



## Student Completed Project Information Sheet

Name of Project: Differential Expression Profile of lncRNAs from Primary Human Hepatocytes Following DEET and Fipronil Exposure

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### Project Abstract:

While the synthesis and use of new chemical compounds is at an all-time high, the study of their potential impact on human health is quickly falling behind, and new methods are needed to assess their impact. We chose to examine the effects of two common environmental chemicals, the insect repellent N,N-diethyl-m-toluamide (DEET) and the insecticide fluocyanobenpyrazole (fipronil), on transcript levels of long non-protein coding RNAs (lncRNAs) in primary human hepatocytes using a global RNA-Seq approach. While lncRNAs are believed to play a critical role in numerous important biological processes, many still remain uncharacterized, and their functions and modes of action remain largely unclear, especially in relation to environmental chemicals. RNA-Seq showed that 100  $\mu$ M DEET significantly increased transcript levels for 2 lncRNAs and lowered transcript levels for 18 lncRNAs, while fipronil at 10  $\mu$ M increased transcript levels for 76 lncRNAs and decreased levels for 193 lncRNAs. A mixture of 100  $\mu$ M DEET and 10  $\mu$ M fipronil increased transcript levels for 75 lncRNAs and lowered transcript levels for 258 lncRNAs. This indicates a more-than-additive effect on lncRNA transcript expression when the two chemicals were presented in combination versus each chemical alone. Differentially expressed lncRNA genes were mapped to chromosomes, analyzed by proximity to neighboring protein-coding genes, and functionally characterized via gene ontology and molecular mapping algorithms. While further testing is required to assess the organismal impact of changes in transcript levels, this initial analysis links several of the dysregulated lncRNAs to processes and pathways critical to proper cellular function, such as the innate and adaptive immune response and the p53 signaling pathway.

Project-related Products:

Robert D. Mitchell III, Andrew D. Wallace, Ernest Hodgson and R. Michael Roe.  
Differential Expression Profile of lncRNAs from Primary Human Hepatocytes Following DEET  
and Fipronil Exposure. *Int. J. Mol. Sci.* 2017, 18, 2104; doi:10.3390/ijms18102104

Robert D. Mitchell III, Anirudh Dhammi, Andrew Wallace, Ernest Hodgson,  
and R. Michael Roe. Impact of Environmental Chemicals  
on the Transcriptome of Primary Human Hepatocytes:  
Potential for Health Effects. *J Biochem Molecular Toxicology* 2016, 30(8), 375; DOI 10.1002/jbt