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The Different Artificial Sweeteners and Their Effects on Endothelial Cell/Blood Vessel Health: Possible Implications for Ringing in the Ear

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The Different Artificial Sugars and Their Effects on Endothelial Cell/Blood Vessel Health: Possible Implications For Ringing in Ears

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STATEMENT OF THE PROBLEM

Background

- Every year about 35-50 million American adults experience tinnitus, with symptoms ranging in severity from mild to debilitating, prompting some to seek medical intervention.
- Tinnitus is a noise that persists in the ear when no auditory stimulus is present.
- There is no known cause of tinnitus, making it difficult to treat.
- This study intends to look at the gaps in previous research studies and to shed light on the possible connection between artificial sugars and the prevalence of tinnitus across various age groups.

Significance of the Problem

- There is an insufficient amount of information regarding causes tinnitus. Many speculations exist but none have come to a firm conclusion.
- Millions of people suffer from tinnitus, which demands the scientific community's efforts to elucidate causes of this condition.
- Our goal is to research age and artificial sugar intake as possible triggers of tinnitus.

OBJECTIVES

To assess factors in a person's life related to an increased prevalence of tinnitus.

To assess the distribution of tinnitus symptoms across different age group.

To determine the effects of natural sugars and artificial sweeteners on the HUVEC health.

HYPOTHESES

H01= There will be no difference in the prevalence of tinnitus among individuals who consume higher amounts of artificial sweeteners in their diet to those individuals who consume higher amounts of natural sugars in their diet.

H1= There will be a difference in the prevalence of tinnitus among individuals who consume higher amounts of artificial sweeteners in their diet to those individuals who consume higher amounts of natural sugars in their diet.

H02= There will be no difference in the prevalence of tinnitus in individuals who sleep well as to those who do not.

H2= There will be a difference in the prevalence of tinnitus in individuals who sleep well as to those who reported poor sleeping habits.

H03= There is no difference in the prevalence of tinnitus among people reporting higher stress levels and those who do not.

H3= People living with high stress will have a higher incidence of tinnitus than those who do not.

H04= There is no difference in the prevalence of tinnitus among different age groups.

H4= There is a significant difference in the prevalence of tinnitus among various age groups.

Laboratory Hypotheses

H0= There is no difference in the impact of natural sugars and artificial sweeteners on the health of HUVECs.

H1= There is difference between the impact of natural sugars and artificial sugars on the health of HUVECs.

REFERENCES

1. Joos K, Vanneste S, De Ridder D. Disentangling depression and distress networks in the tinnitus brain. *PLoS One*. 2012;7(7):e40544. doi:10.1371/journal.pone.0040544.
2. Langguth B, Kreuzer PM, Kleinjung T, De Ridder D. Tinnitus: Causes and clinical management. *Lancet Neurol*. 2013;12(9):920-930.
3. McCormack A, Edmondson-Jones M, Mellor D, et al. Association of dietary factors with presence and severity of tinnitus in a middle-aged UK population. *PLoS One*.
4. Nondahl D, Cruickshanks K, Wiley T, et al. The 10-year incidence of Tinnitus Among Older Adults. *International journal of audiology*. 2010;49(8):580-585. doi:10.3109/14992021003753508.
5. Park B, Choi HG, Lee HJ, et al. Analysis of the prevalence of and risk factors for tinnitus in a young population. *Otol Neurotol*. 2014;35(7):1218-1222.
6. Park RJ, Moon JD. Prevalence and risk factors of tinnitus: The Korean national health and nutrition examination survey 2010-2011, a cross-sectional study. *Clin Otolaryngol*.
7. Paul AK, Lobrinias E, Simmons R, et al. Metabolic imaging of rat brain during pharmacologically-induced tinnitus. *Neuroimage*. 2009;44(2):312-318. doi: 10.1016/j.neuroimage.2008.09.02.
8. Richardson BD, Brozoski TJ, Ling LL, Caspary DM. Targeting inhibitory neurotransmission in tinnitus. *Brain research*. 2012;1485:77-87. doi:10.1016/j.brainres.2012.02.014.
9. Shargorodsky J, Curhan G, Farwell W. Prevalence and Characteristics of Tinnitus among US Adults. *The American Journal of Medicine*. 2010;123(8):711-718. doi:10.1016/j.amjmed.2010.02.015.
10. Sindhusake D, Mitchell P, Newall P, Golding M, Rochtchina E, Rubin G. Prevalence and characteristics of tinnitus in older adults: the Blue Mountains Hearing Study. *Int J*
11. Widen S, Eriandsson S. Self-reported tinnitus and noise sensitivity among adolescents in Sweden. *Noise and Health*. 2004;7(25):29.
12. Zeman F, Koller M, Langguth B, Landgrebe M. Which tinnitus-related aspects are relevant for quality of life and depression: results from a large international multicentre sample. *Health and Quality of Life Outcomes*. 2014;12:7. doi: 10.1186/1477-7525-12-7.

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PROPOSED METHODS

Study Design

Survey

- The survey will be cross-sectional, assessing patients in a single moment in time.
- It will be created and administered through Qualtrics with the option of a paper version.
- It will investigate a variety of factors having an effect on ear and vascular health including: sleep, sugar consumption, mediations stress and trauma.
- It will also make record of patients' demographics and their history and severity of tinnitus.
- The cross-sectional survey will be disseminated via audiologists in Ohio's major cities.

Laboratory

- The laboratory section will utilize one experiment to examine all the sweeteners.
- Ten different sugars and artificial sweeteners will be tested in standardized concentrations in human umbilical vein endothelial cells (HUVECs).
 - Sugars: fructose, glucose, high fructose corn syrup (HFCS), and sucrose.
 - Artificial sweeteners: sucralose, aspartame, saccharin, acesulfame and stevia.
- The PathScan® Phospho-Akt1 (Ser473) Sandwich ELISA Kit #7160, run in triplicate, will be used to evaluate the health of the cell.
- This ELISA will quantify the phosphorylation of pAKT-- an increased level of which indicates stimulation of the survival pathway.

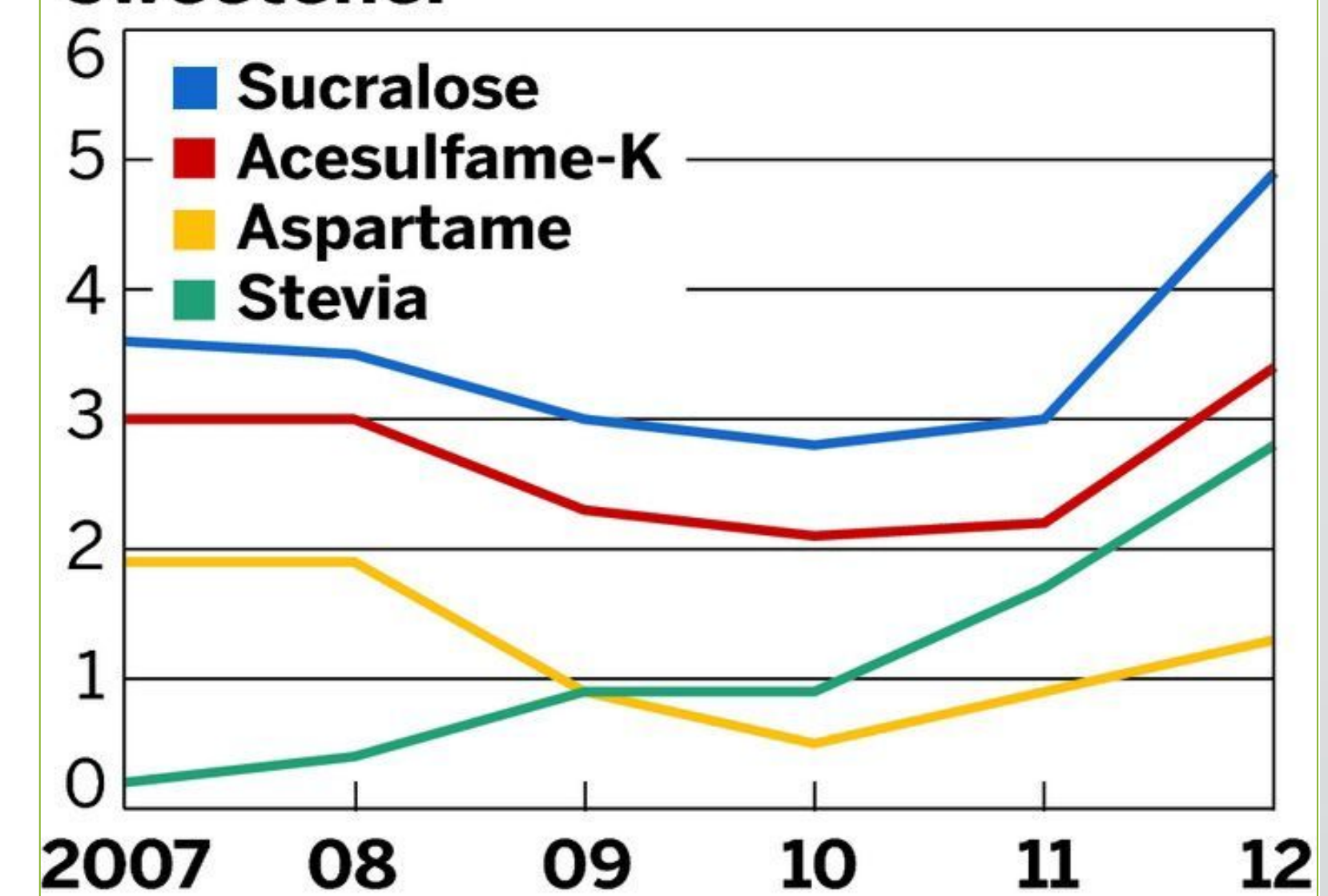
Sample

- The study will comprise of individuals suffering from tinnitus who are referred to the study from audiologists in the major cities of Ohio. The cities include: Cincinnati, Dayton, Akron, Cleveland and Toledo.
- Ten sugars will also be tested on HUVEC lines.

Data Collection

- Data from the survey will be collected electronically and analyzed with SPSS.
- The lab data will be manually collected by observing the cell lines.

% of total new products with sweetener



http://qzprod.files.wordpress.com/2014/02/sweeteners_et.jpg?quality=80&strip=all&w=700&h=589

PROPOSED ANALYSES

Survey

- Once collected, surveys will be collated in a spreadsheet then coded into SPSS for analysis.
- Descriptive statistics will be run first.
- Dependent upon the normality of the data collected, we will test for significance using ANOVA/Kruskal-Wallis or an independent t-test/Mann-Whitney as well as post hoc tests.

Laboratory

- The ELISAs will be analyzed by measuring absorbance, which will directly measure the amount of pAKT in the cell. The levels of absorbance will be compared amongst the different sugars.

PROJECT TIMELINE

January 2016 : IRB approved

February 2016- February 2017: Survey completed and distributed

March 2016: Begin testing sugars on HUVECs

March 2017: Data collection from the surveys and data analysis

LIMITATIONS

- There is no known mechanism for tinnitus development.
- Literature on factors definitively contributing to tinnitus is severely lacking.
- External validity is threatened because data produced will not be generalizable.
- This research is prone to selection bias: ruling out people that have not gone to the doctor for their problems and only looking at cities (excluding rural areas).

FUTURE DIRECTIONS

- If sugars do affect tinnitus, further research could seek to create new clinical approaches to relieve symptoms.
- From studying sugars' effect on the pathway of cell metabolism, different molecules could be researched to act as antagonists to block harm caused by those substances.