



Research in the Spotlight

Intestinal disease is severely debilitating to both veterinary and human patients. In horses, colic is the leading known cause of death. Additionally, gastrointestinal diseases affect approximately 60 to 70 million Americans annually. One of the most dangerous forms of intestinal disease that afflicts both humans and animals is intestinal ischemia and reperfusion injury, which result in a lack of blood flow to the intestine.

In the face of no new therapies for treatment of intestinal ischemia in decades, intestinal stem cells have been heralded as the greatest potential therapeutic because of their tremendous capacity for proliferation and mucosal repair. Intensive study is underway to understand and harness the therapeutic potential of intestinal stem cells. NC State is leading the way in the field of large animal intestinal stem cells and novel stem cell-driven structures called enteroids, or “mini guts.”

The Program

Liara Gonzalez, an assistant professor of gastroenterology and equine surgery at the North Carolina State University College of Veterinary Medicine, was the first to develop a large animal porcine model to study intestinal stem cells and was the first to identify these cells in horses.

She and her team are also the first to grow and expand intestinal stem cells into 3-D complex structures from tissues derived from both pigs and horses.

The Need

The development of new therapies to treat both human and veterinary species has been hampered by the lack of models in higher order mammals such as pigs and horses, as compared to the predominant species used in studies to date – the mouse. Stem cells are the source of intestinal renewal and using the capacity of these cells to expand may hold the key to improving intestinal repair after injury.

About Dr. Liara Gonzalez

Liara Gonzalez and her team are leading the field in the utilization of large animal models to study intestinal stem cells.

Dr. Gonzalez specializes in gastroenterology and equine surgery with a special emphasis on colic. Her work with horses with colic drives her research that aims to improve and innovate clinical medicine.

She is a diplomate in the American College of Veterinary Surgeons and holds a Ph.D. in comparative biomedical sciences. She is also passionate about improving the inclusion and acceptance of students of all backgrounds.

Among her honors are:

- Phi Beta Kappa, 2003
- National Institutes for Health Initiative for Maximizing Student Diversity Outstanding Mentor, 2011 and 2012
- Leroy Coggins Award for Large Animal Research, 2013
- American Association of Equine Practitioners Equus Foundation Research Fellow Scholarship, 2014
- NIH Ruth L. Kirschstein National Research Service Award, 2012-2014
- NIH Special Emphasis Research Career Award, 2015

The Opportunity

Dr. Gonzalez believes that her research targeting and utilizing the capacity of intestinal stem cells to repair injured intestines will have a broad impact, helping both veterinary and human patients suffering from intestinal disease.

Developing large animal models to better study human gastrointestinal disease is critical to the development of improved therapies.

A Message from Dr. Gonzalez:

“Working with horses suffering from colic and their loving and dedicated owners has been the driving force to improve the medicine we have to offer. The reality is that there has been a failure to develop new, innovative therapies despite the fact that colic is the leading cause of death from disease in horses. The treatment for severe intestinal disease in humans has stalled as well.

I believe that I am in a unique position to help both veterinary and human patients by my use of large animal models that better recapitulate clinical disease as well as through my research on harnessing the regenerative potential of intestinal stem cells.

The research that I am able to conduct here at NC State is unique in that I use both pigs and horses, animal species that are more similar to humans and other higher order mammals. Most researchers are restricted to the use of rodents. Although important information can be gleaned from rodent models, the information obtained from these models does not commonly translate well to human subjects.

For this reason, the National Institutes of Health emphasizes the importance of large animal model research. Using the porcine model is difficult because many of the reagents and tools for advanced research have been developed for use in rodents. That is why much of my research has focused on developing the pig as a model to study intestinal stem cells and gastrointestinal disease. One of the most exciting breakthroughs was our development of a 3-D intestinal stem cell culture technique. We are able to grow the innermost layer of the intestine into a 3-D structure. This development allows us to ask and answer questions at the molecular level that we can then go back and test in-vivo.

We have strong collaborations with both UNC and Duke medical schools to help develop and utilize large animal models to study gastrointestinal disease.

The potential to make a difference excites me. I always knew that I wanted to make a broad impact with my career. I am able to do that both with my research and the exciting advances that we have already made, as well as through teaching and mentoring future veterinarians and researchers. I want research to be exciting and fun and to inspire the next generation of clinician-scientists. Plus, our lab coats are tie-dyed. Need I say more?”



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