Glen Borchert, J Marine Sci Res Dev 2015, 5:2
http://dx.doi.org/10.4172/2155-9910.S1.001

OMICS International
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International Conference on
Transcriptomics
July 27-29, 2015 Orlando, USA

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RNA editing and Next Generation Sequencing

RNA editing by RNA specific adenosine deaminase (ADAR) is increasingly being found to alter microRNA (miR) regulations. Editing of miR transcripts can affect their processing as well as what mRNAs they target. Further, editing of target mRNAs can also affect their complementarity to miRs. Notably, ADAR editing is often increased in malignancy with the effect of these RNA changes largely unclear. In addition, reports have also identified many miRs to be differentially expressed in cancer though the majority of their targets are also undefined. We propose that modulating the targets of miRs via mRNA editing can play a direct role in the pathology of many carcinomas. To address this, we have recently developed new algorithms to identify and analyze RNA edit sites in RNA-Seq data and used these to identify microRNA target sites created and destroyed by deamination of mRNA adenosines. Initial computational analyses of some of our breast cancer RNA-Seq data identified over 250,000 A-to-I edit sites primarily located in mRNA 3' UTRs. When these locations were screened against the list of currently annotated miRs we discovered that these A-to-I editing events caused a subset (~5%) of human miRs to have significantly altered mRNA complementarities leading us to propose that modulating the targets of miRs via mRNA editing plays a direct role in the pathology of many carcinomas. Broadly, these results suggest that the creation of miR targets may be an underappreciated function of ADAR and may help further elucidate the role of RNA editing in tumor pathogenicity. Furthermore, our results strongly indicate that the creation of miR regulatory sites is a novel (and surprisingly prevalent) function for ADAR activity, and consequently, many miR target sites are only identifiable through the examination of expressed sequences.

Biography

Glen M Borchert has completed his PhD in Genetics from University of Iowa in the year 2006. He did his first postdoctorate in Structural Biology from University of California in the year 2008 and the second one in Immunology from Illinois State University in the year 2012. After which he joined as Assistant Professor in University of South Alabama and currently working as Assistant Professor, Pharmacology in USA College of Medicine. He has been honored by NIH with a Research award to study hypoxia induced mutation. Also, National Science Foundation (NSF) gave him the CAREER award of $533,000 to research miRNA targeting.

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