Amaresh C. Panda: breakthrough discoveries result from strong work ethics and effective teamwork!

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Editor's note

Circular RNAs (circRNAs) are a form of RNA that has been found to regulate mammalian transcription. This recently discovered RNA is a large class of ubiquitously expressed novel noncoding RNAs (ncRNAs) reported to regulate gene expression by modulating the function of micro RNAs (miRNAs) and RNA-binding proteins (RBPs). CircRNAs are believed to be able to serve as molecular markers of complex diseases. However, the understanding of their role in the development of diabetes is still limited.

As a previous Postdoctoral Fellow in the lab of Dr. Myriam Gorospe at National Institute on Aging (NIA), National Institutes of Health (NIH) and currently a Ramanujan Faculty Fellow at Institute of Life Sciences in India, Dr. Amaresh C. Panda has been studying into the characterization of circRNAs expressed in pancreatic β-cells and the analysis of their role in the development of diabetes. *Non-coding RNA Investigation* (*NCRI*) is happy to interview Dr. Panda this time with an aim to understand the current progress and challenges of circRNAs research, his 5-year experience at the NIH lab and some memorable stories throughout his research career.

Expert's introduction

Dr. Amaresh C. Panda, PhD, currently serves as a Ramanujan Faculty Fellow at Institute of Life Sciences, Bhubaneswar, India. Before returning to India, Dr. Panda worked as a Postdoctoral Fellow for 5 years in the lab of Dr. Myriam Gorospe at NIA, NIH, Baltimore, USA. He also worked for a few months as an Assistant Scientist at the University of Miami, Miami, USA and a Postdoctoral Research Associate at University of Colorado, Denver, USA (*Figure 1*).

Dr. Panda obtained his PhD in Biotechnology from National Centre for Cell Science, University of Pune, India. His research interests vary from RNA-mediated gene regulation, understanding of the mRNA-interactome in muscle, role of circRNAs in muscle regeneration, to circRNAs in diabetes. His studies have uncovered new mechanistic details of the post-transcriptional regulation by RBPs and ncRNAs, specifically miRNAs and circRNAs, in physiological processes including insulin production, myogenesis, and cellular senescence.

Figure 1 Dr. Amaresh C. Panda.

Interview

NCRI: Your lab is aiming to identify and understand RNA-mediated gene regulation. What is the current progress and challenges in this area of study?

Dr. Panda: Traditionally, RNA molecules are believed to convey genetic information encoded in the DNA into the synthesis of specific proteins. In the 1950s, the biological function of ncRNAs started with the discovery of transfer RNA and ribosomal RNA. Since then, the number and types of functional ncRNAs in the cells are rising with the discovery of small nuclear RNAs (snRNAs), piwi-interacting RNA (piRNA), long noncoding RNAs (lncRNAs), miRNAs,

and poorly explored circRNAs.

Our lab is mostly interested in characterizing the circRNAs expressed in pancreatic β-cells and analyzing their role in the development of diabetes. CircRNAs are a large class of ubiquitously expressed novel ncRNAs reported to regulate gene expression by modulating the function of miRNAs and RBPs. Although a number of circRNAs have been identified, only a handful of them are functionally characterized to have biological significance. Not much is known about the role of circRNAs in development of diabetes. The circRNA field is still in an immature stage. Currently, the circRNA field faces a few major challenges which need to be addressed urgently: (I) invention of methods/kits to isolate pure circRNAs without traces of linear RNAs; (II) development computational pipelines for identification and quantification of circRNAs accurately, as none of the available tools can do this accurately; (III) develop integrated datasets to understand the complex gene regulatory network of circRNAs and their associated miRNAs and RBPs; (IV) develop better technologies for circRNA silencing and overexpression to study the specific biological role of circRNAs. With these technological advancements, we will be in a better position to delineate the role of circRNAs in disease diagnosis and therapy.

NCRI: As a previous Postdoctoral Fellow in the lab of Dr. Myriam Gorospe at NIA, what were your major role and duties there?

Dr. Panda: NIH is a home for thousands of talented Postdoctoral fellows from around the world. I worked for 5 years as a Postdoctoral Fellow with Dr. Myriam Gorospe in NIA, NIH, Baltimore. Like most Postdoctoral Fellows, my primary role was to perform cutting-edge science and publish the findings in reputed scientific journals. Besides working on my own research projects, I was also expected to work on various collaborative projects involving investigators working in the USA and abroad. I also trained a few undergraduate students and post-graduate junior scientists during my postdoctoral training.

NCRI: Is there a project that is particularly memorable to you?

Dr. Panda: Dr. Gorospe's laboratory mainly worked on the role of ncRNAs in aging and cellular senescence. In 2013, circRNAs were reported to be ubiquitously expressed and regulate gene expression by sponging miRNAs. We changed our lab focus to explore the role of these novel circRNA molecules in aging. We wanted to characterize the circRNAs in aging skeletal muscle. We discovered and annotated thousands of circRNAs in skeletal muscle of monkeys and have identified differentially expressed circRNAs with advancing muscle age. At that moment, it was a challenge to characterize them due to the lack of tools to design specific primers and predict their biological function. To overcome these issues, we developed the CircInteractome web-tool (http//circinteractome.nia.nih.gov) to elucidate the possible biological roles of circRNAs. We used publicly available datasets for circRNAs and regulatory molecules like miRNAs and RBPs for predicting the potential function of circRNAs. CircInteractome allows the users to: (I) identify circRNAs which can potentially act as sponges for miRNAs and RBPs; (II) design divergent primers for specific detection of circRNAs; (III) design siRNAs for circRNA silencing; and (IV) identify potential internal ribosomal entry sites (IRES) which could potentially be translated. It was a really exciting project and the web tool is heavily used by researches in circRNA field to explore the role of circRNAs.

NCRI: What were your biggest rewards in your 5-year experience at NIH? What techniques/knowledge were you able to acquire that can be brought back to India?

Dr. Panda: The biggest reward in my 5-year research was the exposure to the cutting-edge RNA technologies to study the role of novel RNA molecules in gene regulation. Besides the technical training, I have also had a chance to practice scientific writing in the form of Inter-laboratory proposals funded internally by the office of the director and manuscripts to report my research. I have also been fortunate to have a dedicated mentor like Dr. Gorospe. I have learned that mentoring is not just teaching the technical details about scientific experiments, but it is coaching the overall development of a student to become a confident, rigorous, and motivated scientist who can work independently and can contribute productively to a group effort. Overall, the 5-year NIH training was intellectually stimulating and helped a lot to set up my lab in India.

NCRI: Were there any special moments during the years in NIH?

Dr. Panda: Yes, there were difficult times during my NIH postdoctoral career. The first setback was coping with the

American lifestyle and culture when I moved from India to the USA. But with time, I could manage that by making new friends and adapting to the American lifestyle. Like most young researchers, I also struggled a lot to maintain a work-life balance. As a young Postdoc, there was enormous pressure to work hard and produce high-impact papers. At the same time, I had to look for faculty positions as NIH does not allow to work beyond the 5 years. I really enjoy doing research and often forget to put a line between work and personal life. Like most postdocs, I used to work from home in the night times and holidays. Initially, it was a major challenge to spend quality time with family and doing research in working hours. I really worked hard to restrict my research to the lab and planned to have a life outside the lab which helped in maintaining work-life balance. A few small steps, including staying away from research, traveling to new places, and meeting friends during the holidays helped me have a beautiful family life. Additionally, these activities helped me in planning and performing productive experiments leading to the discovery of novel molecular mechanisms influencing human health and disease.

NCRI: How did you become involved in your line of research?

Dr. Panda: Diabetes is caused by deregulation of insulin synthesis or secretion from the pancreas. Insulin production and secretion are controlled at various stages in the pancreatic β-cells. For a few decades, it has been known that various ncRNAs regulate gene expression by affecting mRNA transcription, splicing, and translation. During my PhD and postdoctoral training, I have extensively worked on posttranscriptional regulation of insulin and role of circRNAs in gene regulation respectively. CircRNAs have been reported to regulate gene expression in various pathophysiological conditions. Interestingly, the role of circRNAs in pancreatic β-cells and development of diabetes remains largely unknown. I am now interested in exploring the role of pancreatic β-cell circRNAs in the development of diabetes.

NCRI: What do you regard as the key factors of a successful research?

Dr. Panda: For me, successful research needs a few things, including passion for research, healthy lab atmosphere, hard work, and teamwork. Instead of feeling like they 'work on the mentor's project', students should be encouraged early on to develop a passion for science, so that they take pride in and 'own' their work. Moreover, the researchers should be encouraged to work actively towards building a friendly lab environment where individual ideas are respected and discussed constructively. I have seen first-hand that breakthrough discoveries result from strong work ethics and effective teamwork.

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