RECOGNIZING OUTSTANDING UNDERGRADUATE RESEARCH

2019 Research Day at the Capitol

STUDENT ORIENTATION SESSION

OKLAHOMA EPSCoR

2019 Research Day at the Capitol

Congratulations for being selected to represent your institution at the

24th Annual Research Day at the Capitol!

Event Sponsors:

Oklahoma NSF EPSCoR
The National Science Foundation
Oklahoma State Regents for Higher Education

OKLAHOMA EPSCoR

What is Research Day at the Capitol?

- Annual event, sponsored by:
  - Oklahoma State Regents for Higher Education
  - The National Science Foundation (NSF)
  - Oklahoma Established Program to Stimulate Competitive Research (OK NSF EPSCoR)
- To celebrate the excellent undergraduate student research being conducted on Oklahoma's college and university campuses
- A chance to inform Legislators and the public about undergraduate student research

2019 Research Day at the Capitol

YOUR STIPEND FUNDING

You can expect delivery of your $250 stipend check within approximately 3-4 weeks. Contact me if you haven't received it by Jan. 7, so my office can put a trace on the check.

- Funds are to cover your travel to/from OKC and for costs related to your poster printing & display (easel, board, etc.).
- Your check must be mailed to your permanent address (as indicated on your nomination form) per State guidelines.
- Checks will be issued from "OKLAHOMA STATE UNIVERSITY," NOT "EPSCoR."
- OSU students' checks will be processed through the OSU Bursar's Office.

2019 Research Day at the Capitol

TWO DAYS OF ACTIVITIES – MARCH 25 & 26

March 25 (Hyatt Place Hotel)

- Formal judging: Poster & oral presentations

March 26 (State Capitol Building)

- Posters presented, 4th Fl. Capitol Rotunda
- Awards ceremony, 2nd Fl. Capitol Rotunda

Students must participate in all activities to retain the $250 stipend and qualify for prizes.

2019 Research Day at the Capitol

CASH PRIZES: FOR THE TOP 7 PRESENTERS

The following prizes will be awarded:

Grand Prize: $500 cash prize + $4,000 summer research internship
$2,500 award to the sponsoring college/university lab to offset expenses of hosting the internship

1st, 2nd and 3rd Place Prizes will be awarded in each of two categories: Regional/community colleges (3 awards/1st, 2nd, 3rd)
Research-intensive campuses (3 awards/1st, 2nd, 3rd)

1st Place: $500 cash prize (1 ea: regional & research-intensive)
2nd Place: $250 cash prize (1 ea: regional & research-intensive)
3rd Place: $250 cash prize (1 ea: regional & research-intensive)

2019 Research Day at the Capitol

MONDAY, MARCH 25: HOW YOU ARE JUDGED

- Panel of 4 judges
- WELL educated, but not necessarily experts in your field of study

You will be judged on the following:

1. Poster
2. Abstract
3. 3-min. oral presentation before judging panel
4. Oral responses to judges' follow-up questions

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MONDAY, MARCH 25: HOW YOU ARE JUDGED

The following judging criteria are used, with a 1-10 point scale for each item:

- Abstract
  Format, clarity, societal impact, objective of study, results, conclusions.
- Scientific presentation
  Purpose, hypothesis, background information, results, impact, further study expected
- Student's ability to explain the project
- Visual appearance
- Clarity for general audiences
- Societal impact statement
- Overall

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ABSTRACT: REVISION DEADLINE FEBRUARY 4, 8 A.M.

Judges will score your abstract as part of your cumulative score. If you wish to alter or edit the abstract that was originally submitted, you must submit your final, revised abstract in MS Word format prior to February 4th at 8 a.m.

- MS Word format, no PDFs accepted (template provided)
- Maximum 350 words
- If images are used they will detract from the available word count; image files must be submitted separately (not only embedded in the document).
- Avoid excessive scientific jargon, but don't oversimplify
- Must be the work of the student
- See the provided sample judging sheet for scoring criteria
- Be sure you receive a confirmation of receipt from me

2019 Research Day at the Capitol

MONDAY, MARCH 25 * HYATT PLACE HOTEL, OKC

9:00 a.m – 4:00 p.m. Poster & Oral Presentation Judging

- Individual timeslots will be provided in advance
- Arrive at designated time
- Bring your poster with you, mounted on a firm board
- Check in at the EPSCoR table
- Poster number will be provided at check-in
- Place the number in the top/right corner of your poster
  Leave the number on your poster throughout the event/both days
- Wait outside the judging room for your turn to present
- Students will enter the judging room one-at-a-time
- Take your poster in with you
  (Demonstration materials are okay if they are small and safe)

➢ **IMPORTANT!!** An easel will be provided in the judging room. However, YOU must bring your own easel to the Capitol the following day.

2019 Research Day at the Capitol

POSTER AND ORAL PRESENTATION JUDGING

Oral Presentation: 3 minutes (timed)

- Walk in- SMILE, introduce yourself, be confident, and take them through what you have done - using your poster as a guide.

Poster Review + Q & A by Judges: 5 minutes maximum (timed)

- Anything on your poster is eligible for questioning so BE FAMILIAR with all components.
- Questions are usually to re-affirm or clarify something about your presentation.
- Kinds of questions - Procedural, social impacts, future aspirations.
- The entire 5 minutes may not necessarily be used.

- ❖ After Q&A: Exit the room with your poster (& demonstration materials if you brought them)
- ❖ Leave the number on your poster for Tuesday
- ❖ You are free for the rest of the day

2019 Research Day at the Capitol

PRESENTATION PREP & SUGGESTIONS

- The best way to improve your presentation skills is to present.
- Record yourself presenting and play back your recording to notice and fix your mistakes.
- Practice presenting to a friend who doesn't have a science background and listen to their feedback on your presentation.
- Practice presenting in an empty room using the volume you plan to speak at and hand gestures (pointing to figures/text on poster).
- Maintain natural eye contact with your audience in order to keep them engaged.
- Emphasize the importance of your societal impact. Explain why your scientific findings are important.
- What if you're asked a questions that you don't know the answer to? Do NOT make up an answer—it's better to say you don't know.

2019 Research Day at the Capitol

ADDITIONAL PRESENTATION SUGGESTIONS

Special suggestions from past participants:

- Don't underestimate the difficulty of synthesizing your project into a mini 3-minute presentation.
  - Time yourself over and over again to make sure you can present your material in the 3-minute timeframe.
- Also practice how you will talk to any Capitol guests who may not have experience in your area or who are non-scientists (this will be different than your more technical/judged presentation).
- Know ahead of time what you want to share with your Legislators.

2019 Research Day at the Capitol

SUGGESTIONS FROM THE JUDGES

- Review sample judging criteria sheet
- Review your abstract and make sure it's accurate; use the space that you have been allotted & revise if necessary
- Talk loud and project your voice
- Pay close attention to societal impact and research objective
- Answer, "What have you accomplished with your research?"
- Statistics are good—provide proof of outcomes

2019 Research Day at the Capitol

SUGGESTIONS FROM THE JUDGES

- Focus on what you contributed in regards to the research.
  Don't claim to have done it all if that's not the case.
  Toot your horn if it's applicable!
  "With assistance I…."
  "In collaboration with my faculty mentor I….."
  "I explored ____ with the grad assistant on the project."
  "I independently performed……"
- Avoid jargon in oral presentations; clarity for general audiences should be considered
- Societal impact statement should be included on the poster and also in the oral presentation

2019 Research Day at the Capitol

HOTEL ACCOMMODATIONS (REQUEST DEADLINE FEB. 4)

EPSCoR will provide lodging on the evening of Monday, March 25 for student participants who live outside the OKC metro area and who have requested lodging prior to the February 4th deadline.

- Conference hotel: Hyatt Place Hotel
  The EPSCoR office will book the room for you and pay the hotel directly for the room charge.
- Hotel will require a credit/debit card from students at check-in to cover any incurred incidental charges.
- A guest may stay in the room with you at no additional charge.
- Email me no later than Feb. 4 to secure a room; a signup sheet is available today (indicate one bed or two in the room).
- Confirmation numbers will be issued to you in February.
- If a room is booked on your behalf and is not used, you/your institution will be responsible for the charges.

2019 Research Day at the Capitol

TUES., MARCH 26 CAPITOL POSTER SESSION

2019 Research Day at the Capitol

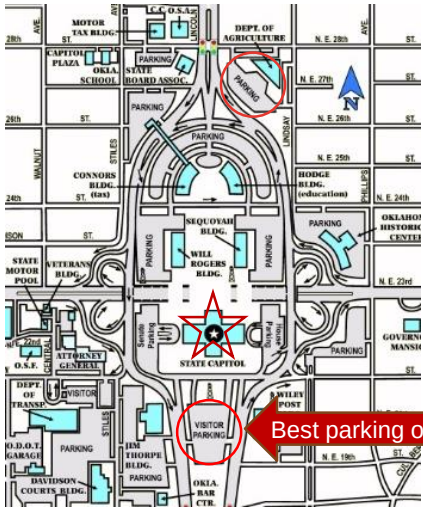
2019 Research Day at the Capitol

TUES., MARCH 26 TIMELINE: POSTER SESSION & AWARDS

6:30-7:00 a.m.	Breakfast for students staying at the Hyatt *(Free for guests, Hotel lobby)*
7:30-8:00 a.m.	Students arrive at Capitol, 4th Floor Rotunda *(Setup posters)*
8:25 a.m.	All poster set up & ready to present
8:30-11:15 a.m.	Posters on exhibit, 4th Floor Rotunda *(Students greet Legislators & Capitol guests)*
11:30 a.m.	Awards Ceremony, 2nd Floor Rotunda
12:30 p.m.	Adjourn & take down posters

2019 Research Day at the Capitol

CAPITOL COMPLEX: IT'S A MAZE + LIMITED GOOD PARKING



2019 Research Day at the Capitol

TUES., MARCH 26 ARRIVAL INFORMATION

- Give yourself plenty of time—it's hard to navigate around the Capitol streets & parking lots in the dark
- Park in an approved visitor parking area
- Go through security (no knives, etc.) & take elevator to the 4th floor
- Your program book, survey form, and a contact sheet will be on your table.
- Wear your name badge from the previous day.
- **Everyone must be set up and ready to go by 8:30 a.m.**
- Survey forms/contact sheets should be turned in to the EPSCoR table prior to the awards ceremony (~11 am).

2019 Research Day at the Capitol

MARCH 26 CAPITOL POSTER SESSION

A six-foot table covered with a white, floor-length tablecloth will be provided for you.

You are required to bring:

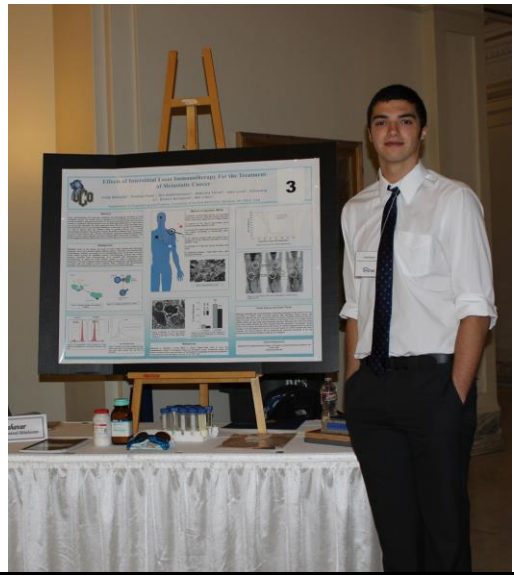
- Photo ID
  (May be requested by security at the Capitol entrance)
- Your poster
- Firm board backing for your poster
- Easel
- Tacks, Velcro or other attachment materials
- Your poster number that was provided the previous day

You are highly encouraged to:

- Bring hands-on demonstration materials

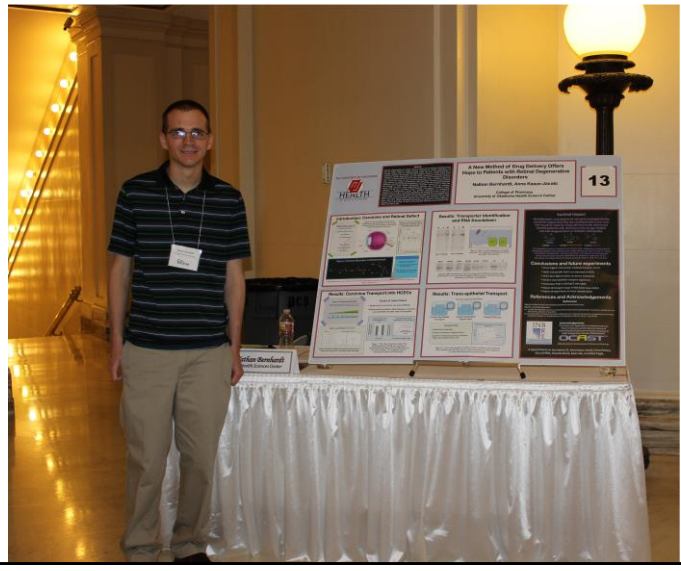
March 26 * At the Capitol

BRING HANDS-ON DEMONSTRATION MATERIALS



March 26 * At the Capitol

DRESS PROFESSIONALLY; A NEW SUIT ISN'T NECESSARY



2019 Research Day at the Capitol

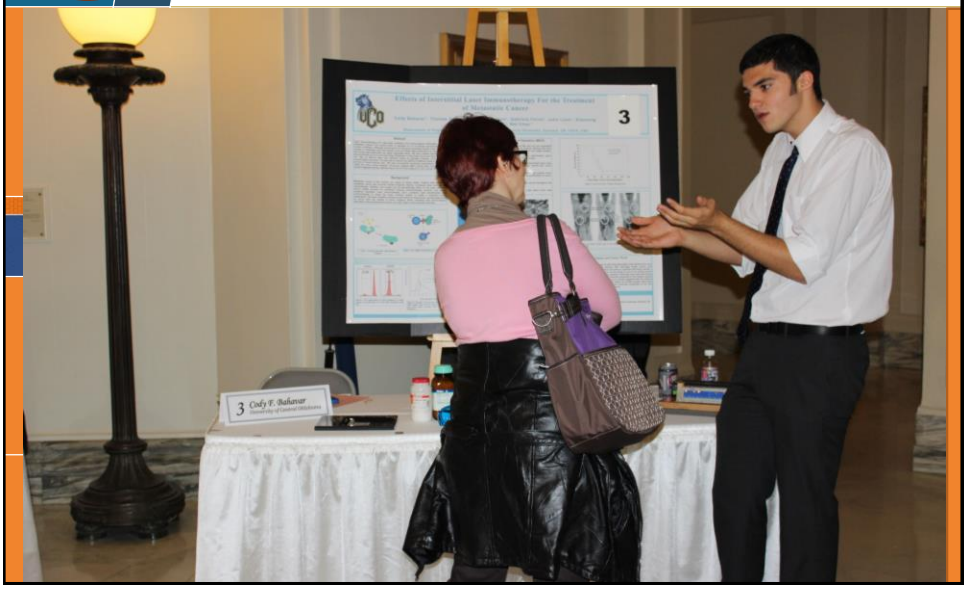
APPROPRIATE DRESS – BOTH DAYS

March 26 * At the Capitol

DO NOT FORGET YOUR EASEL AND FIRM BOARD!

March 26 * Day of the Event

SHARE YOUR WORK: RDC JUDGES, LEGISLATORS & CAPITOL VISITORS



March 26 * At the Capitol

THE LEGISLATORS

- Identify your home and school Representatives and Senators (may be different) www.oklegislature.gov
- Remember: Use layman's terms & outline how your research affects and/or benefits his/her constituents!
- Not everyone will receive a citation, but we make a recommendation and provide details to encourage it.
- Grab a photographer.

2019 Research Day at the Capitol

TIMELINE OF IMPORTANT DATES

Dec. 2, 2018 – March 24, 2019	Students prepare scientific posters & oral presentations
Monday, February 4, 2019	Students' revised abstracts and lodging requests are due
Monday, March 11, 2019	Online registration closes
Monday, March 25, 2019	Poster/oral presentation judging 9 a.m. – 4 p.m. Hyatt Place Hotel, Oklahoma City *Student Participation Mandatory*
Tuesday, March 26, 2019	Posters on Exhibit 8:30 – 11:15 a.m. 4th Floor Rotunda, State Capitol, OKC *Student Participation Mandatory*
Tuesday, March 26, 2019	Awards Ceremony 11:30 a.m. – noon 2nd Floor Rotunda, State Capitol, OKC *Student Participation Mandatory*

All March 25-26 activities are mandatory for student researchers; registered guests are invited to participate in all Capitol activities on the 26th.

2019 Research Day at the Capitol

POSTER PREP: A QUICK REFERENCE GUIDE

Purpose of your Research Poster: Disseminate research findings and progress to Legislators, the public, and your peers

- Will not be a cut-and-paste version of your abstract
- Visually communicates a "take-away message"
- Spotlights your most important ideas, points, findings
- Serves as an interface between your research results and your oral presentation

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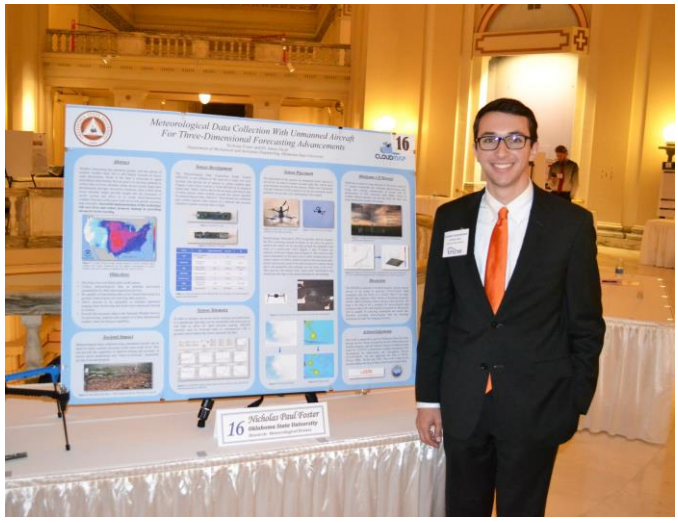
❖ *Posters must be the work of the student researcher.*

2019 RESEARCH DAY AT THE CAPITOL
Poster Prep: A Quick Reference Guide



2019 Research Day at the Capitol
POSTER PREP: A QUICK REFERENCE GUIDE

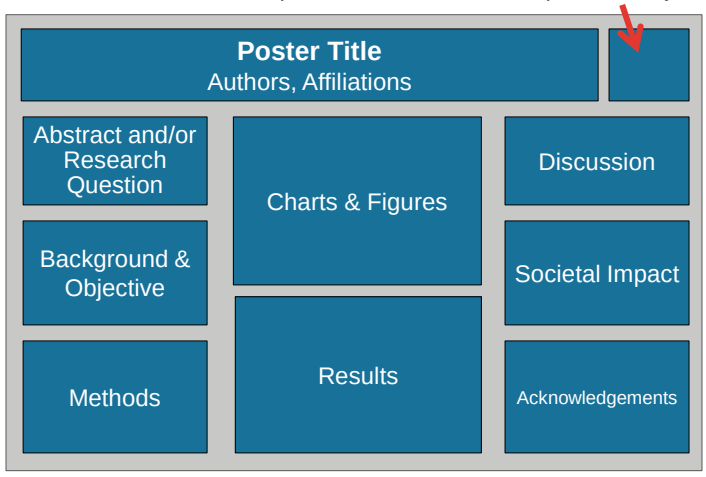
- PowerPoint is recommended for your poster design
- Before you start
  - Check with your print shop regarding size and color constraints that may apply
  - Average size 48”x36”
  - Set the page size (in your (program) to match the final print size
  - Ask your mentor for advice regarding where to print your poster

- Your poster for this event may deviate slightly from the standard/traditional 48”x36” poster dimensions

2019 Research Day at the Capitol

POSTER PREP: GENERAL POSTER FORMAT

Leave 4.5x5.5” blank space here for poster number that will be provided to you



2019 Research Day at the Capitol

POSTER PREP: A QUICK REFERENCE GUIDE

- Every poster should be custom made/tailored to the event you are preparing it for
- Your Research Day at the Capitol poster is being judged by highly educated individuals from various STEM fields but it IS ALSO being viewed by important Legislators who may not have a science background.

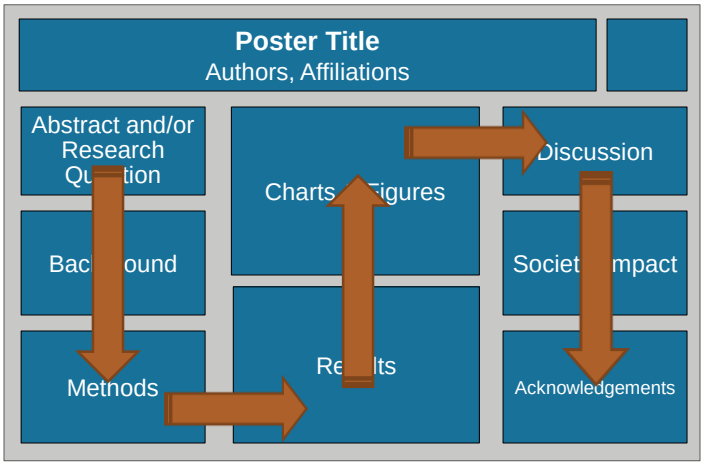
SO:

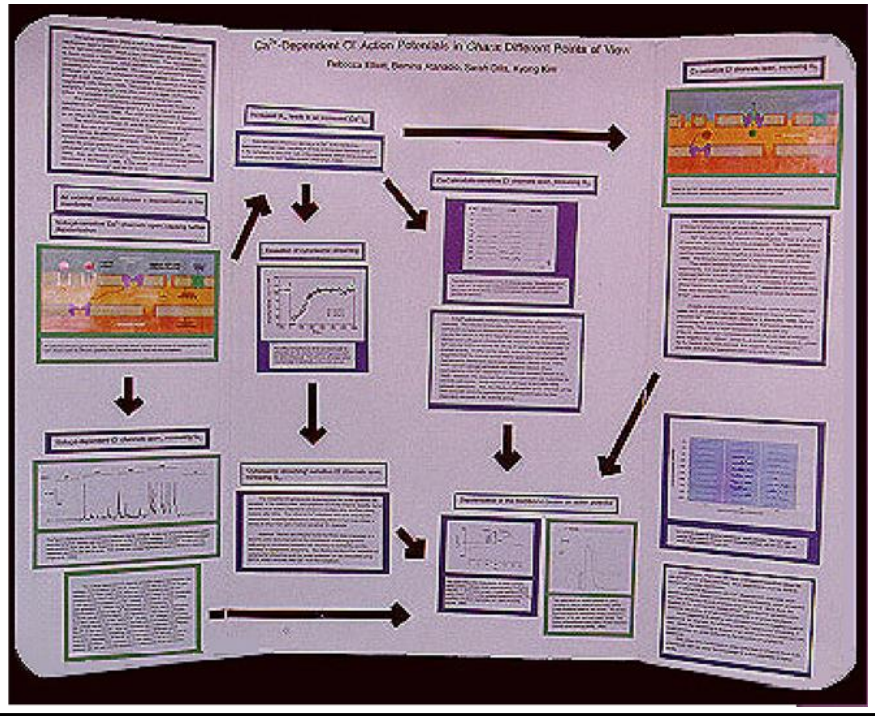
- Succinctly and clearly express your scientific research and findings
- Include all essential information; keep writing concise
- Avoid field-specific jargon
- DON’T dumb-down your research!
- Use your Societal Impact Statement to reach the audience members who may not understand the deeper science.

2019 Research Day at the Capitol

POSTER PREP: GENERAL POSTER FORMAT

Use logical flow between sections: top to bottom and left to right





PMA induces growth inhibition and morphological changes in HT-1080 cells

Mary Katherine Randolph[1] and Zhizhuang Joe Zhao[2]
[1]Department of Chemistry, Oklahoma City Community College,
[2]Department of Pathology, University of Oklahoma Health Sciences Center

Abstract

Introduction: Ras oncogene activations are present in approximately 30% of human malignancies including colon, pancreas, thyroid and hematopoietic cancers. Our earlier studies reveal that oncogenic K-Ras-transformed cells are highly sensitive to inhibition by phorbol 12-myristate 13-acetate (PMA). In this study, we utilized a human fibrosarcoma cell line (HT-1080) with a mutated N-Ras allele to investigate further the effects of PMA on Ras-transformed cells.

Methods: The entire coding region of N-Ras was amplified from HT-1080 cell cDNA by PCR and sequenced. HT-1080 cells were cultured in Dulbecco's Modified Eagle Medium (DMEM) supplemented with 10% fetal bovine serum (FBS) at 37°C, 5% CO2, and humidified conditions in the presence or absence of PMA. Cell counts were obtained on a 2/10 mm hemocytometer and phase contrast microscope. Cell density and morphology were observed with Wright-Giemsa and immunofluorescence staining. Activation of Erk1/2 was assessed using Western blot analysis and immunofluorescence staining.

Results: Heterozygous N-RasQ61K mutation was found in HT-1080 cells. Cultures treated with a high dose of PMA (10uM) consistently showed a significant ($p<0.05$) decrease in cell number compared to the respective control culture. Results for HT-1080 cell cultures treated with a low dose of PMA (0.02uM) were less consistent and the decrease was not always significant ($p>0.05$). PMA-treated cells have a stretched appearance with prominent actin reorganization and appear differentiated.

Conclusions: PMA induces extensive cell growth inhibition and morphology changes in HT-1080 fibrosarcoma cells.

Introduction

The Ras proto-oncogenes encode small GTPases (N-Ras, H-Ras, and K-Ras) which act as molecular switches in regulating cellular proliferation, differentiation, and survival.[1] Non-transformed Ras proteins are only transiently active while oncogenic mutations create constitutively active Ras proteins.[1] This state results in constitutive activation of downstream effectors, including the Ras-Raf-Mek-Erk(p42/p44 MAPK) pathway, which is involved in cellular proliferation.[1] Oncogenic Ras mutations occur with a 30% frequency in cancers of the highest mortality.[2] We investigated the effect of PMA on the HT-1080 human fibrosarcoma cell line containing an endogenous mutated N-Ras allele. PMA mimics the endogenous activator diacylglycerol (DAG) to activate proteins across many different classes including novel and classical protein kinase C isozymes, protein kinase D isozymes, and Ras guanine nucleotide exchange factors which activate Ras proteins.[3] PMA is perhaps best known for its tumor promoting properties in the mouse skin carcinogenesis model. Prolonged topical application of PMA promotes skin tumors on mice previously exposed to a mutagenic carcinogen.[3] Our earlier studies, however, revealed that oncogenic K-Ras-transformed cells are highly sensitive to inhibition by PMA. Depending on the cell type, PMA is capable of promoting mitogenic responses or initiating growth arrest. Our goal was to investigate further the effects of PMA on N-Ras-transformed cells.

Acknowledgments

This project was supported by the National Institute of General Medical Sciences of the National Institutes of Health through Grant Number 8P20GM103447 and by Oklahoma EPSCoR.

Results

Heterozygous N-RasQ61K mutation in HT-1080

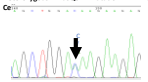


Figure 1. The entire coding region of the N-Ras gene was amplified from HT-1080 cell cDNA by PCR and sequenced. HT-1080 cells show heterozygosity for the N-Ras mutation with a single amino acid substitution at position 61, from a glutamine (Q) to a lysine (K).

Comparative Morphology

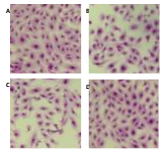


Figure 2. Morphology of investigated HT-1080 cells. (A) Control, (B) 10uM PMA, (C) 100uM PMA, and (D) 1000uM PMA. Cells in B-D are less dense, irregularly shaped and appear elongated. Wright-Giemsa stain, bright field, 100X.

Viable cell count

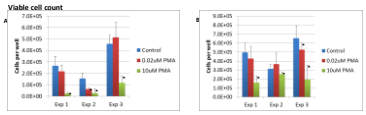


Figure 3. Experiments in set (A) were seeded with half the uL HT-1080 cells seeded in set (B). Four viable cell counts were taken per slide, error bars indicate standard deviation. *P<0.05 indicates PMA-treated cells are significantly different from the corresponding control cells.

Morphological changes, actin reorganization and Erk 1/2 activation by PMA in HT-1080 cells

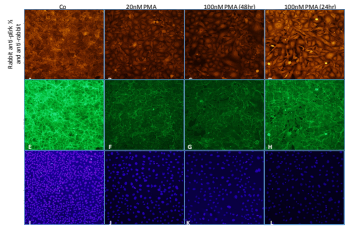


Figure 4. With the addition of PMA, A-D highlight increasing Erk 1/2 activation, E-H actin reorganization, and I-L increasing nucleus size and decreasing cell numbers. Brightly stained mitotic cells are visible in image I which are lacking in J-L after PMA treatment. Immunofluorescence microscopy, 200X.

Materials & Methods

Cell culture. Stock cultures of HT-1080 cells were maintained in DMEM supplemented with 10% FBS at 37°C, 5% CO_2, and humidified conditions. PMA dissolved in DMSO was added to cultures at a concentration of 0uM, 0.02uM, or 10uM. For each experiment to determine cell count, a high and low volume of HT-1080 cells were seeded from the stock culture; the low volume was always equivalent to half of the high volume. DMSO alone at the final concentration used in our experiments (<1%) is assumed to have no effect on cell growth. Cell numbers were determined on a 2/10 mm hemocytometer and phase contrast microscope (1X) after trypsinization in the presence of 0.05% EDTA.

Cell staining. HT-1080 cells were treated with 10uM, 100uM, 1000uM PMA or DMEM alone (control) for three days, fixed with methanol and stained with a Wright-Giemsa stain. For immunofluorescence microscopy, adherent HT-1080 cells were grown on glass coverslips. Cultures were treated with 20nM PMA for 48 hours, 100nM PMA for 48 hours, 100nM PMA for 24 hours or DMEM alone (control). Cells were fixed with 4% formaldehyde, permeabilized with 0.2% Triton X-100, and blocked with 50mM Tris-HCl to minimize nonspecific binding. Samples were then labeled with rabbit monoclonal antibody recognizing pERK 1/2 followed by goat anti-rabbit polyclonal secondary antibody Cy3-conjugated. Actin were stained with FITC-phalloidin dye and nuclei were stained with Hoechst 33258 dye.

Western blotting. Proteins were separated by SDS-PAGE, transferred to a PVDF membrane and blocked with 1% BSA. The membrane was probed with a rabbit monoclonal antibody recognizing pERK 1/2, washed and then probed with a goat anti-rabbit-HRP conjugated polyclonal secondary antibody. Chemiluminescent detection was performed and images were

Conclusions

- HT-1080 cells treated with PMA exhibited extensive growth inhibition as determined by cell counts three days after treatment. Growth inhibition was most effective at higher doses of PMA (10uM) with fewer HT-1080 cells seeded from the stock culture. The high dose of PMA (10uM) showed a significant ($p<0.05$) decrease in cell number in six out of six experiments, regardless of the initial concentration of HT-1080 cells seeded.
- In the presence of PMA, HT-1080 cells tend to be less dense in patches across the culture whereas the density is more uniform throughout control cultures.
- After PMA treatment, HT-1080 cells become stretched in appearance with prominent actin reorganization, more stress fibers are visible and the cells and nucleus appear larger. Single giant cells are also visible.
- Based on nuclear staining, the number of mitotic cells appear to decrease with the addition of PMA.
- Erk 1/2 becomes more active in the nucleus of PMA-treated cells.

Societal Impact

Both K-Ras and N-Ras transformed cells are sensitive to PMA treatment which may have implications for development of anti-cancer drugs targeting oncogenic RAS or its downstream effectors.

References

1. Takashima A, Faller D. Targeting the RAS oncogene. *Expert opinion on therapeutic targets*. 2013;17:507-531.
2. Griner E, Kazanietz M. Protein kinase C and other diacylglycerol effectors in cancer. *Nature*. 2007;7(4):281-294.

2019 Research Day at the Capitol

POSTER PREP: A QUICK REFERENCE GUIDE

Font Suggestions

- Use clear, simple fonts
  e.g. Times New Roman, Garamond, Arial, Century Gothic
- Title, 60-72 pt
- Authors & Institution, 38 pt
- Headings of boxes/sections , 42 pt
- Text of boxes/section, 26-32 pt
  (each column of text should have 11-12 words per line)
- Figure legends, 32 pt
- Acknowledgements, 26-32 pt
- Adjust font size as needed to fill your poster, but be consistent throughout the poster

2019 Research Day at the Capitol

POSTER PREP: A QUICK REFERENCE GUIDE

Graphics & Photos

- Use visual aids to tell your story (images, charts, diagrams, timelines)
- Minimal text to supplement the graphics
- Use titles, legends, consistent color (X and Y-axes should be labeled!)
- Be concise in your wording
- Text and graphics should be legible from three feet away
- Careful use of color (2-3 colors maximum)
- Photos must be min. 300 ppi
- Credit photos when appropriate

A Novel Polysulfide Synthesized Entirely From Waste and Its Use In Water Remediation

Austin M. Evans, Michael P. Crockett, Prof. Justin M. Chalker
The University of Tulsa Department of Chemistry and Biochemistry
Tulsa, Oklahoma, USA 74104

Abstract

Many functional materials today are prepared from non-renewable feedstocks. Addressing this issue, our research team has developed a novel polysulfide material synthesized entirely from the industrial waste products sulfur and limonene. This material is easy to synthesize on a large scale and is effective in removing toxic metals from water.

Background

Many chemical products are synthesized from non-renewable petroleum sources. Addressing this issue, our goal was to use abundant and renewable compounds as starting materials. Specifically, we reacted limonene and sulfur directly to form a polysulfide. 70,000 tons of limonene are produced as waste each year by the citrus industry. Sulfur is produced in the excess of 70,000,000 tons per year by the petroleum industry. Their wide availability has prompted exploration of these materials as chemical feedstocks.

Figure 1. Production of sulfur and Limonene

Because of the high sulfur content of our limonene-sulfur polysulfide, we hypothesized that it would bind to toxic metals and therefore be useful in removing toxic metals from water. This is particularly pertinent to Oklahoma because many of our waterways exhibit some form of toxic metal pollution.

Materials and Synthesis

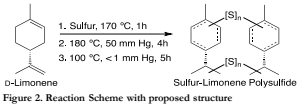


Figure 2. Reaction Scheme with proposed structure

Reaction Outline

1) Melt Sulfur (124 °C)
2) Heat to 170 °C (Radical Formation)
3) Add equal mass of limonene (b.p. = 176 °C)
4) Heat 1-5 hours at 170 °C
5) Process directly (mold, coat, etc)

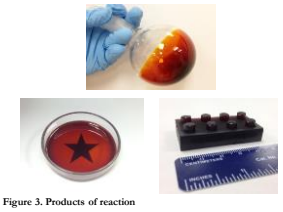


Figure 3. Products of reaction

Reaction Features

1) No exogenous solvents or reagents
2) Completely atom economical
3) Operationally simple
4) Easily Scalable, 100 gram syntheses are routine

Water Remediation

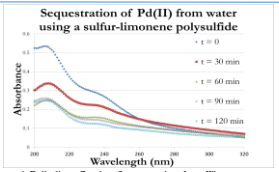
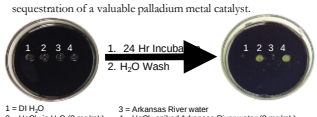


Figure 4. Palladium Catalyst Sequestration from Water

Using UV-Vis Spectroscopy, we monitored a time course of the sequestration of a valuable palladium metal catalyst.



1 = DI H_2O
2 = $HgCl_2$ in H_2O (2 mg/mL)
3 = Arkansas River water
4 = $HgCl_2$ spiked Arkansas River water (2 mg/mL)

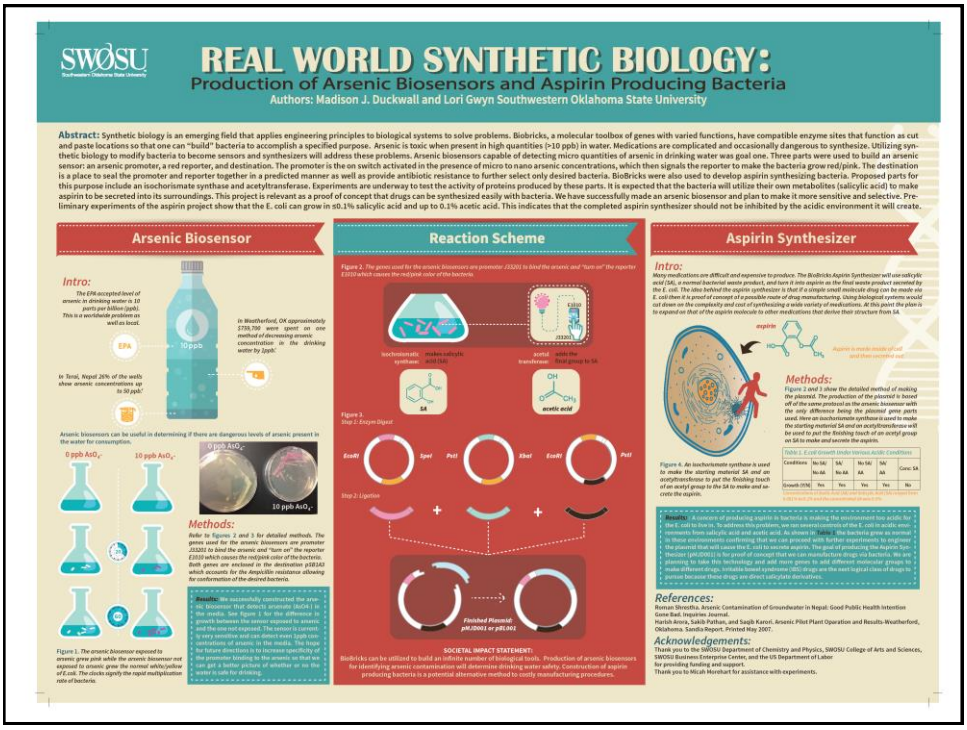
Figure 5. Mercury sensing by a chromogenic response

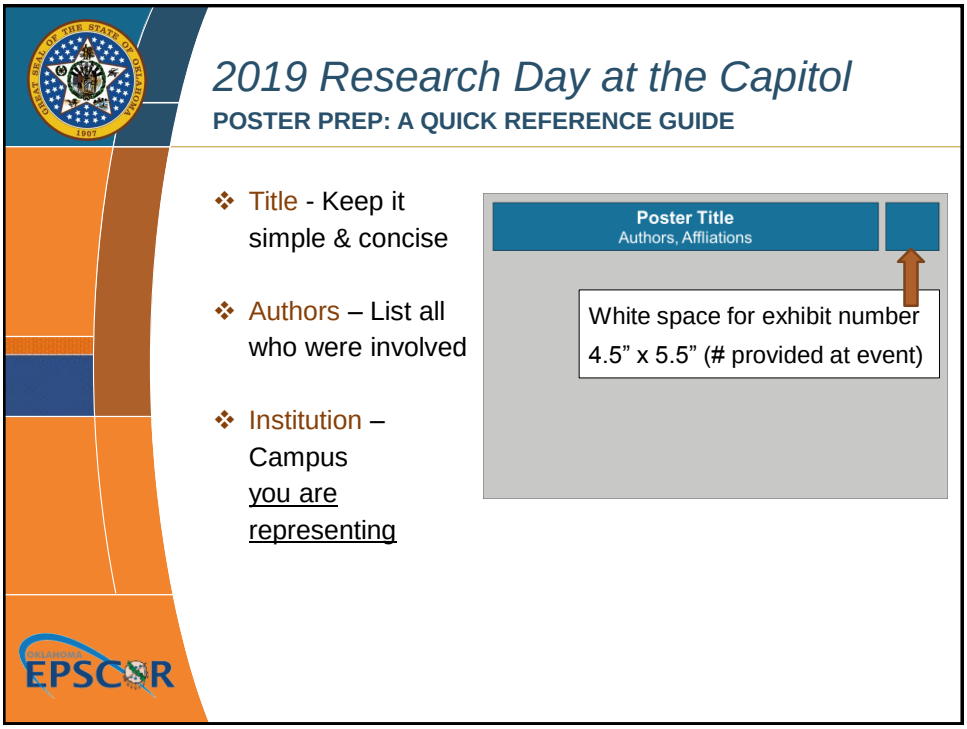
Societal Impact

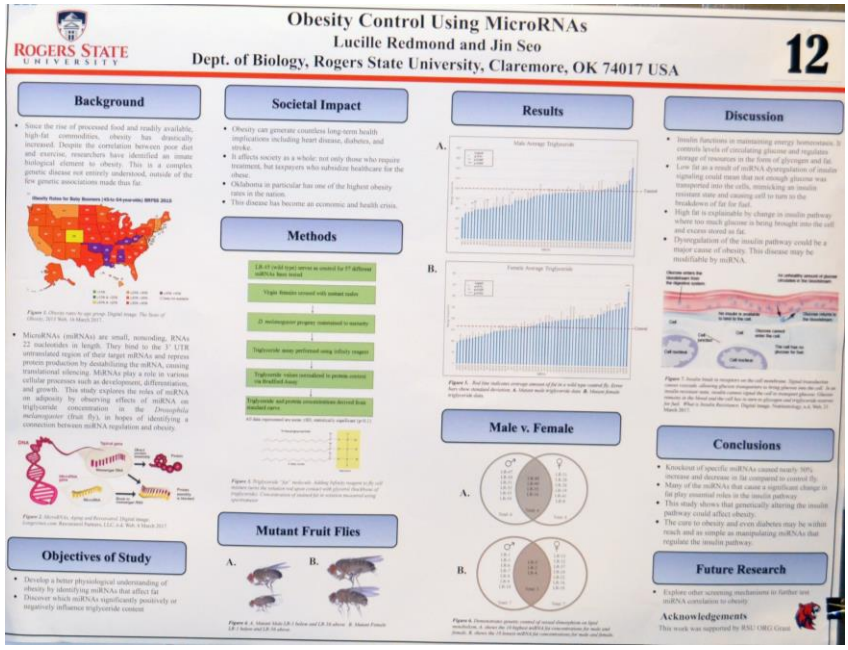
We have synthesized a novel polysulfide material entirely from industrial waste. The limonene-sulfur polysulfide is useful in removing metals from water, including mercury salts. We are currently investigating commercialization of this technology for on-site purification of natural waterways.

References

1. Chung, et al. *Nature Chemistry* **2013**, *5*, 518-524.
2. Polymers from Renewable Resources Gandini, A. *Macromolecules* **2008**
3. Crockett, M. P.; Evans, A. M.; Chalker, J. M. Unpublished
4. Sulfur-Limonene Polysulfide. Crockett, M. P.; Evans, A. M.; Chalker, J. M. Provisional patent filed Oct 24, 2014. No. 62068074.


SWOSU
REAL WORLD SYNTHETIC BIOLOGY:
Production of Arsenic Biosensors and Aspirin Producing Bacteria
Authors: Madison J. Duckwall and Lori Gwyn Southwestern Oklahoma State University
Abstract: Synthetic biology is an emerging field that applies engineering principles to biological systems to solve problems. Biobricks, a molecular toolbox of genes with varied functions, have compatible enzyme sites that function as cut and paste locations so that one can "build" bacteria to accomplish a specified purpose. Arsenic is toxic when present in high quantities (>10 ppb) in water. Medications are complicated and occasionally dangerous to synthesize. Utilizing synthetic biology to modify bacteria to become sensors and synthesizers will address these problems. Arsenic biosensors capable of detecting micro quantities of arsenic in drinking water was goal one. Three parts were used to build an arsenic sensor: an arsenic promoter, a red reporter, and destination. The promoter is the on switch activated in the presence of micro to nano arsenic concentrations, which then signals the reporter to make the bacteria grow red/pink. The destination is a place to seal the promoter and reporter together in a predicted manner as well as provide antibiotic resistance to further select only desired bacteria. BioBricks were also used to develop aspirin synthesizing bacteria. Proposed parts for this purpose include an isochorismate synthase and acetyltransferase. Experiments are underway to test the activity of proteins produced by these parts. It is expected that the bacteria will utilize their own metabolites (salicylic acid) to make aspirin to be secreted into its surroundings. This project is relevant as a proof of concept that drugs can be synthesized easily with bacteria. We have successfully made an arsenic biosensor and plan to make it more sensitive and selective. Preliminary experiments of the aspirin project show that the E. coli can grow in ≤0.1% salicylic acid and up to 0.1% acetic acid. This indicates that the completed aspirin synthesizer should not be inhibited by the acidic environment it will create.
Arsenic Biosensor
Intro:
Methods:
Reaction Scheme
SOCIETAL IMPACT STATEMENT:
Aspirin Synthesizer
Intro:
Methods:
References:
Acknowledgements:


2019 Research Day at the Capitol
POSTER PREP: A QUICK REFERENCE GUIDE
Title - Keep it simple & concise
Authors – List all who were involved
Institution – Campus you are representing
Poster Title
Authors, Affiliations
White space for exhibit number
4.5" x 5.5" (# provided at event)
OKLAHOMA EPSCoR



Obesity Control Using MicroRNAs

Lucille Redmond and Jin Seo

Dept. of Biology, Rogers State University, Claremore, OK 74017 USA

12

ROGERS STATE UNIVERSITY

Background

Societal Impact

Results

Discussion

Methods

Male v. Female

Conclusions

Mutant Fruit Flies

Objectives of Study

Future Research

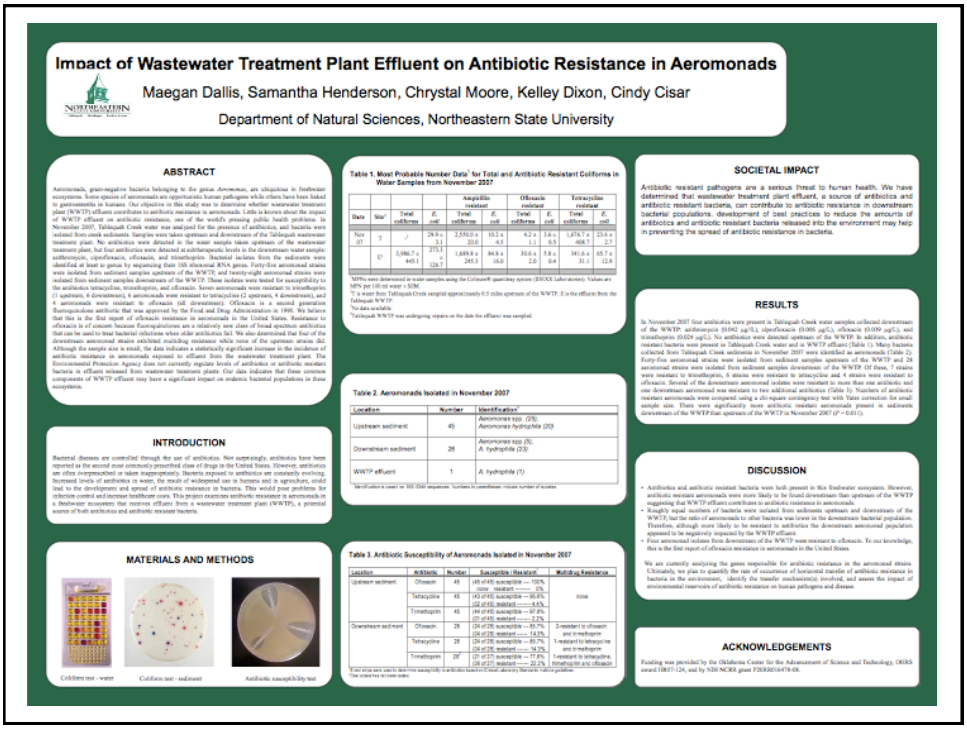
Acknowledgements

2019 Research Day at the Capitol

POSTER PREP: GENERAL POSTER FORMAT

Abstract and/or Research Question	• Summary of your poster • What is the problem or issue you are investigating/trying to solve?
Background & Objective	• Objective of your research • How does your work contribute to existing research on the topic?
Methods	• What did you do? • Use visual aids when possible

OKLAHOMA EPSCoR



Impact of Wastewater Treatment Plant Effluent on Antibiotic Resistance in Aeromonads

Maegan Dallis, Samantha Henderson, Chrystal Moore, Kelley Dixon, Cindy Cisar

Department of Natural Sciences, Northeastern State University

ABSTRACT

Aeromonads, gram-negative bacteria belonging to the genus *Aeromonas*, are ubiquitous in freshwater ecosystems. Some species of aeromonads are opportunistic human pathogens while others have been linked to gastroenteritis in humans. Our objective in this study was to determine whether wastewater treatment plant (WWTP) effluents contributes to antibiotic resistance in aeromonads. Little is known about the impact of WWTP effluent on antibiotic resistance, one of the world's pressing public health problems. In November 2007, Tahlequah Creek water was analyzed for the presence of antibiotics, and bacteria were isolated from creek sediments. Samples were taken upstream and downstream of the Tahlequah wastewater treatment plant. No antibiotics were detected in the water samples taken upstream of the wastewater treatment plant, but four antibiotics were detected at subtherapeutic levels in the downstream water samples: azithromycin, ciprofloxacin, ofloxacin, and trimethoprim. Bacterial isolates from the sediments were identified at least to genus by sequencing their 16S ribosomal RNA genes. Forty-five aeromonad strains were isolated from sediment samples upstream of the WWTP, and twenty-eight aeromonad strains were isolated from sediment samples downstream of the WWTP. These isolates were tested for susceptibility to the antibiotics tetracycline, trimethoprim, and ofloxacin. Seven aeromonads were resistant to trimethoprim (1 upstream, 6 downstream), 6 aeromonads were resistant to tetracycline (2 upstream, 4 downstream), and 6 aeromonads were resistant to ofloxacin (all downstream). Ofloxacin is a second generation fluoroquinolone antibiotic that was approved by the Food and Drug Administration in 1990. We believe that this is the first report of ofloxacin resistance in aeromonads in the United States. Resistance to ofloxacin is of concern because fluoroquinolones are a relatively new class of broad-spectrum antibiotics that can be used to treat bacterial infections when older antibiotics fail. We also determined that four of the downstream aeromonad strains exhibited multidrug resistance while none of the upstream strains did. Although the sample size is small, the data indicates a statistically significant increase in the incidence of antibiotic resistance in aeromonads exposed to effluent from the wastewater treatment plant. The Environmental Protection Agency does not currently regulate levels of antibiotics or antibiotic resistant bacteria in effluent released from wastewater treatment plants. Our data indicates that these common components of WWTP effluent may have a significant impact on endemic bacterial populations in these ecosystems.

INTRODUCTION

Bacterial diseases are controlled through the use of antibiotics. Not surprisingly, antibiotics have been reported as the second most commonly prescribed class of drugs in the United States. However, antibiotics are often overprescribed or taken inappropriately. Bacteria exposed to antibiotics are constantly evolving. Increased levels of antibiotics in water, the result of widespread use in humans and in agriculture, could lead to the development and spread of antibiotic resistance in bacteria. This would pose problems for infection control and increase healthcare costs. This project examines antibiotic resistance in aeromonads in a freshwater ecosystem that receives effluent from a wastewater treatment plant (WWTP), a potential source of both antibiotics and antibiotic resistant bacteria.

MATERIALS AND METHODS

Coliform test - water | Coliform test - sediment | Antibiotic susceptibility test

Table 1. Most Probable Number Data[1] for Total and Antibiotic Resistant Coliforms in Water Samples from November 2007

Date	Site[2]	Total coliforms	*E. coli*	Ampicillin resistant: Total coliforms	Ampicillin resistant: *E. coli*	Ofloxacin resistant: Total coliforms	Ofloxacin resistant: *E. coli*	Tetracycline resistant: Total coliforms	Tetracycline resistant: *E. coli*
Nov 07	T	/	29.9 ± 3.1	2,550.0 ± 20.0	10.2 ± 4.5	4.2 ± 1.1	3.6 ± 0.5	1,676.7 ± 404.7	23.6 ± 2.5
	E[3]	3,986.7 ± 445.1	273.3 ± 126.7	1,698.8 ± 245.3	84.8 ± 16.0	30.6 ± 2.0	5.8 ± 0.4	341.6 ± 31.1	65.7 ± 12.9

MPNs were determined in water samples using the Colisure® quantitray system (IDEXX Laboratories). Values are MPN per 100 ml water ± SEM.
[1] T is water from Tahlequah Creek sampled approximately 0.5 miles upstream of the WWTP. E is the effluent from the Tahlequah WWTP.
[2] No data available.
[3] Tahlequah WWTP was undergoing repairs on the date the effluent was sampled.

Table 2. Aeromonads Isolated in November 2007

Location	Number	Identification[1]
Upstream sediment	45	*Aeromonas* spp. (29), *Aeromonas hydrophila* (20)
Downstream sediment	28	*Aeromonas* spp (5), *A. hydrophila* (23)
WWTP effluent	1	*A. hydrophila* (1)

[1] Identification is based on 16S rDNA sequences. Numbers in parentheses indicate number of isolates.

Table 3. Antibiotic Susceptibility of Aeromonads Isolated in November 2007

Location	Antibiotic	Number	Susceptible / Resistant	Multidrug Resistance
Upstream sediment	Ofloxacin	45	(45 of 45) susceptible — 100% none resistant — 0%	
	Tetracycline	45	(43 of 45) susceptible — 95.6% (2) of 45) resistant — 4.4%	none
	Trimethoprim	45	(44 of 45) susceptible — 97.8% (1 of 45) resistant — 2.2%	
Downstream sediment	Ofloxacin	28	(24 of 28) susceptible — 85.7% (4 of 28) resistant — 14.3%	2-resistant to ofloxacin and trimethoprim
	Tetracycline	28	(24 of 28) susceptible — 85.7% (4 of 28) resistant — 14.3%	1-resistant to tetracycline and trimethoprim
	Trimethoprim	28*	(21 of 27) susceptible — 77.8% (6 of 27) resistant — 22.2%	1-resistant to tetracycline, trimethoprim and ofloxacin

[1] Kirby-Bauer disk diffusion susceptibility tests were used to determine susceptibility to antibiotics based on Clinical Laboratory Standards Institute guidelines.
* One isolate no longer viable.

SOCIETAL IMPACT

Antibiotic resistant pathogens are a serious threat to human health. We have determined that wastewater treatment plant effluent, a source of antibiotics and antibiotic resistant bacteria, can contribute to antibiotic resistance in downstream bacterial populations. development of best practices to reduce the amounts of antibiotics and antibiotic resistant bacteria released into the environment may help in preventing the spread of antibiotic resistance in bacteria.

RESULTS

In November 2007 four antibiotics were present in Tahlequah Creek water samples collected downstream of the WWTP: azithromycin (0.042 µg/L), ciprofloxacin (0.008 µg/L), ofloxacin (0.098 µg/L), and trimethoprim (0.024 µg/L). No antibiotics were detected upstream of the WWTP. In addition, antibiotic resistant bacteria were present in Tahlequah Creek water and in WWTP effluent (Table 1). Many bacteria collected from Tahlequah Creek sediments in November 2007 were identified as aeromonads (Table 2). Forty-five aeromonad strains were isolated from sediment samples upstream of the WWTP and 28 aeromonad strains were isolated from sediment samples downstream of the WWTP. Of these, 7 strains were resistant to trimethoprim, 6 strains were resistant to tetracycline and 4 strains were resistant to ofloxacin. Several of the downstream aeromonad isolates were resistant to more than one antibiotic and one downstream aeromonad was resistant to two additional antibiotics (Table 3). Numbers of antibiotic resistant aeromonads were compared using a chi-square contingency test with Yates correction for small sample size. There were significantly more antibiotic resistant aeromonads present in sediments downstream of the WWTP than upstream of the WWTP ($\chi^2 = 0.011$).

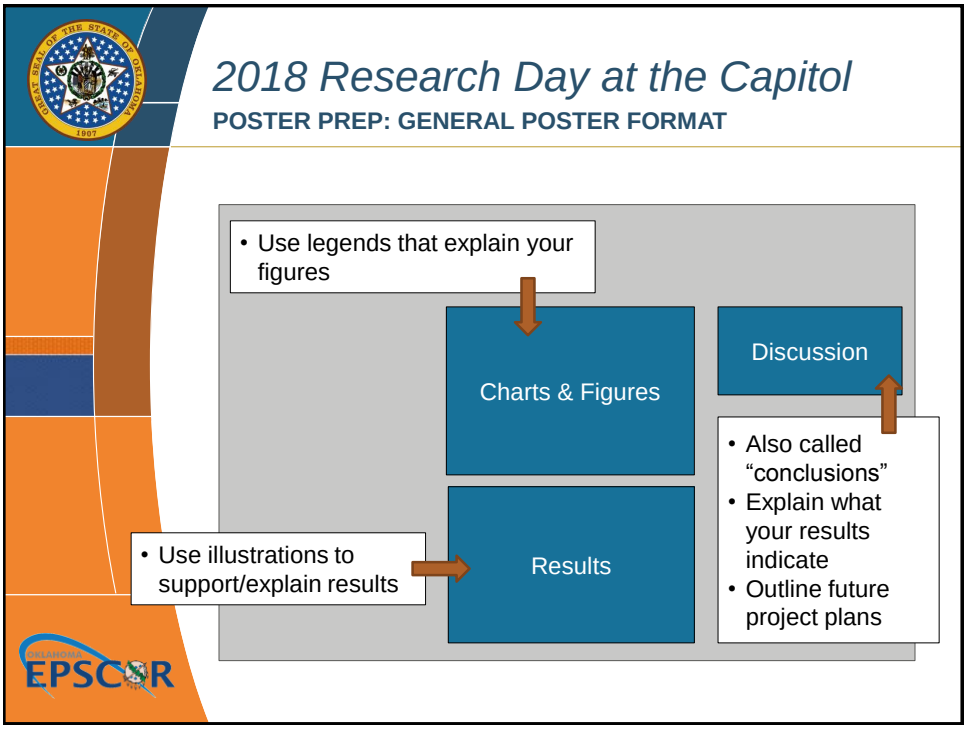
DISCUSSION

- Antibiotics and antibiotic resistant bacteria were both present in this freshwater ecosystem. However, antibiotic resistant aeromonads were more likely to be found downstream than upstream of the WWTP suggesting that WWTP effluent contributes to antibiotic resistance in aeromonads.
- Roughly equal numbers of bacteria were isolated from sediments upstream and downstream of the WWTP, but the ratio of aeromonads to other bacteria was lower in the downstream bacterial population. Therefore, although more likely to be resistant to antibiotics the downstream aeromonad population appeared to be negatively impacted by the WWTP effluent.
- Four aeromonad isolates from downstream of the WWTP were resistant to ofloxacin. To our knowledge, this is the first report of ofloxacin resistance in aeromonads in the United States.

We are currently analyzing the genes responsible for antibiotic resistance in the aeromonad strains. Ultimately, we plan to quantify the rate of occurrence of horizontal transfer of antibiotic resistance in bacteria in the environment, identify the transfer mechanism(s) involved, and assess the impact of environmental reservoirs of antibiotic resistance on human pathogens and disease.

ACKNOWLEDGEMENTS

Funding was provided by the Oklahoma Center for the Advancement of Science and Technology, OCAST award HR07-124, and by NIH NCRR grant P20RR016478-08.



A Novel Assay to Predict Cancer Resistance to Cisplatin

Lacy Brame[1], Vengatesh Ganapathy[1], Ilangovan Ramachandran[1], Lurdes Queimado[1-5]

Departments of [1]Otorhinolaryngology, [2]Cell Biology and [3]Pediatrics; [4]The Oklahoma Tobacco Research Center and [5]The Peggy and Charles Stephenson Cancer Center, The University of Oklahoma Health Sciences Center, Oklahoma City, OK 73104, USA.

Introduction

- Cisplatin is widely used as chemotherapy drug that induces DNA damage and ultimately triggers apoptosis. However, therapeutic resistance and tumor relapse remains a significant clinical problem.
- Recently, our laboratory developed an assay (Fig. 1) called primer anchored DNA damage detection assay (PADDA) that screens genomic areas for DNA damage[1]. PADDA has been shown to detect a dose-dependent increase in DNA damage caused by genotoxic agent (Fig. 2).
- We hypothesized that PADDA will discriminate the ability of cancer cells to repair damage induced by cisplatin, and therefore predict cancer resistance to cisplatin.

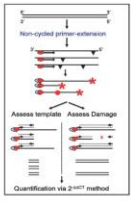


Figure 1. Diagram of PADDA. A single strand-specific non-cycled primer extension performed with a 5'-biotin-tagged primer and Vent exo- DNA polymerase identifies damaged nucleotides (inverted triangles), and generates a pool of highly specific biotin-tagged extended products, each of them derived from one strand of a single DNA molecule. Each extended product has a stop, which represents replicative arrest by a damaged nucleotide or nick. Some extended products will contain misincorporations that represent polymerase lesion by-pass with misincorporation. After several purification steps, the strand-specific, biotin-bound extended products can be used for damage quantification on a high throughput setting. q-PADDA).

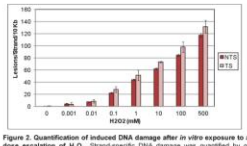


Figure 2. Quantification of induced DNA damage after *in vitro* exposure to a dose escalation of H_2O_2. Strand-specific DNA damage was quantified by q-PADDA. Lesion frequency was estimated via Poisson equation. NTS, non-transcribed strand; TS, transcribed strand; Data represents Mean ± S.E.M

Aim

To define the levels of DNA damage induced at p53 nucleotides by cisplatin treatment and to measure the ability of cancer cells to repair damage induced by cisplatin.

Materials & Methods

PADDA was used on a high-throughput setting to quantify DNA damage in human oral cancer cells (SCC-1) exposed to different doses of cisplatin. Cell viability was determined by 3-(4,5-dimethylthiazol-2-yl)-2,5 diphenyl tetrazolium bromide (MTT) assay. Data was analyzed by Student's *t*-test.

Results

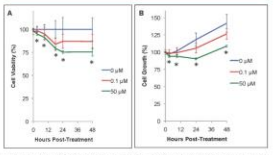


Figure 3. Cell viability assay and cell growth. SCC-1 cells were treated with 0 μM, 0.1 μM, 50 μM concentrations of cisplatin and allowed to repair damage for 0, 3, 9, 18, 24 & 48 hour time intervals. Cell viability (A) and cell growth (B) were determined by MTT assay. Data shown as Mean ± S.D. * $p<0.01$.

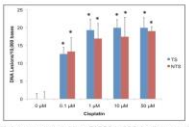


Figure 4. DNA damage measured by q-PADDA in SCC-1 cells exposed to cisplatin for 3 hours. Damage was quantified by q-PADDA in both transcribed (TS) and non-transcribed (NTS) strands. Data shown as Mean ± S.E.M. * $p<0.01$.

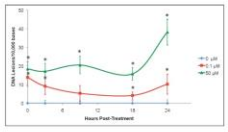


Figure 5. DNA damage measured by q-PADDA in SCC-1 cells after exposure to cisplatin. SCC-1 cells were treated with 0 μM, 0.1 μM, 50 μM concentrations of cisplatin and allowed to repair damage for 0, 3, 9, 18 & 24 hour time intervals. Data shown as Mean ± S.E.M. * $p<0.01$.

Conclusion & Societal Impact

- PADDA was able to quantify DNA damage and repair after cisplatin treatment. This information will allow us to determine if resistance to cisplatin is due to effective damage removal or to damage tolerance. This data would facilitate the development of strategies targeting the mechanism of drug resistance.
- This observation has **significant clinical importance** as it can be used to predict treatment response and direct treatment selection in cancer patients.

Future Directions

- This assay has potential to elucidate the differential efficacy of cisplatin as a chemotherapy drug and act as a preliminary screening method to determine differential cisplatin resistance.
- This project can be extended to determine the genotoxicity and resistance of cisplatin in other head and neck cancer cell lines.
- PADDA can be used to determine if patients will respond or become resistant to not only platinum-based chemotherapy treatments, but also to other treatments that induce DNA damage.

Acknowledgement

Funding was provided by the Oklahoma Tobacco Research Center and the Oklahoma Center for the Advancement of Science and Technology. Dr. Queimado holds a Presbyterian Health Foundation Endowed Chair in Otorhinolaryngology.

References

[1]Reis AM, Mills WK, Ramachandran I, Friedberg EC, Thompson D and Queimado L. Targeted detection of *in vivo* endogenous DNA base damage reveals preferential base excision repair in the transcribed strand. Nucleic Acids Res. 40(1): 206-219, 2012.

2019 Research Day at the Capitol

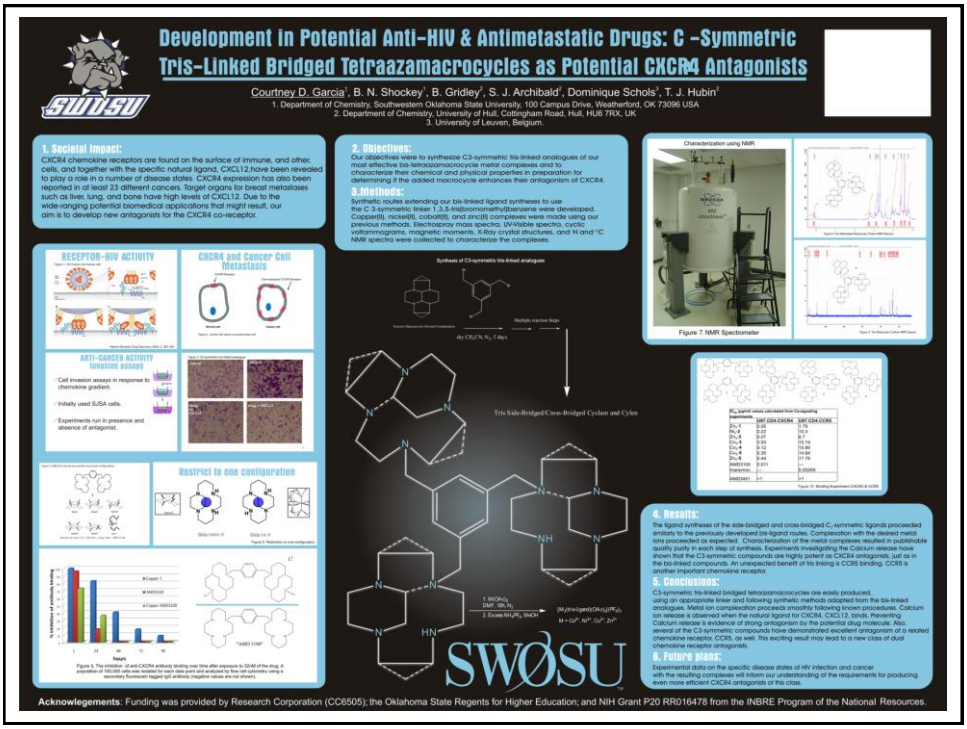
POSTER PREP: GENERAL POSTER FORMAT

- DO NOT OVERLOOK THIS SECTION!!!
- Arguably one of the most important
- 2-3 concise sentences
- Explain the social benefits of your research in layman's terms

→ Societal Impact

Acknowledge your:
- Funding source(s)
- Collaborators (big and small)
- Journal articles used as references
- EPSCoR

→ Acknowledgements



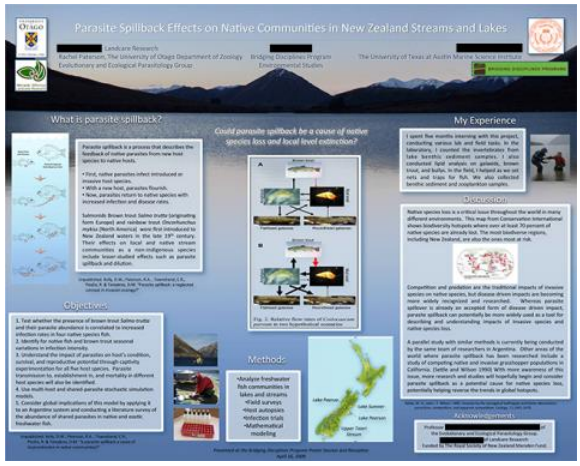
Poster Examples: "Do's" and "Don'ts"

Strengths:

- Logical order
- Various visual aid types
- Acknowledgements

Weaknesses:

- Sections & images not aligned
- Distracting background
- Too many visual components



Credit: University of Texas at Austin, https://ugs.utexas.edu/our/poster/samples


Systematic reviews of animal experiments demonstrate poor human clinical and toxicological utility

ATLA: Alternatives to Laboratory Animals. 2007; 35(6): 641-659.

An example of why you should NOT use a photo or graphic as your poster background.

Text is impossible to read and potential observers would be too distracted by the image to sort through the information anyway.

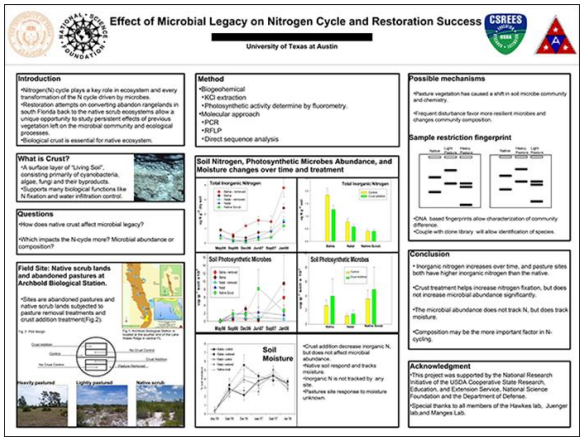
Poster Examples: "Do's" and "Don'ts"

Strengths:

- Clearly defined research questions
- Effective use of visual aids
- Clear organizational structure
- Bullets break up text

Weaknesses:

- Technical language & undefined acronyms (limits audience)
- Narrow margins within text boxes
- Too many thick borders around boxes
- Uses incorrect logo for the institution


Effect of Microbial Legacy on Nitrogen Cycle and Restoration Success

University of Texas at Austin

Introduction

Method

Possible mechanisms

What is Crust?

Soil Nitrogen, Photosynthetic Microbes Abundance, and Moisture changes over time and treatment

Questions

Field Site: Native scrub lands and abandoned pastures at Archbold Biological Station.

Conclusion

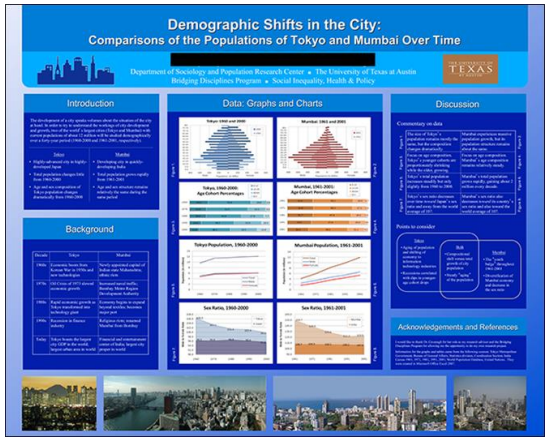
Acknowledgment

Credit: University of Texas at Austin, https://ugs.utexas.edu/our/poster/samples

Poster Examples: "Do's" and "Don'ts"

Strengths:
- Venn diagram in discussion
- Consistent graphics
- Multiple types of visual aids

Weaknesses:
- Light text on dark background
- Color backgrounds should be avoided, especially dark ones
- Unlabeled, non-credited photos

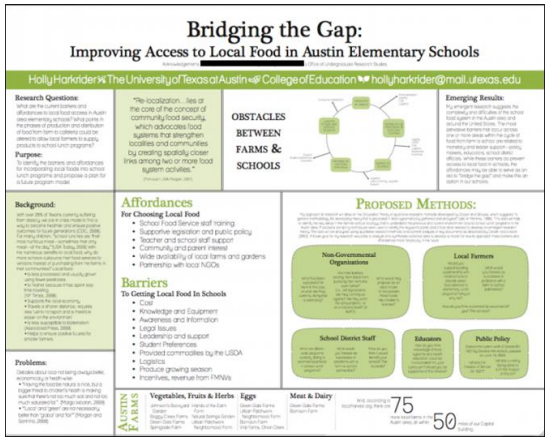


Credit: University of Texas at Austin, https://ugs.utexas.edu/our/poster/samples

Poster Examples: "Do's" and "Don'ts"

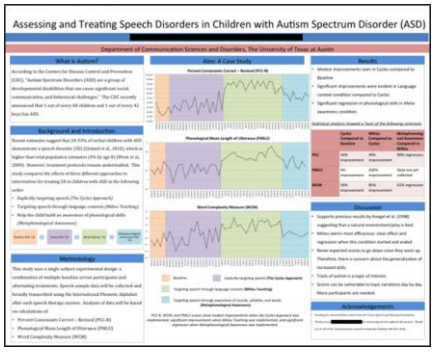
Strengths:
- Easy to read
- Clearly defined research question
- Use of white space
- Simple color scheme
- Use of shapes, figures, bullets to break up text
- Compelling title (and title font size)
- Clean visual impression

Weaknesses:
- Many sections without a clear flow between them
- Lacks acknowledgements

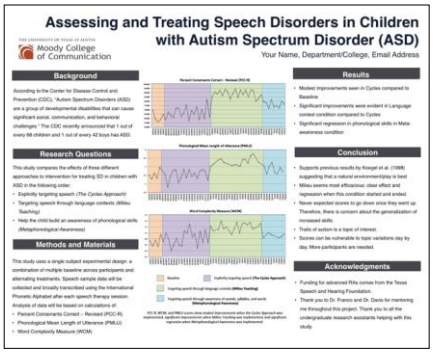


Poster Examples:

Before



After



Credit: University of Texas at Austin, https://ugs.utexas.edu/our/poster/templates

An Online Poster Prep Resource
https://ugs.utexas.edu/our/poster

The University of Texas at Austin's online Poster Guide is a great resource, providing thorough and easy-to-understand scientific poster design tips and instruction.

- Guide to Creating Research Posters
- Poster Samples: What to do and what not to do
- Poster Content Development
- Organizing Poster Content
- Poster Design Elements and Guidelines
- Review Your Poster
- Printing Your Poster
- Presenting Your Poster
- Talking About Your Poster

2019 Research Day at the Capitol

ONLINE REGISTRATION REQUIRED (BY MARCH 11)

All student researchers & anyone who will be attending Research Day at the Capitol activities in support of the student researcher must register online at:

http://www.okepscor.org/2019-research-day-capitol-participant-sign-form-guests-faculty-mentors-student-researchers

- Please advise parents, friends, family, faculty advisors, etc. to register online (or you may register online for them)
- Why? This event is funded through a grant from the National Science Foundation. NSF requires participant information to continue funding for the event.
- Registration deadline: March 11

2019 Research Day at the Capitol

FINAL THOUGHTS—THINGS TO REMEMBER

You were chosen for a reason!

- Be ready and mentally prepared—practice!
- Emphasize your societal impact
- Dress professionally and be punctual
- Know your Legislators and engage them
- Judges are looking for someone who has the whole package!

2019 Research Day at the Capitol

INSIGHT FROM A PAST WINNER

Devin Laurence, Grand Prize Winner 2018

University of Oklahoma

Poster Topic: Cardiovascular Biomechanics

2019 Research Day at the Capitol

INSIGHT FROM A JUDGE

Sherry Marshall

President & CEO, Science Museum Oklahoma

Educational background: Physics, with additional emphasis in Chemistry, Applied Behavioral Science in Education, and Curriculum and Instruction