Effects of E-Cigarette Vapor on Dalpha7 Gene Expression in Adult Drosophila melanogaster

Roma Seal
rseal@carroll.edu

Bella Maag
imaag@carroll.edu

Follow this and additional works at: https://scholars.carroll.edu/surf

Part of the Molecular and Cellular Neuroscience Commons, and the Other Cell and Developmental Biology Commons

Seal, Roma and Maag, Bella, "Effects of E-Cigarette Vapor on Dalpha7 Gene Expression in Adult Drosophila melanogaster" (2019). Carroll College Student Undergraduate Research Festival. 66.
https://scholars.carroll.edu/surf/2019/all/66

This Event is brought to you for free and open access by Carroll Scholars. It has been accepted for inclusion in Carroll College Student Undergraduate Research Festival by an authorized administrator of Carroll Scholars. For more information, please contact tkratz@carroll.edu.
Effects of E-Cigarette Vapor on \textit{Dalpha7} Gene Expression and Motor Function in Adult \textit{Drosophila melanogaster}

Isabella Maag and Roma Seal
Cell and Molecular Neuroscience, Carroll College

\textbf{Introduction}

- The species \textit{Drosophila melanogaster} (\textit{D. Melanogaster}) is a popular model organism in Neuroscience.
- \textit{Dalpha7} is a gene that codes for the Nicotinic Acetylcholine Receptor in the nervous system in both humans and \textit{D. melanogaster}.
- The goal of this project was to determine whether nicotine from E-cigarette vapor has a deleterious effect on the motor function in \textit{D. melanogaster}.
- \textbf{Hypothesis}: If E-cigarette vapor is given to \textit{D. melanogaster}, then there will be more expression of \textit{Dalpha7}, resulting in the inhibition of motor function.

\textbf{Methods}

- \textbf{Primer synthesis}: Primers for \textit{Dalpha7} were designed using IDT Oligoanalyzer software.
- \textbf{Culturing}: \textit{Drosophila melanogaster} cultures were maintained in a medium containing potato flakes, yeast, and deionized water. The cultures were stored in a 22.5 °C incubator.
- \textbf{Exposure}: Control flies exposed to CO2 and experimental flies exposed to CO2 and 1 syringe full (10ml) of E-cigarette vapor containing 1.2% Nicotine, once a day, for four days.
- \textbf{RNA extraction}: RNA was extracted using Trizol and purified using Qiagen's RNeasy Mini Kit.
- \textbf{Reverse transcription}: cDNA was synthesized using RevertAid.
- \textbf{qPCR} was performed using PowerUp SyBr Master Mix and primers targeting GAPDH and \textit{Dalpha7}. The cycle threshold values were used to generate fold changes in \textit{Dalpha7} expression.
- \textbf{RING Assay}: A Negative Geotaxis assay was used to compare motor function between control and experimental \textit{D. Melanogaster}.

\textbf{Results}

- Figure 1: Comparison in fold change between control flies and flies exposed to E-Cigarette vapor containing 1.2% Nicotine. (P-value = .6016)
- Figure 2: Comparison between motor function in control flies and flies exposed to E-cigarette vapor containing 1.2% Nicotine. Error bars show the standard error for each average. (P-value = 4.26 E-10)

\textbf{Conclusion}

- The RING assay showed a slower reaction time in \textit{D. Melanogaster} that were exposed to E-Cigarette vapor.
- The t-test p-value proved the difference to be significant for motor function (Fig. 2).
- The fold change for gene expression of \textit{Dalpha7} between the control group and the group exposed E-cigarette vapor was 2.59.
- The p-value showed the difference in \textit{Dalpha7} expression was insignificant (Fig. 1).
- The results disagreed with our hypothesis on \textit{Dalpha7} expression and agreed with our hypothesis regarding motor function.

\textbf{Future Direction}

Using the same experimental set-up, we would focus on the connection between E-cigarette vapor and motor function in \textit{D. Melanogaster}, while testing the expression of a different gene.

\textbf{References}


\textbf{Acknowledgements}

We would like to thank Dr. Stefanie Otto Hitt for her support and guidance with this project.