Ratnam Seelan, Ph.D.

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Scholarly Activities:

Dr. Seelan's primary research interest is in understanding the epigenetic basis for developmental defects such as cleft palate. In particular, he seeks to understand how the environment influences gene expression during murine secondary palate development *via* epigenetic mechanisms, such as DNA methylation, microRNA regulation and histone modification. Knowledge of this largely nascent area will not only help contribute to the understanding of the complex etiology underlying cleft palate but also identify the processes and mechanisms required for normal palatogenesis. As a prelude, the methylation landscapes of the developing secondary palate of normal mice (gestational days 12 to 14) have been determined using promoter microarrays that were probed with CpG-enriched, genomic DNA fragments, isolated from these tissues (Birth Defects Res A Clin Mol Teratol 2013; 97:171-186). Ongoing analyses hope to complement DNA methylation profiles of the gd12-14 secondary palate tissues with active (H3K4me3) and repressive (H3K27me3) histone marks, using ChIP-seq. Data from the aforementioned gene methylation and histone modification studies will be integrated with the cognate mRNA/miRNA expression profiles to identify major signaling pathways and genes that are critical for normal palatogenesis. Aspects of these studies, funded by an NIH RO3 grant, are being undertaken in collaboration with Drs. P. Mukhopadhyay and G. Brock. Additional areas of interest include determining the roles environmental factors (such as azacytidine, folate deprivation and tobacco smoke) play in the etiology of orofacial clefts. Specifically, differentially methylated regions (DMRs) in the genome of the first branchial arch of mice exposed to these environmental factors are being identified using Methyl-Capture/ Next Generation Sequencing (NGS) strategies. Dr. Seelan continues to seek additional funding support for his varied interests.

Grants:

Role: Co-Investigator
Title: *Epigenetic Regulation of Gene Expression During Orofacial Development*
Funding Agency: NIH R03 (Co-PIs: Partha Mukhopadhyay, Guy Brock).
Direct Costs Funded: $300,000

Publications (2013-2014):

Seelan RS, Mukhopadhyay P, Warner DR, Webb CL, Pisano MM, Greene RM. The epigenetics of *Sox4* regulation in murine palatogenesis. *Epigenomics* 5:131-146 (2013).

Parthasarathy RN, Lakshmanan J, Thangavel M, **Seelan RS**, Stagner JI, Janckila AJ, Vadnal RE, Casanova MF, Parthasarathy LK. Rat brain *myo*-inositol 3-phosphate synthase is a phosphoprotein. *Mol Cell Biochem* 378:83-89 (2013).

Seelan RS, Appana SN, Mukhopadhyay P, Warner DR, Brock GN, Pisano MM, Greene RM. Developmental profiles of the murine palatal methylome. *Birth Defects Res A Clin Mol Teratol* 97:171-186 (2013).

Seelan RS, Warner DR, Mukhopadhyay P, Andres SA, Smolenkova IA, Wittliff JL, Pisano MM, Greene RM. Epigenetic analysis of laser capture microdissected fetal epithelia. *Anal Biochem* 442:68-74 (2013).

Thangavel M, **Seelan RS**, Lakshmanan J, Vadnal RE, Stagner JI, Parthasarathy LK, Casanova MF, Parthasarathy RN. Proteomic analysis of rat prefrontal cortex after chronic valproate treatment. *J Neurosci Res* 92:927-936 (2014).

Seelan RS, Mukhopadhyay P, Warner DR, Appana SN, Brock GN, Pisano M, Greene RM. Methylated MicroRNA Genes of the Developing Murine Palate. *MicroRNA 3*:160-73 (2014).

External Professional Activities (2013-2014):

Ad hoc reviewer – *BMC Genomics*, 2013; *DNA & Cell Biol,* 2014;