IRSF Spotlight: Monica J. Justice, PhD, Baylor College of Medicine

By Jim Keller

This month's installment features Dr. Justice from Baylor College of Medicine who will Co-Chair this year's Session on animal and human cellular models of Rett syndrome (RTT) at our 12th Annual Rett Syndrome Symposium and is also a 2010 IRSF ANGEL Grant Award recipient—the second of its kind. Her project titled "Developing new therapeutic targets for amelioration of Rett Syndrome from the identification of genetic suppressors in mice" applies cutting-edge techniques to the discovery of suppressors of the symptoms of Rett syndrome. This project uses genetic strategies in mice to identify genes that, when altered, ameliorate the symptoms caused by the mutation of MeCP2. Though Dr. Justice's approach has had very powerful applications in bacteria, flies and worms, rarely has a forward genetic screen for suppressors been carried out in the mouse (this is only the second one). Despite being considered a very "high risk" screen, her lab's preliminary data shows that suppressors of the Mecp2 mutation can be identified in the mouse, and suggests that Dr. Justice's discoveries will have applications for identifying therapeutic targets.

Dr. Justice is considered to be a pioneer in the field of mouse chemical mutagenesis, as she has carried out one of the first such genetic screens as a graduate student at Kansas State University. Her research exploits the fact that genes and whole chromosome regions are conserved between the mouse and human. After completing her postdoctoral training at the National Cancer Institute-Frederick Cancer Research Facility in cancer biology and mouse molecular genetics, Dr. Justice began working in the area of gene discovery where she identified many new cancer-causing genes, as well as new causes of birth defects using genetic and genomic technologies. Her career then followed the wave of genome sequencing and discovering genes and their function. Dr. Justice was Director of a large-scale mutagenesis program in developmental defects, which produced hundreds of new mouse models of human disease that have allowed for discoveries of gene functions in diverse areas such as reproduction, neurobiology, obesity, and blood, heart, and bone development. She was recruited to the RTT field to carry out a genetic screen based on her genetics and genomics expertise.

What prompted you to begin a career in research?
For as long as I can remember, I wanted to help children overcome diseases such as leukemia and cystic fibrosis. My plan was to be a physician, but exposure to a research lab made me realize that research was my passion. My research questions now focus on human health and disease.

What is the single most rewarding aspect of conducting Rett syndrome research?
The possibility that my research could make a difference in the quality of life for girls affected by Rett syndrome drives me. Every discovery and step towards a treatment is a reward. Even so, because our research may directly affect people's lives, I feel that we cannot carry out our research fast enough!

What is a potential positive outcome of the research you're conducting that is specific to your IRSF Award?
The research I am currently conducting aims to find alternative therapeutic targets for Rett syndrome, which

would ameliorate symptoms. We have used a genetic approach to find genes that ameliorate the symptoms in mice, and hope that this knowledge can be applied to humans.

If you could pick any one symptom of Rett syndrome to prevent or to provide relief for, what would it be?
My dream is to be able to alleviate the neurological symptoms to an extent that the girls are interactive and healthy. This, hopefully, would mean that they would not have stereotypic movements, seizures, ataxia or breathing disorders. Realistically, any improvement in the quality of life and health of the girls would be a success.

What other diseases does your research focus on?
I am a developmental geneticist. Therefore, the bulk of my research focuses on genetic causes of birth defects and diseases of the blood, including leukemias and blood diseases resulting from hematopoietic stem cell defects. We have created a multitude of mouse models that are being used by many laboratories world-wide.

What else would you like the RTT community to know about you?
I entered the Rett Syndrome field in 2007 with a high risk genetic project designed to identify modifiers that suppress symptoms of Mecp2 mutation in the mouse. I am on the IRSF Scientific Advisory Board, an IRSF Grant Reviewer and have Co-Chaired IRSF's Annual Rett Syndrome Symposium. I will be a panelist in an NIH Workshop on "Setting Priorities for Therapy Development in Rett Syndrome."

Working with mice comes naturally to me. I was raised on a farm, and my grandfather and father served as local veterinarians. My uncle is a physician, and my entire family had hoped that I would follow in his footsteps to become a physician. Mouse genetics allows me to combine my ability to work with animals with a direct application to human health. The ability to help children with Rett syndrome has an appeal to me as a person that I have never faced in my role as professor and scientist. Adrian Bird's amazing result, which shows that introducing appropriate levels of Mecp2 to mice that are severely compromised by disease will reverse the symptoms, allows hope that the symptoms of this genetic disease will be ameliorated in the lifetime of children that are currently affected. Our results will show that such screens can be applied to other genetic diseases that remain untreatable.

Outside of work, I love to garden. I raise my own herbs for gourmet cooking, and I find that cooking after a long day of work relaxes me. My children, grandchildren and husband all appreciate this!

Please visit this page to register for the Symposium and to view a list of confirmed speakers.