Posters:
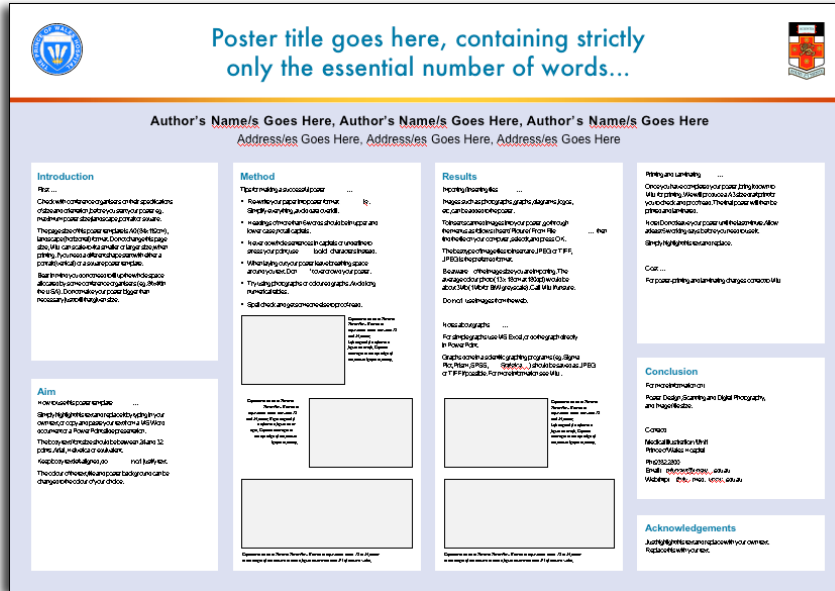# A brief overview from the Office of Undergraduate Research

It's just an illustrated abstract

Expectations of order

- Background/description/literature review
  - Develop credibility and **situate/motivate work**
- Gap/Research Question (goal, outcome, creative work)
- Methodology/process
- Analysis/Findings
- Conclusion/"so what"
  - What is the discipline contribution?
  - **Why should people care?**
- References (need to have citation pairs)

Expectations of order

You and listener(s)/reader(s) should always be able to answer:

1. What are you asking about/learning more about/creating? (motivate this)

2. How did you find the answer/learn more/create (what steps)?

3. What did you find/how will your outcome or creation be used?

Don't forget - Why is it important?

Communicating – language, style

- Know your "knows" (audience, worth, expectations)
- The multidisciplinary audience
  - Everyone understanding = quality/contribution by all
  - Do NOT "dumb it down", just translate/simplify
- Be concise!
- Define terms and abbreviations
- Supplement text/pictures
  - Give examples people can relate to

General Presentation skills

- Practice and peer review
  - Have listener/reader restate highlights (what, how, why)
- Follow expected order
- Everything must have a reason & be digestible
  - Especially figures and pictures (explain them too)
- Virtual vs in person
- Loss of interest happens quickly
  - Poster should be eye-catching (visuals!!)
  - Be a dynamic presenter
  - Browsers will browse

Posters (the process)

- You get one-on-one audience time and feedback
  - Keep something to write with nearby!

- Typical (idealized) process
  - People walk around
  - You give 3-5 minute overview
  - They ask you questions
 - They move on
  - New group comes in

Posters (visual/talking)

- Use templates/branding (as indicated/required)
- NCSU branded poster templates
- Ease of readability!
  - Consistency in sizes/texts
- Typical pattern, but can deviate
- Typical (required) sections and pieces
- Don't overpopulate!
  - It's a synopsis, not an article (you're there to fill in)

Poster layout

- Titles should be big – bring the audience to you
- Affiliations and names
- White space – not too much, but don't crowd
- Headings and paragraphs
- Images/graphs are better than words
  - Poster = visual
- Colors – writing, backgrounds, visuals
- Proofread!
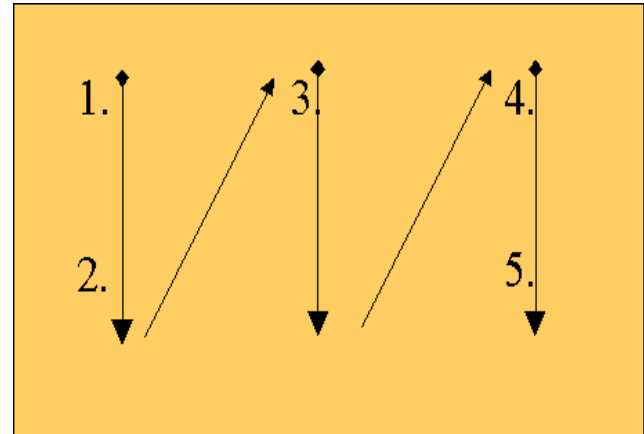
Data

- Don't misrepresent data in visuals
- Visuals should be explanatory – labels!
- Think about size of the visual

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Search books, articles, journals, website

Hours   My Account   Log Out   Ask Us   Chat Now 💬

Our buildings are not open, but our online services continue. Libraries Coronavirus Response →

Data Visualization Guides and Tools

Data Visualization Guides

- Workshop Materials. Materials from our popular Data and Visualization Workshop Series.
- Learn Data Viz. Guide from UNC Libraries.
- Infographic Creation Guide. Tools, tutorials, templates, books, and other resources for designing infographics.
- Visualizing Impact. Use graphs and visualizations to analyze and present research impact. Includes a step-by-step guide on bibliometric network visualization using Web of Science and Gephi.
- Data Visualisation Catalogue helps you select an appropriate chart type and provides links to tools.
- Data Viz Project. A website trying to present all relevant data visualizations, so you can find the right visualization and get inspiration on how to do it.
- Picking a Colour Scale for Scientific Graphics
- Top Ten Chart Dos and Don'ts, by Angela Zoss of Duke University Libraries.

Data Visualization Tools

- Datavisualization.ch provides a useful compilation of free data visualization tools.
- Tableau helps you create and share interactive charts and graphs, maps, and dashboards.
- Plotly provides online graphing and stats tools for individuals and collaboration, as well as scientific graphing libraries for Python, R, MATLAB, Perl, Julia, Arduino, and REST.
- Raw is an easy-to-use open web app for creating visualizations using D3.js.
- Vischeck and Chromatic Vision Simulator let you check your visualization for colorblind safeness.

Data Sources for Visualization

- Awesome Public Datasets
- Tableau Sample Datasets
- More datasets for teaching and learning

Link to Page

Text sizes:

Title: **85 point**

Authors: **56pt**

Sub-headings: **36pt**

Body text: **24pt**

Captions: **18pt**

72 point can be read at 14 feet
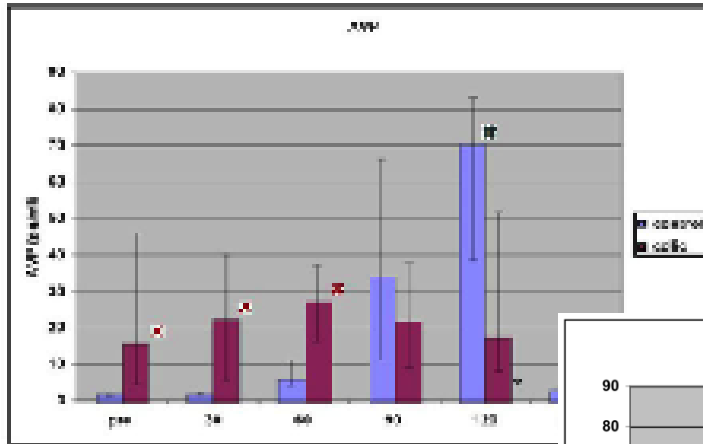
60 pt – 12 ft

48 pt – 10 ft

20 pt – 6 ft

Images

- Avoid resolution overkill!
  At least 150 dpi, but no more than 300 dpi

- Save photos as jpg or png
  Line art as a png (graphs)

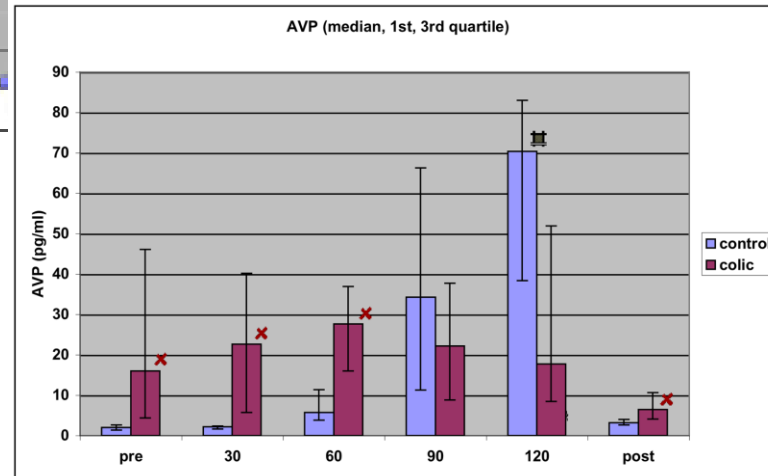- Web images are usually
  poor resolution 72 dpi

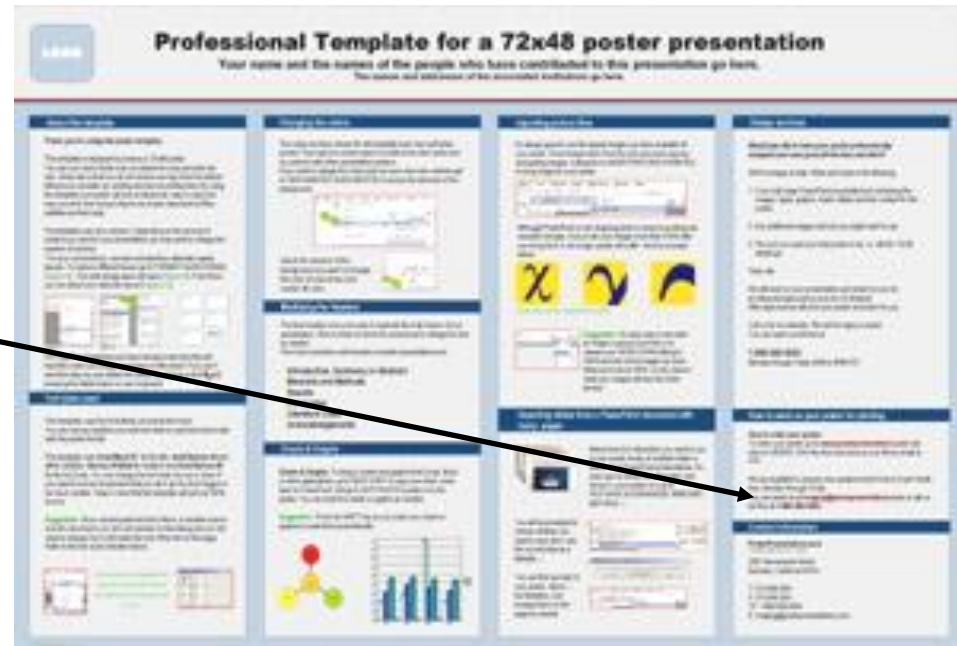Line art is best displayed as a "png"

jpg (not as crisp)

png

AVP (median, 1st, 3rd quartile)

Funding acknowledgements

OUR, TRiO, BME, etc.
Your department can
provide you with the
required wording

Print out a letter-sized draft

Can you read the type?

Are these the colors you really want?

Does it look too busy?

Do my main points pop?

The Three-column Format

- A more recognized standard of poster formatting
- Use boxes and/or headings to offset sections
- Visuals!
- Sections include (vary slightly by discipline):
  - Introduction/background
  - Methods
  - Results
  - Conclusion
  - References
  - Acknowledgements

Examples

- The following are some examples. Consider what areas of improvement could be addressed and what each did well.

- *Some have been copied and pasted. It may be difficult to read them, but consider layout and content more generally.*

NC STATE U
REDESIGN LAB
stemregenmedlab.web.unc.edu
NIH National Institute of Deafness and Other Communication Disorders (NIDCD)
Joint Department of BIOMEDICAL ENGINEERING
THE UNIVERSITY of NORTH CAROLINA at CHAPEL HILL   NC STATE UNIVERSITY

Microtissue Contraction of Human Mesenchymal Stem Cells in Extracellular Matrix Hydrogels Derived from Respiratory Tissues

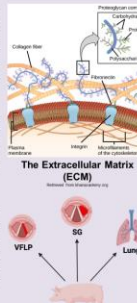Marina Kapitanov[a,b], Andreea Biehl[b], Ana Maria Martins[a,b], Lewis Gaffney[a,b], Donald Freytes[a,b]

[a]NCSU/UNC-CH Joint Department of Biomedical Engineering, Raleigh NC; [b]Comparative Medicine Institute, Raleigh, NC

Introduction

Voice disorders affect millions of Americans each year, with one example being vocal fold (VF) fibrosis. VF fibrosis represents a challenging therapeutic scenario, associated with significant changes in composition and mechanical properties of the extracellular matrix (ECM).

Our current study focuses on quantifying the in vitro contractile response of human MSCs (hMSCs) in ECM-derived hydrogels from respiratory system tissues (lung, vocal fold lamina propria (VFLP), supraglottic (SG)).

The contractile profile of hMSC cultures grown in ECM hydrogels provides valuable information on wound healing responses *in vivo*. This high throughput *in vitro* model will enable us to model different hMSCs and ECM hydrogel formulations capable of producing enough force for optimal wound closure *in vivo*.

The Extracellular Matrix (ECM)

Hydrogel Preparation and Cell Seeding

Figure 1. ECM hydrogel preparation and hMSC seeding on the microtissue platform. The ECM powder was enzymatically digested, and the pH and salt concentration were adjusted to enable self-assembling into ECM hydrogels. hMSCs were cultured at 25,000 and 50,000 cells/well in 3 mg/mL ECM hydrogels for 4 days with image capture every 24 hours. Following digital camera image capture, microtissue contraction was measured using distances between embedded optical fibers. Photo analysis was performed using ImageJ and statistical significance was determined using two-way ANOVAs across time points and ECM types.

Microtissue Platform Setup

Figure 2. Microtissue platform configuration. (A) Detailed perspective view of image capture setup. (B) Perspective view of the core experimental components (rack, plate, and grid). (C) Representation of how the contraction measurements are obtained in the system: side view of the well containing a microtissue wrapped around the two-segments of the optical fiber showing significant contraction and bending of the optical fibers after 24h.

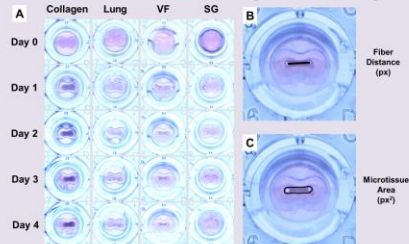## Microtissue Formation and Image Processing

Figure 3. Image capture and processing. (A) Representative time-lapse images obtained for Collagen, VFLP-ECM, SG-ECM, and Lung-ECM microtissues containing 25,000 cells. (B) Hand-annotated distances between fibers. (C) Hand-annotated microtissue area.

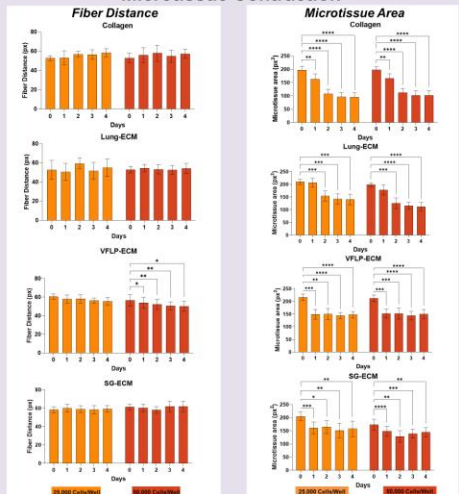## Effect of Cell Concentration and Time on Microtissue Contraction

Figure 4. Charts quantifying fiber distance and microtissue area across ECM types and days. Significance shown for $p < 0.05$ for different days with respect to T0.
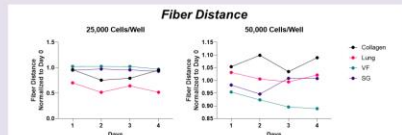
Discussion

Figure 5. Line charts showing microtissue percent contraction per day by ECM type and seeding concentration. Percent contractions were determined by normalizing to day 0.
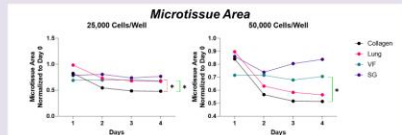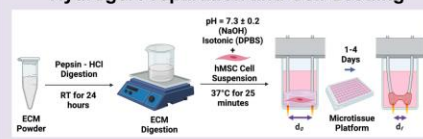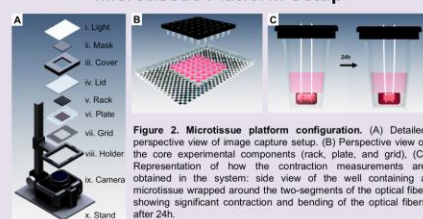
Figure 6. Line charts showing microtissue percent area per day by ECM type and seeding concentration. Percent area were determined by normalizing to day 0. Significance between ECM-types for all days indicated for $p < 0.05$.

- VFLP-ECM demonstrated significant consistent contraction for 50,000 cells/well when compared to T0.
- All ECM types demonstrated significant decreases in microtissue area for both 25,000 and 50,000 cells/well.
- Significant differences in microtissue area were found between VFLP-ECM and Collagen at both 25,000 and 50,000 cells/well and Lung-ECM and Collagen at 25,000 cells/well.

Conclusions

- These microtissue platform experiments show that at a higher seeding density, further studies can be performed using respiratory tissue ECM to measure microtissue contraction in vitro using a cost-effective, reproducible method.
- Future studies will focus on measuring the contraction and assessing the anti-fibrotic effect of microtissues incorporating hMSCs both in collagen and ECM hydrogels derived from respiratory tissues under the influence of TGF-β1.
- Overall, this platform will help us determine the optimal configuration (hydrogel alone or hydrogel with hMSCs) that could yield significantly lower scar tissue at the site of VF injury.

Acknowledgements

References

1. Biehl, Andreea, et al. "Towards a standardized multi-tissue decellularization protocol for the derivation of extracellular matrix materials." *Biomaterials science* 11 (2023): 641.
2. Martins, Ana Maria, et al. "Microphysiological system for high-throughput computer vision measurement of microtissue contraction." *ACS sensors* 6 (2021): 985-994.

Molten Salt Material Quantification with Glow Discharge Electrolysis

Alina Jugan, Dr. Alexander Bataller

NEUP Nuclear Energy University Program

U.S. Department of Energy

Introduction

- Molten salt reactors (MSRs) require real-time material quantification
- Glow Discharge Electrolysis (GDE) is a promising method
- GDE plasma ignites in the noble gas filled gap between the liquid and electrode
- Observing GDE in a room temperature saline solution offers a safe environment with similar ionic and conductive properties
- GDE has potential applications in pyro-processing operation and the identification of special nuclear material
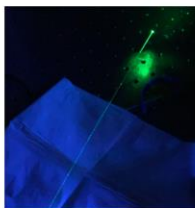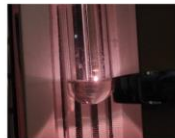
Experimental Setup

- Composed of a programmable furnace (1100 C maximum), a high-voltage DC circuit, Echelle spectrometer (not pictured), and a He gas line
- Observables include voltage, current, gap distance, and spectrum

Simplified molten salt GDE

HV circuit diagram

Fiber optic testing
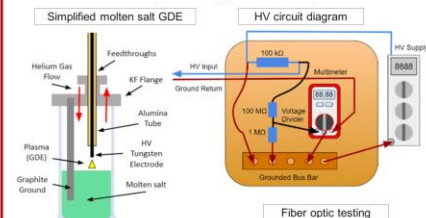
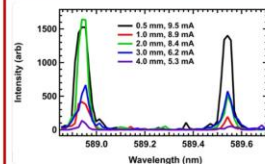Experimental setup for room temperature saline

LiCl-KCl salt prep in Ar glove box

Plasma from GDE in He on 20% wt. by vol. NaCl saline
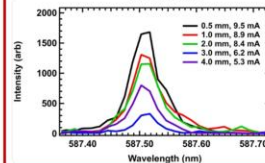

Results

- Height of saline determined by closing the gap with the electrode and observing current at low voltage
- Measured current and spectrum with increasing gap distances

- Voltage = 1 kV
- Resistance = 50 kOhm
- Spectrometer =
  - 50 accumulations
 - 20 ms gate
  - 4095 gain

- 588.95 & 589.55 nm = Na (I)
- 587.5 nm = He (I)

- Increasing gap distance resulted in decreased plasma resistance and, generally, decreased line gap intensity

Future Work

- Saline studies with fixed current (a better proxy for maintaining steady plasma)
- Saline longevity study to observe plasma "evolution"
- LiCl-KCl with spectrum and longevity study
- LiCl-KCl-CeCl$_3$ with spectrum intensity as a function of CeCl$_3$ concentration for GDE limits of detection
- New probe design and analysis
- Patented product
- Commercial deployment

Experimental setup for molten salts
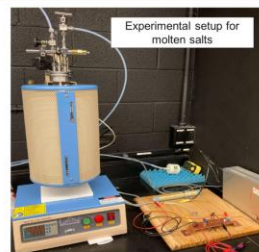
References

[1] K. GREDA ET AL., "Flowing Liquid Anode Atmospheric Pressure Glow Discharge as an Excitation Source for Optical Emission Spectrometry with the Improved Detectability of Ag, Cd, Hg, Pb, Tl, and Zn," Anal. Chem. 88, 17, 8812–8820 (2016). DOI: 10.1021/acs.analchem.6b02250
[2] G. WEI ET AL., "Microplasma Anode Meeting Molten Salt Electrochemistry: Charge Transfer and Atomic Emission Spectral Analysis," Anal. Chem. 90, 13163–13166 (2018). DOI: 10.1021/acs.analchem.8b02872

Acknowledgements

Effect of Brachial Plexus Birth Injury on Structure and Composition of Biceps, Supraspinatus, & Subscapularis Muscles

Brooke K. Dunkley[1,2], Kyla B. Bosh[1,2], Katherine R. Saul[1], Jacqueline H. Cole[1,2]

[1]North Carolina State University, Raleigh, NC, [2]University of North Carolina, Chapel Hill, NC

Introduction

- Brachial Plexus Birth Injury (BPBI) is a common nerve injury in newborns that occurs when the nerves in the shoulder and neck are damaged during a difficult birth[1].
- BPBI can cause lifelong paralysis, reduced range of motion, and musculoskeletal deformities[1].
- Deficits vary by injury location[2,3], but the effect these deficits have on underlying muscle composition as the injury progresses is unknown.
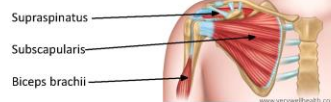
Objective: Determine how collagen content, representative of fibrosis, varies across timepoints following BPBI.

Methods

Surgery on Sprague Dawley rat pups at 3-6 days postnatally

Postganglionic Neurectomy[3] (n=4)　　Preganglionic Neurectomy[4] (n=3)　　Forelimb Disarticulation[5] (n=6)

created with BioRender.com

vs. Sham neurectomy (n=3)

- Sacrificed 4, 8, and 16 weeks after surgery
- Muscles harvested:
  - Supraspinatus
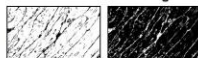 - Subscapularis
  - Biceps brachii

www.verywellhealth.com

- Snap frozen and cryosectioned longitudinally (10 μm)
- Stained with Masson's Trichrome, imaged at 20x magnification, and analyzed as a ratio of collagen to muscle tissue using custom MATLAB code
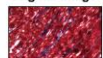
Original Image:　　**Binarized MATLAB Images:**
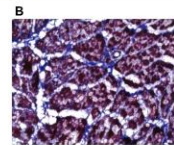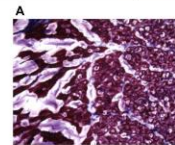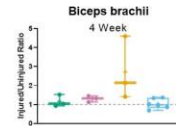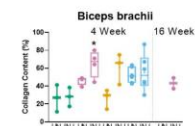
red = muscle
blue = collagen　　black = collagen　　black = muscle

- Un/inj limb comparisons: paired t-tests
- Group comparisons: Kruskal Wallis tests ($\alpha = 0.05$)

Results

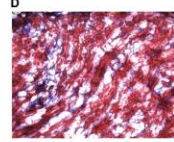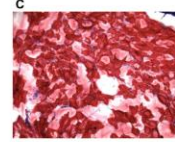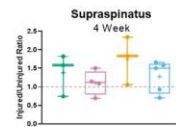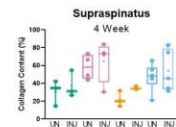Legend: Sham | Postganglionic Neurectomy | Preganglionic Neurectomy | Forelimb Disarticulation

Limb Comparisons | Group Comparisons | Representative Images

- Collagen content for injured (INJ) bicep **(B)** was greater in the postganglionic group (*$p<0.05$) relative to uninjured (UN) bicep **(A)**
- Collagen content tended to be greater in INJ preganglionic bicep relative to UN

- Collagen content tended to be greater in INJ supraspinatus **(D)** than UN **(C)** following preganglionic and postganglionic neurectomy
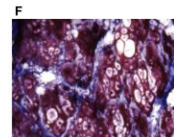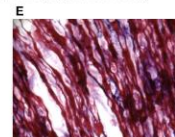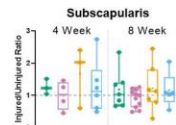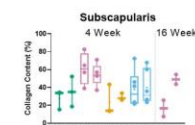
- Collagen content for INJ limbs tended to be similar between 4 **(E)** and 8 week subscapularis muscles but greater at 16 weeks **(F)**
- Preganglionic INJ collagen content tended to be greater in the subscapularis

Discussion

Postganglionic Neurectomy
- Fibrosis is present in the biceps brachii, supraspinatus, & subscapularis by 4-weeks post-injury and the subscapularis muscles have similar levels to a previous study at 8-weeks post-injury[5].
- Injured biceps had greater collagen content relative to the uninjured bicep (*$p<0.05$)

Preganglionic Neurectomy
- Our results demonstrated a tendency for increased fibrosis in all muscles.
- Biceps tended to have greater collagen content than disarticulation and sham groups.

Significance & Future Work
- First study to characterize fibrosis progression of the biceps, supraspinatus, and subscapularis muscles after BPBI, which will aid a greater understanding of tissue-level changes that occur
- Future work will examine 2 and 3 week timepoints to establish a timeline for when fibrosis develops to help inform enhanced treatment strategies for patients with BPBI.

References

[1]Pondaag W. *Dev Med Child Neurol.* 2004;46(2):138-144. [2] Doshi, 2022 *J Orthop Res* 40:1281 [3] Dixit, 2021 *J Hand Surg Am* 46:146. [4] Nikolau S. *J Hand Surg Am* 2015;10:2007. [5] Fawcett 2021 Doctoral Dissertation https://www.lib.ncsu.edu/resolver/1840.20/39052.

Acknowledgments

NC STATE UNIVERSITY

Where are Neuse River Waterdogs (*Necturus lewisi*) Reproducing in the Neuse and Tar River Basins?

Sarah Krementz, Taliana Tudryn, Eric Teitsworth, Krishna Pacifici

Department of Forestry and Environmental Resources

Introduction

- *Necturus lewisi* is a neotenic, aquatic salamander endemic to the Neuse and Tar-Pamlico river basins of eastern North Carolina.
- Habitat includes moderate to large freshwater streams with cobble and/or sand substrates and variable instream structure for refuge and nesting.
- Prior research has identified local and landscape features that drive adult *N. lewisi* occurrence and determined that populations are likely declining (Braswell & Ashton 1985; NCWRC unpublished).
- Adult surveys of *N. lewisi* have been completed from 2018 to 2023 (study by Eric Teitsworth at NCSU) using baited minnow traps, but these were not used for juveniles since they are not as active and remain in the leaf litter as they grow.
- The Neuse River waterdog is currently listed as Threatened under the Endangered Species Act as of 2021 due to its endemism as well as current and anticipated threats.

Study Area

- The Neuse (14,600km²) and Tar-Pamlico (15,920km²) river basins are parallel systems that originate in the Piedmont of north central North Carolina and flow southeast through the Coastal Plain to the Pamlico Sound (Fig. 1).
- Survey locations occurred at four different locations (Durham, Johnston, Halifax, and Pitt Counties) throughout the Neuse and Tar-Pamlico main channels and major tributaries (Fig. 2).
- The sites surveyed were selected due to confirmed adult-presence, proper leaf litter habitat for juveniles, and previous survey activity.

Figure 2. (right) Typical coastal plain habitat of *N. lewisi* in Edgecombe Co., NC

Figure 1. (left) Range of *N. lewisi*: Neuse River (southwest) and Tar-Pamlico River (northeast) in eastern North Carolina

Objective

- A new survey using leaf litter traps, which was novel for *Necturus*, was conducted at four locations with known adult-presence in an attempt to detect evidence of reproduction (i.e. young age classes).
- We wanted to determine what stream characteristics are needed to support Neuse River Waterdog reproduction by exploring juvenile presence as a function of variables collected during standardized habitat assessments.
- This study supplements a larger 5-year study on *N. lewisi* where adult presence is well-researched, and juvenile presence is recorded much less but is critical in understanding population health.

References

Braswell, A. L. and Ashton R. E., JR. 1985. Distribution, ecology, and feeding habits of *Necturus lewisi* (Brimley). Brimleyana. 10:13−35.
NC Department of Environmental Quality. 2016. Standard Operating Procedures for the Collection and Analysis of Benthic Macroinvertebrates. Division of Water Resources. Raleigh, North Carolina.
North Carolina Wildlife Resources Commission. Unpublished. 2011−2015 resurvey effort of 186 of the Braswell and Ashton 1985 locations.

Photo: Dan Guiotto

Methods

N. lewisi Data Collection

- Sampling occurred May−Aug. 2022. 10 cylindrical leaf litter traps, measuring 1ft X 1.5ft, were set at four sites in May (Fig. 3) and spaced ~10m in a 100m transect upstream of a bridge crossing.
- Traps were checked once every two weeks in order to let the leaf litter settle. Dipnetting was also used when a large pile of leaf litter was present to supplement waterdog detections.
- Data collected on all waterdogs captured includes weight, total length, snout to vent length (SVL), and a picture of their dorsal pattern.
- Individuals were tagged using visible implant elastomer (VIE), a Capture-Mark-Recapture method, with a unique code for each site.

Habitat Assessment Data Collection

- Standardized habitat assessments were performed at leaf litter sampling locations in May 2022 and at an additional 168 sites throughout the Neuse and Tar-Pamlico river basins between May 2021 and August 2022.
- The variables accounted for in the habitat assessments are water quality (i.e., temperature, pH, etc.), physical characterization (i.e., width, heigh, depth, etc.), channel flow status, channel modification, instream habitat, bottom substrate, pool variety, riffle habitats, bank stability and vegetation, light penetration, and riparian vegetative zone width (NCDEQ 2016).

Data Analysis

- Program R was used to compare all adult and juvenile capture frequency (751 events from 2018−2022) with the variable scores measured in all of the habitat assessments (from 2018−2022).
- ArcGIS was used to visually compare the spatial distribution of variable scores measured in the habitat assessments.

Figure 3. Stacks of empty vinyl-coated wire leaf litter traps before being set up for the field season in Johnston County.

Acknowledgements

Preliminary Results & Implications

Leaf Litter Trapping Results

- Throughout the 14 weeks of data collection, only two juvenile waterdogs were found within leaf litter traps. One was at the Johnston County site, and one was at the Halifax County site.
- Dozens more were found by dipnetting natural leaf substrate on site, suggesting that the survey method was not effective at detecting evidence of reproduction.

Habitat Assessment Data Analysis

Table 1. Adults and Juveniles Captured in Sites Based on Instream Habitat Scores
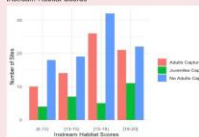
Figure 4. Map of 168 Instream Habitat Scores in Regions of the Neuse and Tar-Pamlico River Basins
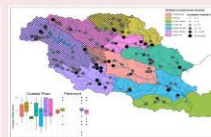
Table 2. Adults and Juveniles Captured in Sites Based on Bottom Substrate Scores

Figure 5. Map of 168 Bottom Substrate Scores in Regions of the Neuse and Tar-Pamlico River Basins
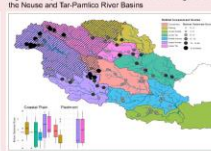
Table 3. Adults and Juveniles Captured in Sites Based on Light Penetration Scores
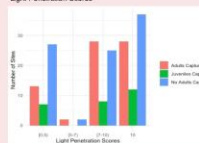
Figure 6. Map of 168 Light Penetration Scores in Regions of the Neuse and Tar-Pamlico River Basins
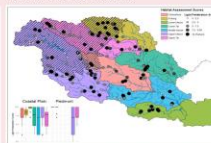
- The tables and figures above display *N. lewisi* detection frequencies in relation the score of selected habitat variables and the spatial distribution of those habitat variable scores.
- Habitat assessment scores illuminated that juvenile waterdogs occurred more in areas with boulder-filled bottom substrate, intact instream habitat, and higher light penetration.

Future Directions

- The results suggest surveys targeting evidence of reproduction (i.e. young age classes) should be completed by dipnetting large patches of natural leaf litter at locations with confirmed adult presence, as leaf litter traps did not produce much data.
- Analysis showing the relationship between instream habitat, bottom substrate, and light penetration with juvenile presence should continue to be explored as they had the highest positive correlation, especially in comparison to the other variables that showed no clear relationship.
- Future studies exploring the correlation between site characteristics and juvenile waterdog presence should occur in the Coastal Plain, such as the Lower Tar, Middle Neuse, and Lower Neuse, where adult populations appear more robust and there is abundant habitat for juvenile waterdogs.

Establishment Patterns of Carolina Hemlock Ecosystems in the Southern Appalachians

Casey Wofford and Dr. Jodi Forrester
Department of Forestry and Environmental Resources

Objectives

The main objective of my research was to determine the establishment patterns of Carolina hemlock (*Tsuga caroliniana*) and neighboring species from five populations, Cliff Ridge (CR), Dobson's Knob (DK), Iron Mountain Top (IMT), Iron Mountain Bottom (IMB), and Lost Cove (LC), in the southern Appalachians. Data gathered from four sites in each population were used to determine these patterns.
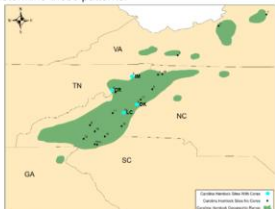
Figure 1: Map noting the geographic range of Carolina hemlock in green, along with notations of specific Carolina hemlock sites that have (blue) and have not (black) had cores taken. Mapped by R. Jetton.

Figure 2: E. Gossman and A. Whittier recording data on a typical Carolina hemlock site (A) and E. Gossman and myself for scale with one of the larger Carolina hemlocks.

Carolina Hemlock Overview

The Appalachian Mountains are home to a unique species of tree, Carolina hemlock, endemic to the southern region. Unlike its relative, the eastern hemlock (*Tsuga canadensis*), Carolina hemlock is generally found in upland, dry sites and is becoming increasingly rare due to insect damage and climate change. The non-native, invasive Hemlock Woolly Adelgid (*Adelges tsugae*) has threatened the health and longevity of both Carolina and eastern hemlock since its introduction to the eastern United States in the 1950's.
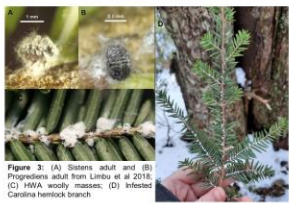
Figure 3: (A) Sistens adult and (B) Progrediens adult from Limbu et al 2018; (C) HWA woolly masses; (D) Infested Carolina hemlock branch

## Results

Many of the Carolina hemlock on these five sites had establishment dates concentrated between 1920 and 1990, with a few outliers. The oldest trees had maximum ages of 151, 214, 150, and 170 for Carolina hemlock, oak, pine, and other hardwood species, respectively. We found that oaks established earlier than other species at most sites, except Dobson's Knob. While Carolina hemlock is considered rare in its natural range (USDA), this species has been consistently establishing at all of our sites since the 1920s. There was no significant correlation between DBH and age for any species.

Acknowledgements

Figure 4: Graphic showing the number of each species or group: Carolina hemlock, Oaks (e.g., chestnut and northern red oaks), Pines (e.g., Table Mountain and eastern white pines), and other hardwoods (e.g., red maple and black gum), in relation to their establishment decade in each of the five sites, Cliff Ridge, Dobson's Knob, Iron Mountain Top, Iron Mountain Bottom and Lost Cove, where cores were gathered. *Three oak cores greater than 200 years old not shown for better scale.
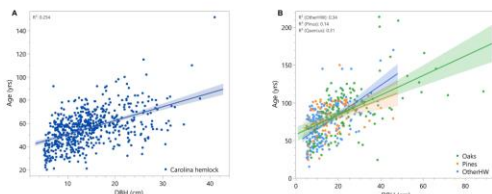
Figure 5: Relationship between the diameter at breast height (DBH) and age of tree for Carolina hemlock (A) and other neighboring trees (B)
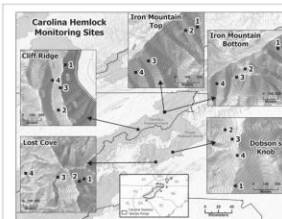
Figure 6: Map displaying the location of the 5 Carolina Hemlock sites and 4 plots per site in western North Carolina and eastern Tennessee. Inset depicting the range of Carolina Hemlock is from Little (1971). From Keyser et al 2023.

Methods

1,250 trees were cored from the five selected populations (Fig. 6). The species and diameter at breast height (DBH) of trees were recorded. Cores were mounted and sanded to help visualize individual tree rings (Fig. 7). Most cores were scanned and growth increments were measured from images using CooRecorder software (Fig. 8). If rings were difficult to see, growth increments were measured using a Velmex system and Measure J2X software. Records were combined in CDendro and establishment years were calculated based on the estimated ages of cores.

Figure 7: Cores taken from site Lost Cove (5), plot 3 (19). Cores include TSCA (Carolina hemlock), QUMO (chestnut oak), PIPU (Table Mountain pine), and ACRU (red maple).

Figure 8: Core run through CooRecorder software with estimated distance to pith.

Takeaways

- Completing the dendroecology of these sites proposes more questions and further research such as the reasoning behind the increase in establishment of Carolina hemlock between 1920 and 1990 and if the introduction of Hemlock Woolly Adelgid in the 1950's had a significant role in these changes.

- Further analysis of distances between tree rings may answer some of the above questions, as it will show changes in growth by year.

NC STATE UNIVERSITY
Department of Forestry and Environmental Resources

Lead Contamination Risk Across Regions of North Carolina

Samuel Holdsclaw[1], Trevor Phelps[2], Dani Lin Hunter[2], and Caren Cooper[2]
1) Department of Biological Sciences 2) Department of Forestry and Environmental Resources

WRRI
NC WATER RESOURCES RESEARCH INSTITUTE

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Introduction

Lead exposure, such as through drinking water, can have debilitating health effects. Lead exposure in drinking water is largely due to the use of lead in plumbing materials (1). Unfortunately, we know very little about the locations of lead piping (2). Furthermore, laboratory testing to confirm whether households experience lead contamination is expensive. Crowd the Tap is a participatory science project that aims to crowdsource the lead piping in water systems across NC and identify affordable measures of lead contamination. We engaged members of our local communities across rural, suburban, and urban geographic regions of North Carolina to participate in Crowd the Tap.

Age of Home   Pipes   Water Aesthetics

Low risk   Unknown risk   High risk

Lemon Test   Laboratory Testing

Unleaded Water   Leaded Water

Peace of mind about drinking water

Resources and suggested next steps
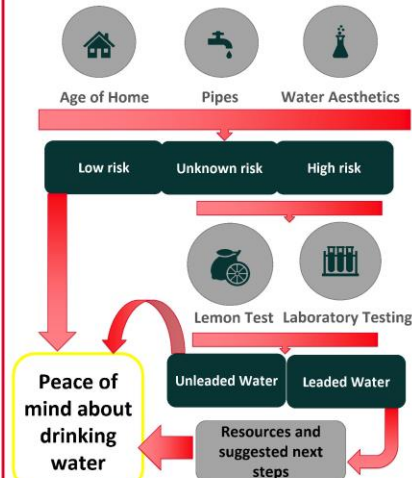
Figure 1: How Crowd the Tap Works

❖ Rural
❖ Suburban
❖ Urban

NC RURAL CENTER

Figure 2: Map of North Carolina by county classification (4)

Research Questions

- In Rural, Suburban, or Urban areas were lead findings more common?
- How did Lemon Test results align with laboratory analysis?

Methods

Screening
- Risk assessment based on pipe materials, home age, and water aesthetics.
- Provide unknown, high, or low risk level

Sampling
- Collect in-home water samples from main tap.
- Faucet not used for 6 hr. prior.

Analysis
- "Lemon test" completed 24 hr. after sample
- ICP-MS (Inductively Coupled Plasma Mass Spectroscopy) laboratory testing at Virginia Tech.

Follow-up
- Return results with lead levels of their water.
- Provide recommendations based on risk categories.

Figure 3: Steps of Methods

% Risk by Geographic Region

Rural   Suburban   Urban   Total

■ Unknown Risk
■ High Risk
▢ Low Risk
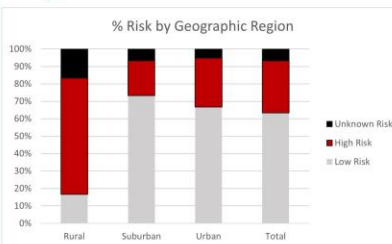
Figure 4: Graph of risk for lead contamination by region

Results

Lead Detection Level % by Region

Rural   Suburban   Urban   Total

Lead detected (ppb)
■ Serious >10
■ Significant 5-10
■ Moderate 2-5
■ Low 1-2
▢ Very Low .1-1
■ Not Detected <.1
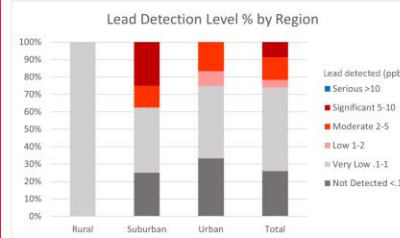
Figure 5: Graph of lead detection level by region

Lemon Test Results
0%
100%

Percentage of Households over 5 ppb
0%
100%   High risk

29%
71%   Low risk

■ Negative Lemon test   ■ Negative Lab test   ▨ Positive Lab Test
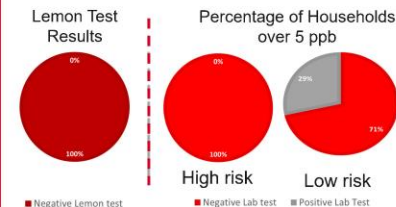
Figure 6: Comparison of Lemon vs Lab testing.

Conclusions

A limitation of the analysis by geographic classification is that we had much larger sample sizes for Suburban & Urban than Rural regions. While Rural homes were at higher risk from the screening, the findings did not corroborate these results. One potential reason for higher risk in Rural regions is more common usage of well water, which has linkages to a higher incidence of blood lead levels (3). The novel lemon test would be a great tool in identifying gaps of coverage in rural areas due to the low cost, ease of use, and quick results. However, our results indicate that it may not be effective at lead detection.

References

1-Thompson, Terrence, et al. Chemical Safety of Drinking-Water: Assessing Priorities for Risk-WHO. World Health Organization, https://apps.who.int/iris/bitstream/handle/10665/43285/9789241546768_eng.pdf?sequence=1
2-Cornwell, Davis, et al. "National Survey of Lead Service Line Occurrence - JSTOR." JSTOR, 2016, https://www.jstor.org/stable/jamewatworass.108.4.e182.
3-Gibson, Jacqueline MacDonald, et al. "Children Drinking Private Well Water Have Higher Blood Lead than Those with City Water." U.S. National Library of Medicine, 21 July 2020, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7382258/.
4- "About Us-NC Rural Center." NC Rural Center, https://www.ncruralcenter.org/about-us/.

NC STATE UNIVERSITY

Department of Statistics
Dr. Emily Griffith, Dr. Stephany Dunstan

Impact of COVID-19 on Masters Degree Completion Time

Authors: Anjali Patel and Jackson Bunte

Research Question

Did masters students enrolled during the pandemic take longer to complete their degree than those who graduated prior to the pandemic?

Background

- Understanding the impacts of Covid-19 on academic institutions is crucial when analyzing quality of education and regards to students mental health [1].

- 24% of graduate students a research institution expect the pandemic to delay their graduation while 35% were unsure and 41% did not prepare for a delay [2].

- Little research has been published thus far to understand these impacts due to how recent the pandemic occurred.

Data Preparation

- Our data consists of masters-level graduate students at a large research institution from the years of 2011-2022.

- Key Variables:
  - Cumulative gpa
  - Units taken towards progress
  - # of semesters completed

- Grouping Variable and Filters:
  - Covid - 0 (degree completed before)
 - Covid - 1 (degree completed during/after)
  - Rounded credit hours
  - Removed semesters with no credit hours and those with more than 15 credit hours attempted

Exploratory Data Analysis

- Students during the pandemic attempted fewer credit hours and had higher GPA's

- Cumulative GPA
  - Pre Pandemic : 3.67
  - Post Pandemic: 3.73

- Credit Hours:
  - Pre Pandemic : 7.47
  - Post Pandemic: 7.00

- Semesters to Completion
  - Pre Pandemic: 4.1986
  - Post Pandemic: 4.6826

- Total Observations : 80,992
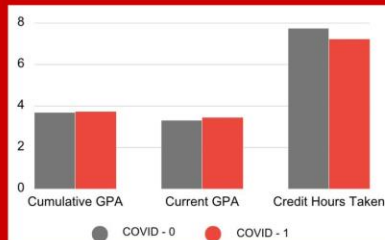
Results - Logistic Regression

Predicted Covid Status by Credit Hours Attempted in a Semester
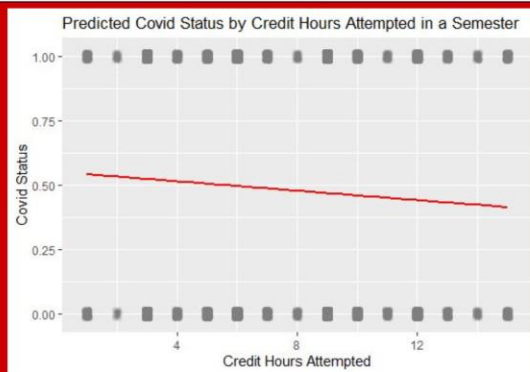
Methods

- We used a logistic regression model with the Covid (0-1) variable as our response variable and credit hours enrolled, semester GPA, in and out of state residency, and the STEM indicator as our dependent variables.

- The credit hours attempted variable was determined to be significant enough for our final model.

- This model predicts that the more credit hours a student attempts, the more likely they were not a student during the pandemic.

Conclusion and Future Steps

- In conclusion, there were significant differences shown in degree completion time for pre pandemic students vs pandemic.

- This does align with previous studies where overall differences were estimated to be significant. However Covid-19 did not affect everyone in the same way and individual student circumstances may cause shorter or longer paths to degree completion.

- Future work may include looking at PhD students, comparing students in different programs, or studying other variables like drop out rates.

References

1. Gamage, Kelum A. A., et al. "Academic Standards and Quality Assurance: The Impact of COVID-19 on University Degree Programs." Sustainability, vol. 12, no. 23, Dec. 2020, p. 10032. Crossref, https://doi.org/10.3390/su122310032.

2. Soria, K. M., Horgos, B., & McAndrew, M. (2021). Obstacles resulting in delayed degrees for graduate and professional students during the COVID-19 pandemic. SERU Consortium, University of California - Berkeley and University of Minnesota.

The *Single-minded* Gene Affects Feeding Behavior in *Drosophila melanogaster*

Gabrielle Schuh; Patricia Estes, PhD
North Carolina State University Department of Biological Sciences

Introduction

Background:
- **Obesity** is a widespread public health concern and maintaining a healthy weight is a chronic issue for many people.
- Obesity is a complex condition that impacts over 40% of US adults and associated healthcare costs $173 billion a year.
- Prevalence won't decline unless we develop new treatments and view it as a disease rather than a personal failing.
- Over 1,000 genes have been linked to obesity predisposition, many function in the brain to regulate hunger and satiety.

The Paraventricular Nucleus (PVN):
- Part of the hypothalamus in the central nervous system (CNS).
- Regulates food intake and energy homeostasis through signaling to the body when to start and stop feeding.

The *single-minded (sim)* gene:
- A transcription factor needed for the development of the PVN in mammals and certain neurons in the CNS of the fly.

Does the sim *gene influence feeding behavior and weight gain?*
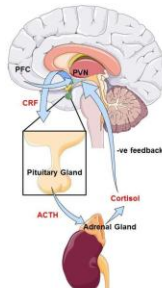
Previous study of the *sim* gene in mice by Michaud et al. 2001:
- Homozygous *Sim1* mutant mice lack the PVN of the hypothalamus and are not viable.
- Heterozygous *Sim1* mutant mice, have 24% fewer neurons in the PVN and are viable.
- Heterozygous *Sim1* mutant mice are hyperphagic and obese.

Sim in *Drosophila melanogaster*:
- *D. melanogaster* flies with silenced *sim* neurons have decreased longevity at room temperature and eat more rapidly as larvae.

Research Question: How does feeding behavior in flies with silenced *sim* neurons compare to wildtype flies?

Hypothesis: We predict that the flies with silenced *sim* neurons will extend their proboscis more often than wildtype flies when offered food, and that *sim* neurons play a similar role to inhibit feeding in both mice and flies.

Methods

UAS-TNT/Sim-GAL4 flies:
Genotype used to silence the *sim* neurons in the experimental group of flies.
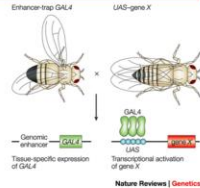
CantonS flies:
Wildtype flies with normal *sim* expression.

Experimental Design:
Newly emerged adult female flies were placed in experimental starvation vials with 1% agar for moisture or control vials with the standard cornmeal molasses diet.
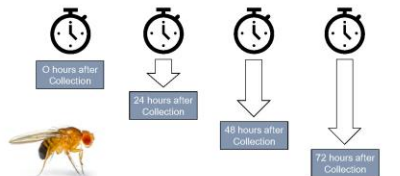
The Proboscis Extension Reflex (PER) Assay:
- PER measured the fly's ability to distinguish between food sources and regulate food intake after various periods of starvation.
- Flies taste objects with their front legs, which contain taste receptors, and reflexively extend their proboscis in response to an attractive stimulus.
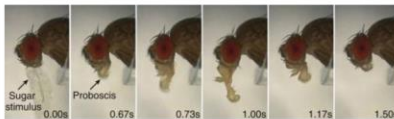
The PER assay was then used, recording percent of flies that extended the proboscis in response to 3M sucrose or 50% yeast.

Results

Response After Control or Experimental Vials
50% Yeast
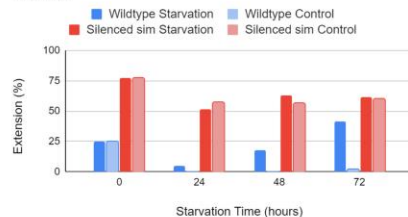
Starvation Vials:
- Flies with silenced *sim* neurons extended more than the wildtype at each time point.
- Wildtype flies extended more often with increased time of starvation after the initial 0 hour collection.

Control Vials:
- Flies with silenced *sim* neurons extended over 50% of the time, even when not starved.
- Wildtype flies extend under 3% after 24, 48 and 72 hours with food.

Comparing the PER results in the control to starvation vials:
- Wildtype flies extended more after starvation than the control with food available.
- Flies with silenced *sim* neurons extended similar amounts with and without starvation.

Discussion

- Silencing sim neurons appears to modify hunger levels and disrupt normal feeding regulation
- These results indicate the *sim* gene in flies responds in similar ways to mice, appearing to be conserved to invertebrates

Future research:
- What are the signals that are interpreted by the *single-minded* neurons to regulate feeding?

Scan the QR code for the list of references

Development of Coffee Toothpaste to Inhibit Growth of Cavity-Promoting *S. mutans*

Prerana Prabhushankar | Dept. of Food, Bioprocessing, and Nutrition Sciences, North Carolina State University | Raleigh, NC

Introduction

- A previous study by Antonio et. al demonstrated that *Coffeea canephora* (*C. canephora*) is effective against *Streptococcus mutans* (*S. mutans*), one of the primary bacteria involved in dental caries (Barma et. al, 2021).
- This study reported that the plaque-fighting benefits of *C. canephora* are only available in black coffee.
- Toothpaste may provide a delivery route for *C. canephora* to interact with *S. mutans*.
- In order to help consumers reap the potential dental benefits of coffee in an alternative manner, would it be possible to include a *C. canephora* extract in toothpaste?

Research Question

Q1: Does *C. canephora* have bactericidal effects when interacting with *S. mutans* biofilm?

Q2: Does *C. canephora* have bactericidal effects when interacting with *S. mutans* coated substrates?

Q3: Does toothpaste containing light roast, decaffeinated *C. canephora* extract have a greater anticaries effect in this model than commercial toothpaste?

Methods & Results

Method 1: A pure culture of *S. mutans* was grown in Brain Heart Infusion (BHI) broth for 24 h. 12-well cell culture plates were inoculated with three different concentrations of light roast coffee or one concentration of green coffee along with a positive and a negative control. Samples were spiral-plated the next day on BHI agar. Colonies were enumerated using the automatic plate counter.

A	B	C	D
CFU: 50 55 g/L Green	CFU: 103 55 g/L Lt. Roast	CFU: 57 110 g/L Lt. Roast	CFU: 8 220 g/L Lt. Roast
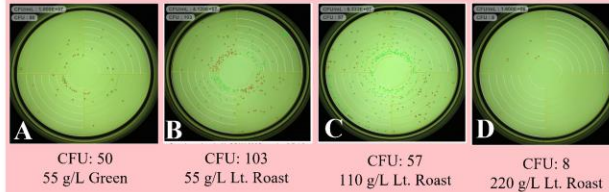
Figure 1: As light roast coffee concentration increase, CFU decreases

Method 2: To determine the Minimal Bactericidal Concentration (MBC), **Method 1** was repeated with 10 concentrations of coffee. Instant coffee was used instead of ground to prep the coffee samples.
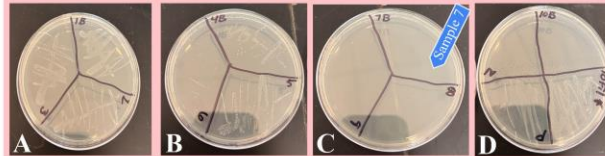
Figure 2: Instant coffee effects on *S. mutans* growth
- Sample 7 (255 g/L instant coffee) shows no growth → MBC

Next Steps

Repeat Methods 2 in triplicate to get consistent results (in progress)

Grow *S. mutans* biofilm onto model tooth structures (hydroxyapatite tablets)

Find MBC for *S. mutans* coated substrates

Incorporate coffee treatment into toothpaste and compare effectiveness to commercial toothpaste using simulated brushing

References

Antonio, A. G., Iorio, N. L. P., Pierro, V. S. S., Candreva, M. S., Candreva, M. S., Farah, A., … Maia, L. C. (2010). Inhibitory properties of Coffea canephora extract against oral bacteria and its effect on demineralisation of deciduous teeth. *Archives of Oral Biology*, 9.

Barma, M. D., Muthupandiyan, I., Samuel, S. R., & Amaechi, B. T. (2021). Inhibition of Streptococcus mutans, antioxidant property and cytotoxicity of novel nano-zinc oxide varnish. *Archives of Oral Biology*, 126.

Acknowledgements

Effects of Developmental Exposure to BMAA and MCLR on Adult Zebrafish

Victoria A. Kapps & Kurt C. Marsden

Department of Biological Sciences, North Carolina State University

Introduction

The Toxic Algae Cycle [12]

- β-methylamino-L-alanine (**BMAA**): cyanotoxin; suspected etiology of Amyotrophic Lateral Sclerosis (ALS)[3,11]
- Microcystin leucine and arginine (**MCLR**): cyanotoxin co-occurring with BMAA, notably linked to dementia[7]
- Acoustic Startle Response (**ASR**): reflexive muscular activity produced in response to a sudden, auditory stimuli; evolutionarily conserved across mammals[6]
- **Zebrafish** as a model organism[4,10]

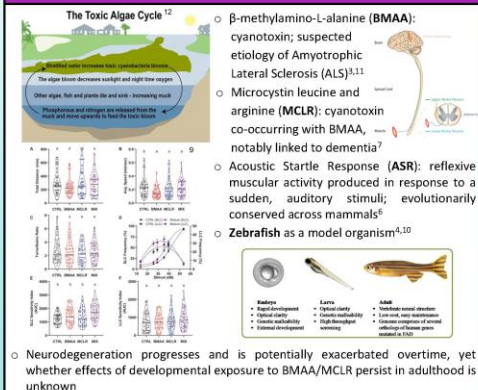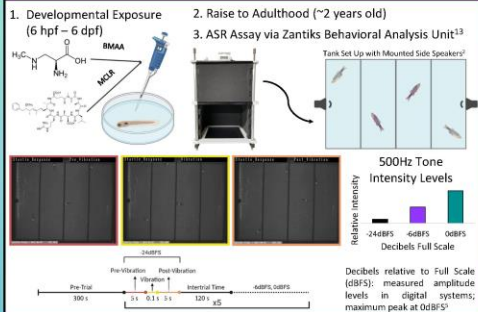- Neurodegeneration progresses and is potentially exacerbated overtime, yet whether effects of developmental exposure to BMAA/MCLR persist in adulthood is unknown
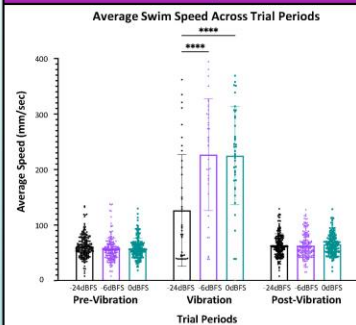
Hypothesis

Considering the deleterious nature of neurodegeneration, diminished acoustic startle response in zebrafish due to developmental BMAA/MCLR exposure is hypothesized to occur in adulthood.

Methods

1. Developmental Exposure (6 hpf – 6 dpf)
2. Raise to Adulthood (~2 years old)
3. ASR Assay via Zantiks Behavioral Analysis Unit[13]

Tank Set Up with Mounted Side Speakers[2]

500Hz Tone Intensity Levels

Decibels Full Scale

Decibels relative to Full Scale (dBFS): measured amplitude levels in digital systems; maximum peak at 0dBFS[5]

Pre-Trial 300 s | Pre-Vibration 5 s | Vibration 0.1 s | Post-Vibration 5 s | Intertrial Time 120 s | -6dBFS, 0dBFS x5

Preliminary Results

Average Swim Speed Across Trial Periods

Figure 1. **Average swim speed of WT controls across trial periods** Three trial periods (Pre-Vibration, Vibration, and Post-Vibration) for each of three 500Hz tones of increasing intensities (-24dBFS, -6dBFS, and 0dBFS). No significant differences in average swim speeds (mm/sec) across three Pre-Vibration trial periods between the three intensities. In Vibration trial period, there was a significant difference (p<0.0001) in average swim speeds between the -24dBFS and -6dBFS intensities and between the -24dBFS and 0dBFS intensities, but there was no significant difference in average swim speeds between the -6dBFS and 0dBFS. No significant differences in average swim speed across Post-Vibration trial periods between the three intensities. One-way ANOVA statistical analysis performed with a defined alpha of α=0.05; n=8; *p<0.05, **p<0.01, ***p<0.001, ****p<0.0001.

Frequency of Acoustic Startle Response (ASR) by Intensity Level
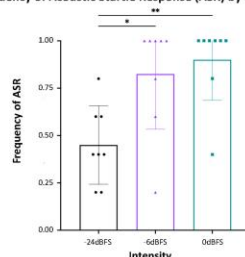
Figure 2. **Frequency of Acoustic Startle Response** Frequency of an acoustic startle response (ASR) between three 500Hz tones of increasing intensities (-24dBFS, -6dBFS, and 0dBFS). Threshold of two standard deviations (SD=19.52) from mean swim speed (x̄=58.66 mm/sec) was used to ensure a true ASR. There was a significance difference in ASR frequency between -24dBFS and -6dBFS intensities (p<0.05) as well as -24dBFS and 0dBFS (p<0.01), but no significance difference between the -6dBFS and 0dBFS intensities was observed. One-way ANOVA statistical analysis performed with a defined alpha of α=0.05; n=8; *p<0.05, **p<0.01, ***p<0.001, ****p<0.0001.

Conclusions

- Experimental set up with mounted side speakers is sufficient to evoke ASRs in adult zebrafish
- Pre-Vibration and Post-Vibration speeds are not significantly different across trial periods, regardless of associated intensity
- While -24dBFS produces significantly less ASRs during Vibration trial periods, there is no significant difference between ASRs induced between -6dBFS and 0dBFS intensities regarding both metrics

Future Research
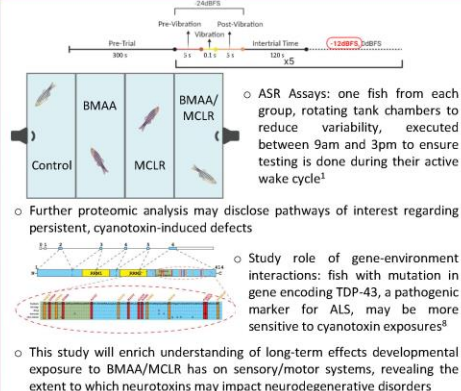
- ASR Assays: one fish from each group, rotating tank chambers to reduce variability, executed between 9am and 3pm to ensure testing is done during their active wake cycle[1]
- Further proteomic analysis may disclose pathways of interest regarding persistent, cyanotoxin-induced defects
- Study role of gene-environment interactions: fish with mutation in gene encoding TDP-43, a pathogenic marker for ALS, may be more sensitive to cyanotoxin exposures[8]
- This study will enrich understanding of long-term effects developmental exposure to BMAA/MCLR has on sensory/motor systems, revealing the extent to which neurotoxins may impact neurodegenerative disorders

Acknowledgements

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References

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Environmental Impacts of Urbanization

Ainsley Deese[1], Suzannah Hale[2]

Mentor: Dr. Erin McKenney, Department of Applied Ecology

1 - Department of Fisheries, Wildlife and Conservation Biology 2 - Department of Plant and Microbial Biology

Overview

- Urbanization is one of the leading causes of habitat loss and fragmentation.[3]
- Fragmentation occurs when habitats are broken into many spaces by barriers or destruction of land.
- Habitat loss and fragmentation limit biodiversity by making it difficult for species to maintain a viable population.

Goals

- Understand the effects of urbanization on fragmentation and habitat loss.
- Explore conservation strategies to minimize the effects of urbanization.
- Gain civilian involvement in conservation efforts.
- Evaluate how habitat loss and fragmentation drive extinction and lessen biodiversity in ecosystems.
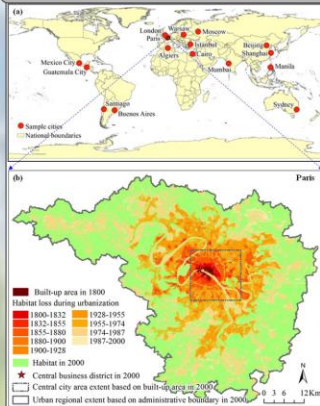
Global Trends in Urbanization

Figure 1. Map of the relationship between habitat loss and the spread of urbanization from 1800-2000 in France.[3]

Built-up area in 1800
Habitat loss during urbanization
1800-1832 1928-1955
1832-1855 1955-1974
1855-1880 1974-1987
1880-1900 1987-2000
1900-1928
Habitat in 2000
★ Central business district in 2000
☐ Central city area extent based on built-up area in 2000
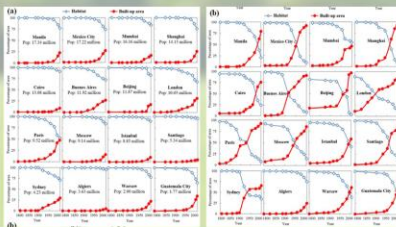☐ Urban regional extent based on administrative boundary in 2000

Figure 2. Trends in available habitat space versus urban development in 16 major cities (a) and inner-city regions within those 16 major cities (b), worldwide from 1800-2000.[3]

Discussion

- The importance of mitigating the global effects of urbanization is that many organisms are losing their ability to grow and survive.
- Humans rely on many plants, insects, and animals that are viable to native ecosystems.[1]
  - Urbanizing areas can drive native insects out of their habitat because of fragmentation, disturbances, and introduction of nonnative/invasive species.[1]
  - Without native insects, important ecosystem functions cannot be carried out such as upkeep of soil health, pollination, and control of pests and other harmful insects.[1]
- With the growing population of humans, urbanization is inevitable. Maintaining the the native environment, as well utilizing every inch of space with native species and /or flowering plants can assist with the harmful effects of urbanization.[1]

Future Conservation Strategies

- We propose a new effort that supports the integration of pollinators within the growing number of urban areas.
  - Encouraging planting of native pollinator-attracting species would increase the stability and population numbers of pollinators, particularly bees.[3]
- Establish habitats to favor native species over invasive species in potentially compromised environments.
  - Reducing fuel emissions, energy consumption, and waste are also ways to help integrate wild and urban spaces.

References

[1]Fukase, J., & Simons, A. M. (2016). Increased Pollinator Activity in Urban Gardens with More Native Flora. 14 (1) , pp.297-310.

[3]Liu, Z., He, C., Wu, J. (2016). The relationship between habitat loss and fragmentation during urbanization: an empirical evaluation from 16 world cities. PLoS One, 11(4), e0154613.

[2]Wilson, C. J., & Jamieson, M. A. (2019). The effects of urbanization on bee communities depends on floral resource availability and bee functional traits. PloS one, 14(12), e0225852. https://doi.org/10.1371/journal.pone.0225852

Standard Curve Implementation to Estimate Viral Loads of Geminivirus Infectious Clones, Pepper Huasteco Yellow Vein Virus (PHYVV) and Pepper Golden Mosaic Virus (PepGMV), in Tomato Lanai and Pepper

Reshma Goud and Trino Ascencio-Ibáñez

INTRODUCTION

Geminiviruses are small, circular, ssDNA plant-infecting viruses that can be mono or bipartite in their genomes. To further characterize the infection of Pepper Huasteco Yellow Vein Virus (PHYVV) and Pepper Golden Mosaic Virus (PepGMV) in tomato Lanai, the use of standard curves and qPCR were utilized. The successful implementation of this project will yield valuable insights into the infection of PHYVV and PepGMV in tomato Lanai, Poblano, and Habanero peppers within different tissues, which could inform future research and assist in the development of effective control strategies for these viruses.
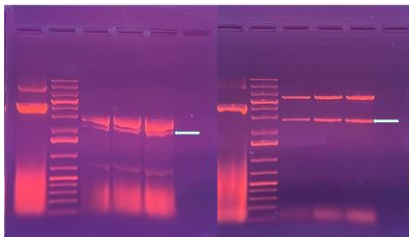
Figure 1: The left gel depicts the digestion of the A component of PHYVV. The right gel shows the digestion of the A component of PepGMV. In both gels, the lower band depicts the monomer (arrow). The gels were 0.7% agarose and ran at 80V.

ACKNOWLEDGMENTS

REFERENCES

C.A. Rajabu, G.G. Kennedy, J. Ndunguru, E.M. Ateka, F. Tairo, L. Hanley-Bowdoin, J.T Ascencio-Ibáñez, Lanai: A small, fast growing tomato variety is an excellent model system for studying geminiviruses, Journal of Virological Methods, Volume 256, 2018, Pages 89-99, ISSN 0166-0934, https://doi.org/10.1016/j.jviromet.2018.03.002.

METHODS AND RESULTS

The first method of separating the viral DNA from their respective plasmids was unsuccessful. Rather than purifying the viral DNA, the plasmid was cut into a monomer via digestion and confirmed using SnapGene. After successful digestions of the plasmids, they were used to produce dilutions and a standard curve for each component of each virus (A and B components). However, we only focused on the A component of each virus for the viral infection samples (33 dpi). Using the Line of Best Fit produced by the standard curve and Number of DNA copies equation, these equations were utilized in solving the concentration of viral presence (ng/uL) in each sample. Calculated values of viral presence smaller than 0.0001 were considered insignificant and disregarded.

STANDARD CURVES

Standard Curve for PepGMV A

$y = -3.4971x + 39.373$
$R^2 = 0.9711$

Standard Curve for PHYVV A

$y = -4.2496x + 47.088$
$R^2 = 0.9877$
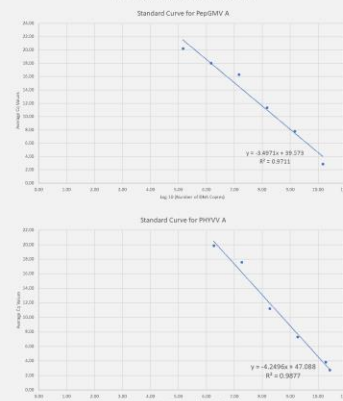
$$Number\ of\ copies = \frac{Amount\ (ng) \times 6.022 \times 10^{23}}{Length\ (bp)\ \times 1 \times 10^9\ \times Mass\ of\ DNA\ bp}$$

ESTIMATED VIRAL LOAD

Virus	Plant	Number of DNA Copies	Viral DNA Concentration (ng/uL)
Mock	Lanai	365.2334914	8.99559E-08
	Poblano	1506.269793	3.7099E-07
	Habanero	1874.964777	4.61798E-07
PepGMV	Lanai	136045524.6	0.033507593
	Poblano	3520.809239	8.67164E-07
	Habanero	1769.225756	4.35755E-07
PHYVV	Lanai	28120424.97	0.006925974
	Poblano	62685.77149	1.54393E-05
	Habanero	34108004.09	0.008400696

Table 1: This table shows the viral DNA concentration (ng/uL) for each virus and plant at 33 dpi. The boxes highlighted in red show insignificant values; therefore, no viral presence is inferred. The boxes highlighted in yellow depict viral presence.

Graph 1 (Top) and 2 (Bottom): Plotted standard curve for the A component of PepGMV and PHYVV, respectively. A line of best fit was produced for each virus and used to determine viral presence in Lanai, Poblano, and Habanero.

The equation to the left was used to calculate the number of DNA copies for the standard curve and viral concentration for the 33 dpi samples. The mass of DNA bp was found to be 618 g/mol based on the total bp (length) and molecular weight of each plasmid. These values were obtained using SnapGene. For the standard curve, the amount of DNA (ng) was found using a Nanodrop.

CONCLUSION

Based on the data, tomato Lanai is a more susceptible host for PepGMV and PHYVV compared to Poblano and Habanero peppers. Poblano and Habanero did not produce enough viral DNA to consider a significant amount of viral presence in the plants infected with PepGMV. Similarly, in the PHYVV-infected plants, Poblano does not contain a significant amount of viral DNA to consider a viral presence. It can be concluded that Poblano is the least susceptible to PepGMV and PHYVV and that tomato Lanai is susceptible to both viruses, and they replicate well in the plant.

FUTURE DIRECTIONS

Further characterization of the infection using in situ hybridization will define the distribution of viruses in the tissue. With this we will conclude the characterization of the tomato Lanai as a model plant for geminivirus-plant interactions. We also plan on sequencing the whole genome of the tomato Lanai to further its use as a model plant.

Diet impacts the avian epigenome for generations
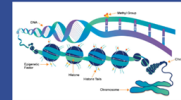
The effect of a diet high in methyl donors on DNA methylation patterns across multiple generations.

Chelsea A. Phillips and Chris M. Ashwell
Prestage Department of Poultry Science,
NC State University, Raleigh, NC 27695 USA
cmashwel@ncsu.edu

G0* G1* G2*

LoLo

HiLo

LoHi
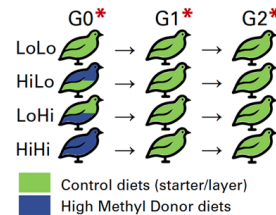
HiHi

■ Control diets (starter/layer)
■ High Methyl Donor diets

DNMT3 Methylation vs. Treatment

$p < 0.0001$
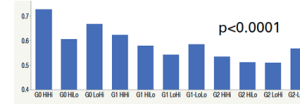
Correlation of DNA Methylation and Gene Expression by RNAseq

Methylation Level

AHCY | CHDH | DNMT3A
DHFR
DNMT3B | FLAD1 | MAT1A | MAT2A
MAT2B | MTHFR | MTR | MTRR
PDXK | RFK | SHMT1 | SHMT2

RPKM

Phenotypes Collected for Each Generation

	BW*	# of Eggs	Egg Wt*	Body Composition*	DNA Methylation Sequencing*
G0 Parents	BW*	# of Eggs	Egg Wt*	Body Composition*	DNA Methylation Sequencing*
G1 Progeny	BW*	# of Eggs	Egg Wt*	Body Composition	DNA Methylation Sequencing
G2 Progeny	BW	# of Eggs	Egg Wt*	Body Composition	DNA Methylation Sequencing*, RNA sequencing*

* Significant differences between G0 treatments

Diet Nutrients

Metabolites

Enzymes

Conclusions

❖ Diet affects genomes for generations

❖ Heritable differences in DNA methylation impact gene expression

❖ Animal Agriculture: Important to consider environment of parent stocks

NC STATE UNIVERSITY

A Poster Design that Highlights

Distributing Information More Easily

Jennifer Example[1], Bob Blueprint[1], Elaine Illustration[2]

[1] Department of Chemistry, NC State
[2] Department of Physics, NC State

Introduction

Lorem ipsum dolor sit amet, consectetur adipiscing elit (citation, 2010). Maecenas ac ornare nisi. Curabitur auctor vitae odio sodales blandit. Praesent molestie in diam id fermentum (citing sources et al., 2019). Cras ornare dictum velit, bibendum imperdiet libero luctus vel. Suspendisse et varius nulla (final source, 2018). Duis nec lectus neque. Nunc sagittis suscipit quam at mollis. Duis interdum congue augue, eu mattis eros lobortis ac.

Methods

- Quisque vulputate ex magna, id consectetur augue interdum commodo
- Praesent auctor lectus quis nisl auctor, ac sagittis nunc vestibulum.
- Pellentesque a fermentum massa.
  1. Donec rutrum velit non pharetra vehicula.
  2. Donec ullamcorper convallis vestibulum.
  3. Vivamus tincidunt sem sapien, ac varius lectus lobortis sed.

Results

Donec nec vehicula ipsum, eu pulvinar arcu. Maecenas pulvinar, orci ut semper vestibulum, risus sapien aliquam ipsum, at pretium sapien massa et nunc. Ut rhoncus vehicula luctus.

This is where I highlight my main finding or most impactful piece of my project.

Figure 1: What I want the audience to focus upon

Group by Condition Results
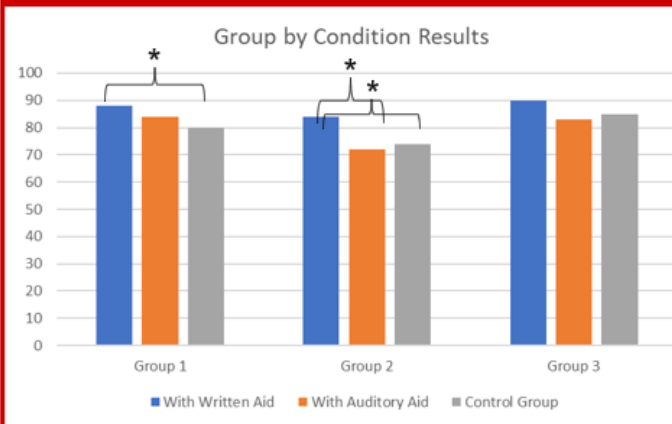
Include some descriptions to assist viewers with interpreting data.

Conclusions

- Lorem ipsum dolor sit amet, consectetur adipiscing elit
- Maecenas ac ornare nisi.
- Curabitur auctor vitae odio sodales blandit.
- Praesent molestie in diam id fermentum (citing sources et al., 2019).

Figure 2: Visuals are so helpful

	Final Test	Post-Test	Delayed Post-Test
Group 1	88	88	90
Group 2	76	79	84
Group 3	91	89	92

Little description regarding how to interpret this. It's important for viewers to have this information.

Figure 3: Informative, helpful figure title

See: <brattle>
Feedback: incorrect vowel

References

Citation, Q. (2010). Title tile title. *Journal of Interesting Science, 23*(1), 100-125.
Citing Sources, M., Fake, N., & Another, E.X. (2019). Interesting title. *Fun Science and Other Information, 4*(6), 310-344.
Final Source, W. (2018). Wow these worked out. *Journal of to be in Order Nicely, 3,* 1-18.

Acknowledgements

NC STATE UNIVERSITY

College of Humanities and Social Sciences
Department of Psychology
Department of Social Work

How Do Parents of Black Adolescents Teach About Race? The Role of Parent Political Beliefs

Kayla Wilmot, Elan C. Hope, PhD & Qiana Cryer-Coupet, PhD

Background

Political Beliefs
- The political beliefs of parents can often impact the development of political beliefs in adolescents (Niemi & Hepburn, 1995)
- According to the Pew Research Center, most African-Americans say they are moderate (44 percent) or conservative (27 percent), while just 26 percent said that they are liberal (Gilberstat & Daniller, 2020)

Racial Socialization
- Parents of Black adolescents are often responsible for the task of racial socialization in order to introduce their children to the experiences members of their social group have regularly (García Coll et al., 1996)
- In the context of this study, racial socialization will be based off five different aspects
  - Cultural Pride Reinforcement, which are statements that encourage having pride in one's identity
  - Cultural Alertness to Discrimination, which are statements discussing experiences of discrimination
  - Cultural Endorsement of the Mainstream, which measures statements that uphold popular views about race in society
  - Cultural Appreciation of Legacy, or the importance of heritage and related concepts
  - Coping with Antagonism, which discuss ways Black youth can cope with the reality of race in our society

Research Question

How do Black adolescent reports of their parents' racial socialization differ based on their parents' political beliefs?

Findings

Cultural Pride Reinforcement

Cultural Alertness to Discrimination

Cultural Endorsement of the Mainstream

Cultural Appreciation of Legacy

Coping with Antagonism
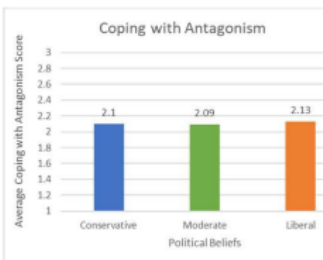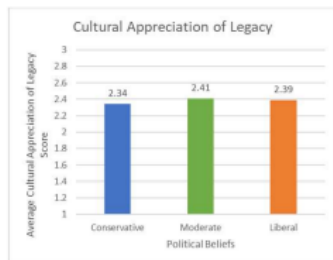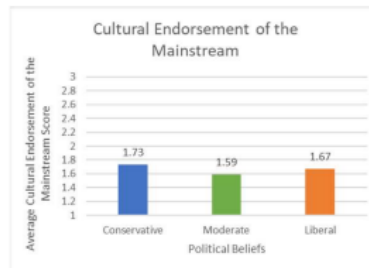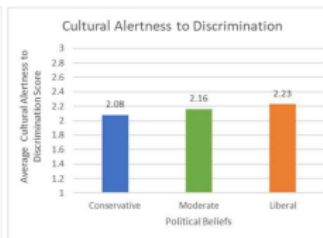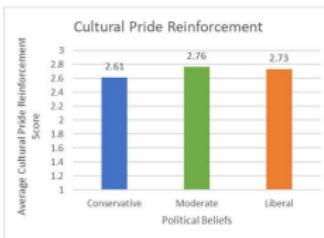
Method

Black Families Survey
- In 2018, Black families (caregivers and their adolescent children) were surveyed with questions regarding their experiences with politics/community, criminal justice, parenting, neighborhood/environment, physical health, and psychological well-being

Adult Participants (N=604)
- 93 Male Participants (15%), 511 Female Participants (85%)
- Ages 25-83 years old

Adolescent Participants (N=50)
- 24 Male Participants (48%), 26 Female Participants (52%)
- Ages 13 through 17

Measures

Teenager Experience of Racial Socialization Scale (Stevenson et al, 2002)
- Adolescents rated the frequency in which their parents engaged in statements or behaviors about race and racism
- Scale: 1 – (Never), 2 (A few times), 3 (A lot of the time)

Parent Political Beliefs
- Parents indicated their political beliefs as very conservative, conservative, moderate, liberal, or very liberal
- 21.8% of parents identified as conservative; 55.6% were moderate and 22.5% were liberal

Results & Future Directions

Results
- Parents with moderate political beliefs socialized their adolescents with more cultural pride reinforcement than conservative parents
- There were no significant differences in the other types of racial socialization.
- We find evidence to support that across all political beliefs, parents of Black adolescents approach the task of racial socialization in similar ways.

Future Endeavors
- Further research is necessary to explore the intricacies of political beliefs (whether someone is socially liberal and/or fiscally conservative) and how they may differ in their methods of racial socialization

Acknowledgements

NC STATE EXTENSION

FireWorks: A K-12 Fire Curriculum for Southeastern Ecosystems

Kaitlyn Tiffany[1], Laurel Kays[1], Renee Strnad[1], Jennifer Fawcett[1], Jonathan Hartsell[2]

What is FireWorks?

- K-12 wildland fire science educational curriculum covering topics including fire physics, history, ecology, and current use
- 7 Major units with over 50 hands-on activities
- Activities easily used for public outreach events
- Currently exists in some Western U.S. regions, but has not been developed for the South....until now!

Original FireWorks Curriculum:
www.frames.gov/fireworks

Sample Southeast-Adapted lessons:

Fire Triangle Lesson:
go.ncsu.edu/fw2_1_draft

Fire Physics Lesson:
go.ncsu.edu/fw2_2_draft

Tony Glen Photo

The Southeast Adaptation

- Develop a new FireWorks curriculum specific to the Southern U.S. region
- Cover three regions across the Southern U.S.:
  a. Coastal plain
  b. Piedmont
  c. Upland hardwood Appalachian ecosystem
- Emphasis on wildland fire as part of healthy landscape, particularly the benefits of prescribed burning
- Targeted towards middle school, with applications for late elementary, early high school, and outreach to general public

Curriculum will include:

1. Encyclopedia of species representing different fire regimes, ecosystems, and relationship to fire
2. Curriculum lessons for teachers on topics including physics of fire and fire ecology

https://www.outsidethebeltway.com/southern-us-map/

Draft Bobwhite Quail Encyclopedia Entry:
go.ncsu.edu/bobwhite

Join Us!

We welcome support in the following areas:
- Technical review
  - Review content
  - Revise activities
- Secure funding
  - Curriculum design & layout
  - Educator training
  - Materials coordination
- Publicize and implement curriculum

Laurel Kays Photo

Contact Laurel Kays at lekays@ncsu.edu to participate and for more information.

UF UNIVERSITY of FLORIDA · Forest Stewards Guild · THE LONGLEAF ALLIANCE · The Nature Conservancy · Museum of Natural Sciences · Project Learning Tree · COOPERATIVE EXTENSION · SOUTHERN Fire Exchange · TALL TIMBERS · WARNELL

[1]North Carolina State University [2]Blue Ridge Resource Conservation & Development

NC STATE UNIVERSITY

Department of Biological Sciences
Dr. Lisa Paciulli

Characteristics of nest construction in captive aye-ayes (Daubentonia madagascariensis)

Kaitlyn Tiffany, Samantha Cothern, David Watts, Dr. Lisa Paciulli

Introduction

Aye-aye lemurs (Daubentonia madagascariensis) are a species of little-known prosimians that are the only extant member of their genus. The body of knowledge surrounding aye-ayes is slim compared to other non-human primates, and especially so in regard to the rest of the lemurs. Even less well documented are their nesting habits; specifically when it comes to the physical characteristics and environmental properties of the nests. This is due in part to the elusive, nocturnal nature of aye-ayes, but mostly as a result of their nests being built a minimum of 10-15m above ground (Petter et al, 1970).

At the Duke Lemur Center in Durham, NC, captive aye-ayes provide a unique opportunity to document nests built in nest boxes or elsewhere in the enclosure -- ones that are not the 3 to 5 stories above the ground as would be found in the wild.
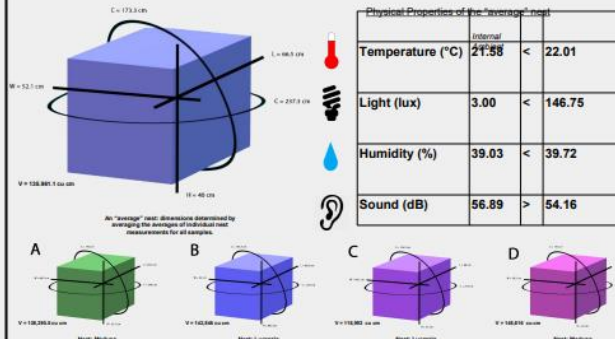
This study examines the dimensions, construction materials, and physical properties (internal humidity, temperature, light, sound level) of nests built by adult individuals, and attempts to construct a baseline knowledge of the ideal aye-aye nest.

Methods

Duke LEMUR CENTER

- Nests built by Lucrezia, 18, and Medusa, 16
- Construction materials selected from those provided by keepers
- Lemurs gnaw/bite off sections of material, weave into nest's form
- Most are built inside metal nest box or provided cardboard box (some in paper bags)

Characteristics of an average nest

C = 173.3 cm
L = 98.5 cm
W = 52.1 cm
C = 237.3 cm
V = 126,881.1 cu cm
H = 48 cm

Physical Properties of the "average" nest

	Internal		
Temperature (°C)	21.58	<	22.01
Light (lux)	3.00	<	146.75
Humidity (%)	39.03	<	39.72
Sound (dB)	56.89	>	54.16

An "average" nest: dimensions determined by averaging the averages of individual nest measurements for all samples.

A V = 128,255.9 cu cm — Nest: Medusa
B V = 142,548 cu cm — Nest: Lucrezia
C V = 110,952 cu cm — Nest: Lucrezia
D V = 145,016 cu cm — Nest: Medusa

Nest Opening

- Each nest has one circular entrance/exit
- Diameter 1 & 2 averaged together in case of oddly shaped opening

Avg D: 19.34 cm
Avg C: 56.5 cm

Construction Materials

- Pine Boughs
- Bamboo
- Wood Wool
- Fleece Strips

Future Directions

- Expand nest-builder population: two senior, female lemurs built the nests in this study
  - Build a more accurate model of the "ideal" or "average" nest
  - Investigate potential variation in construction between sexes
  - Investigate the development of nest construction from infancy to adulthood
- Determine nest properties in high-humidity environments like those in the wild
  - Investigate whether ambient humidity plays a role in the insulatory (thermal + auditory) properties of nests
- Provide a wider variety of materials for construction/locations for construction
  - Most captive nests are built within nest boxes or cardboard boxes--determine if this changes with greater enclosure infrastructure/broader access to construction materials

References

- Petter, J. J., & Peyrieras, A. (1970). NOUVELLE CONTRIBUTION A L'ETUDE D'UN LEMURIEN MALGACHE, LE AYE-AYE (DAUBENTONIA MADAGASCARIENSIS E. GEOFFROY). Mammalia, 34(2), 167-193.
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- File:Thermometer Fever blank.png. (n.d.). Retrieved from https://commons.wikimedia.org/w/index.php?curid=7767425S
- File:Lightbulb1.jpg. (n.d.). Retrieved from https://commons.wikimedia.org/w/index.php?curid=43003649
- Alex Cliparts #7580 (License: Personal Use). (n.d.). Retrieved from http://clipart-library.com/clipart/109550.htm
- https://www.arborsci.com/products/fiberglass-metric-tape-measure-10-pk

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