most recent research found that when the glial cells are activated by certain mediators, they kill off neurons.

“We discovered that inflammation can change the properties of the glial cells, disrupting signaling loops and causing neuron deaths in the gut,” Gulbransen explained. “So you lose a significant portion of enteric neurons and disrupt the balance of excitatory and inhibitory neurons controlling the gut smooth muscle. The resulting loss of control causes the muscles to contract too much or too little.”

Gulbransen’s work relies on cutting-edge technology to investigate glial cells, such as advanced fluorescent microscopy and targeted gene manipulation.

“We have been able to identify signaling pathways involved in neuron death,” he said. “We believe that by investigating these mechanisms, we will identify targets for therapeutics to either reverse or prevent the long-term effects of inflammation on the enteric nervous system and preserve gut function.”

Assistant professor Brian Gulbransen was honored as the 2013 New Investigator of the Year by the American Physiological Society, Gastrointestinal & Liver Physiology Section. This recognition, which comes with a $1,000 monetary award, recognizes an outstanding investigator in the early stages of his/her career that has made meritorious contributions to the field represented by the section.

Professor Steve Heidemann received the 2014 College of Natural Science Alumni Association Meritorious Faculty Award. The award is presented annually to a faculty member who has demonstrated excellence in the areas of teaching and research.

Assistant professor Erica Wehrwein received the 2013 Dale Benos Early Career Professional Service Award from the American Physiological Society (APS). The award honors an early career stage APS member who has made outstanding contributions to the physiology community and demonstrated dedication and commitment to furthering the broader goals of the physiology community.

Department of Physiology faculty members continue to distinguish themselves, landing a number of prestigious honors and awards over the past two years:

Assistant professor Eran Andrechek received the 2013 Outstanding Graduate Advisor Award from the College of Natural Science. The award is given annually to acknowledge advisors who demonstrate excellence in providing useful educational and career advice to NatSci students.