Research Day at the Capitol
Poster Preparation Presentation

Courtney D. Garcia
January 14, 2012

What is Research Day at the Capitol?

Why were you chosen...

- To celebrate excellent undergraduate student research being conducted on Oklahoma's college campuses!

- To attend an annual event sponsored by the Oklahoma State Regents for Higher Education, the National Science Foundation, and the Oklahoma Experimental Program to Stimulate Competitive Research (EPSCoR)

- To let your legislators know what the most outstanding research students like yourself are researching in the state and the progress!

www.okepscor.org

What is EPSCoR?

Purpose & Central Goal

- Promoting Innovative Research within our state

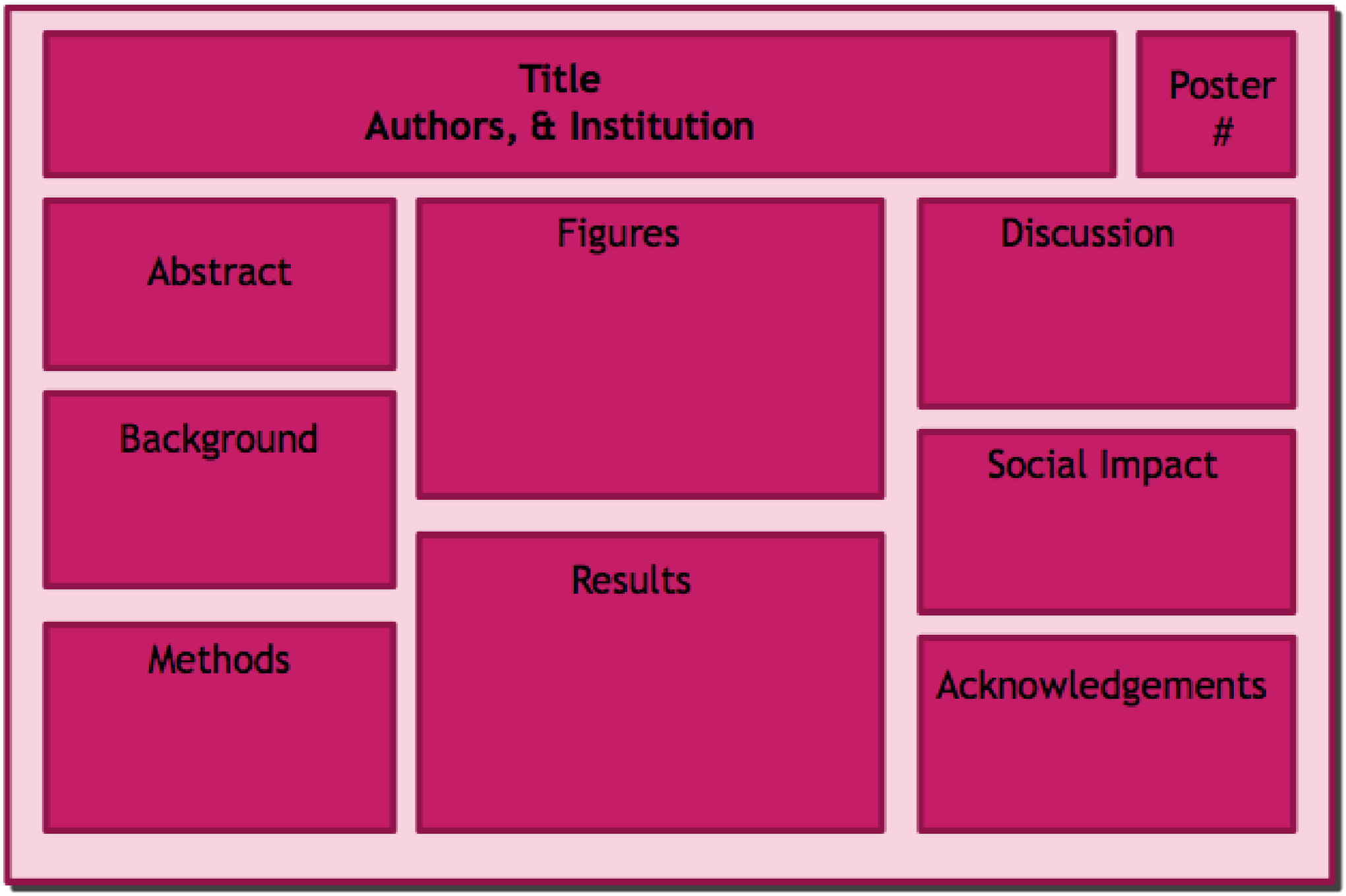
- To increase the state's research competitiveness through strategic support of research instruments and facilities, research collaborations and integrated education and research programs.

Creating Your Poster

- Create PowerPoint slide with background of choice
  - Choose a simple background - not busy, or a photo
- Format the size of the poster
  - Go to Page Setup - Select Width (Standard is 48”), Select Height (Standard is 36”)
  - Check with print shop and/or your mentor for any size restrictions

Creating Your Poster

- Format of a General Research Poster



Creating Your Poster

- Format of a general poster

  - This is a general, simple format. Every project is unique, and therefore will be different.

  - Keep the flow of the boxes top ⟶bottom, & left right.⟶

  - Some projects require more boxes, include what is most important, keep flow simple.

  - There are many formats out there, just keep in mind that your poster is NOT necessarily for a scientific crowd, it is for the general public.

Creating Your Poster

Font suggestions for each section

- Use clear, simple fonts - e.g. Times Roman Numeral, Arial
- Title - 135
- Authors & Institution - 66
- Headings of boxes - 35
- Text of boxes - 24
- Figure legends - 24
- Acknowledgements - 22
- may use larger or smaller, just try to fill the space

Adding boxes

- Insert - Shapes - Square
- Inside square draw text boxes as needed for the title & content

Creating Your Poster

- Title - Keep it simple & concise
- Authors - List all that were involved
- Institution - Campus research took place

Title
Authors
Institution

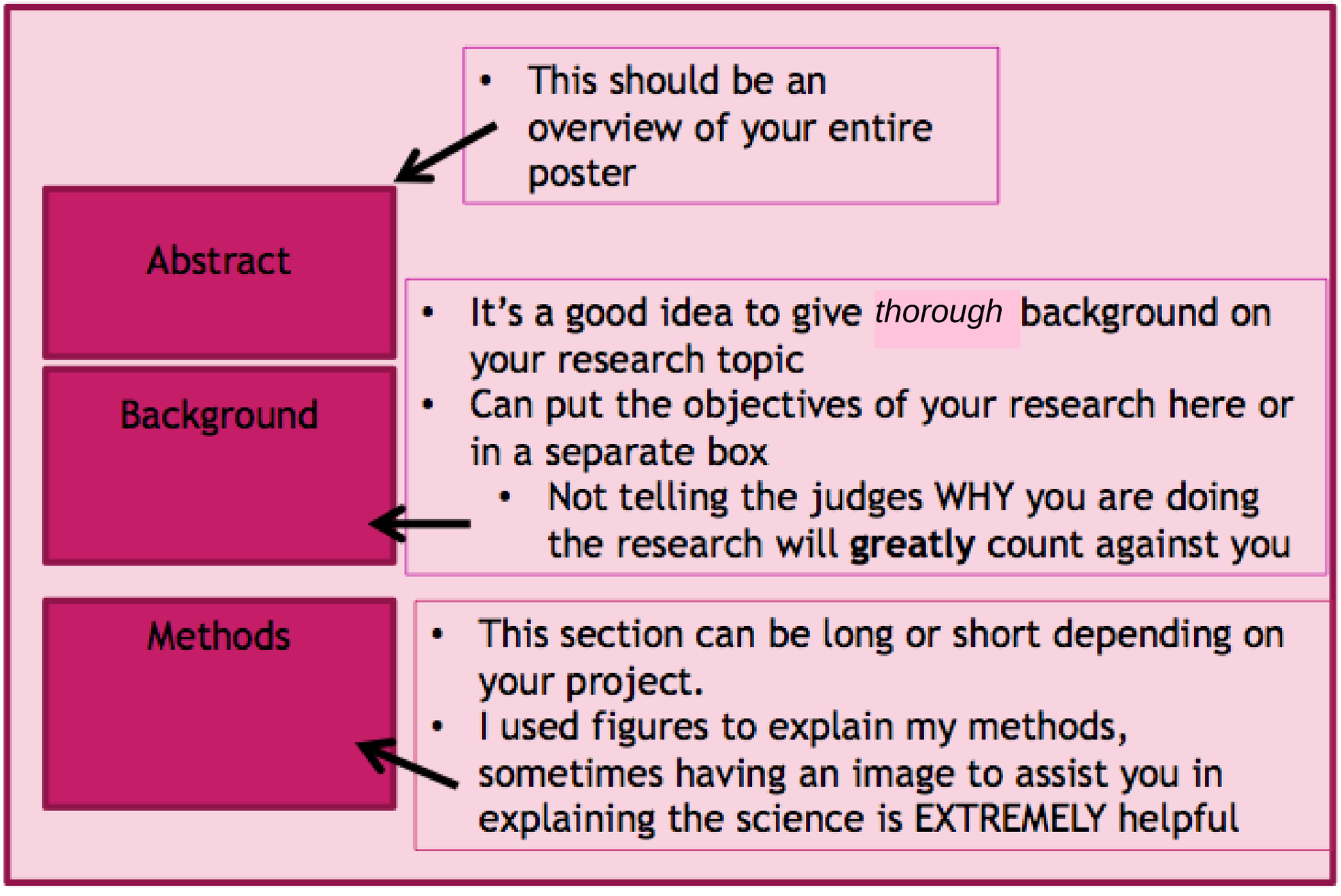
Poster #

- Center these lines
- Put your name first; underlined or bolded
- Make sure the title can be read from 4 ft away
- Using a sans-serif font like Arial is best for the title and the headings of each subsequent box
  - I used Century gothic (another sans-serif font)
  - Sans-serif fonts are easier to read from a distance
- In this box is where most put the logo of the institution that you are representing
- Some also acknowledge EPSCOR with a logo or in their Acknowledgements section

- **Be sure to leave space for your exhibit number!!**
- **If you don't your text will get covered**

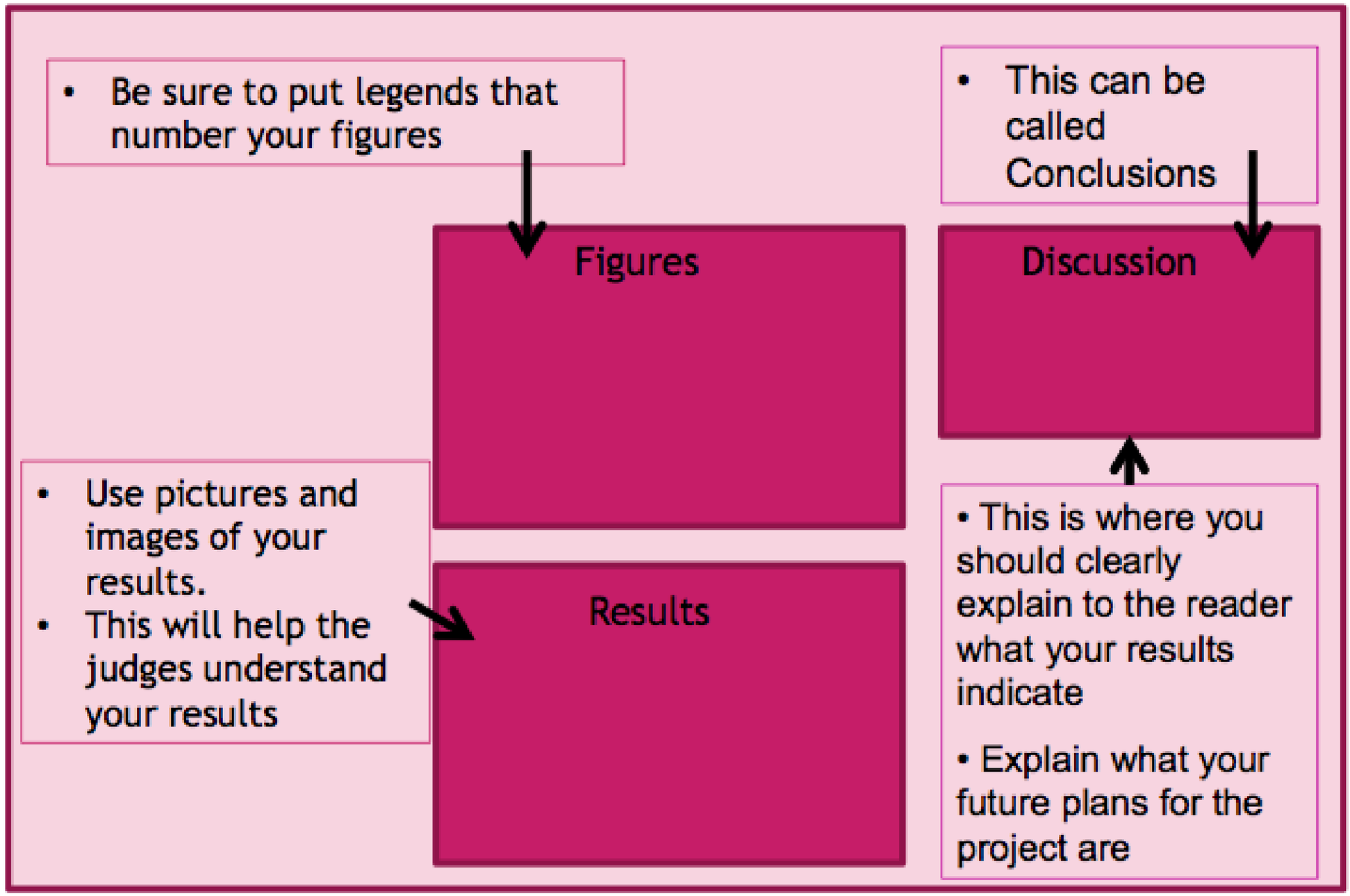
Creating Your Poster

- Abstract, Background, & Methods



Creating Your Poster

- Figures, Results, & Discussion



Creating Your Poster

Societal Impact & Acknowledgements

- **DO NOT OVERLOOK THIS SECTION!!!!**
- This is probably the MOST important section of your poster!
- You don't have to cure cancer, but you need know the benefits of your research and be able to explain them in layman's terms
- 2-3 sentences is all that is needed if they are concise and to the point

Social Impact

- It is VERY important that you acknowledge your funding source!
- Other things to acknowledge:
  - Collaborators (big and small)
  - Journal Articles used as references
  - EPSCoR

Acknowledgements

Creating Your Poster

Extra Tips

- A Picture Is Worth A Thousand Words - You only have 3 minutes to present!!! Fill your poster space wisely.

- First impressions will set the tone of your presentation - Make your poster unique - DON'T BE AFRAID TO BE CREATIVE!

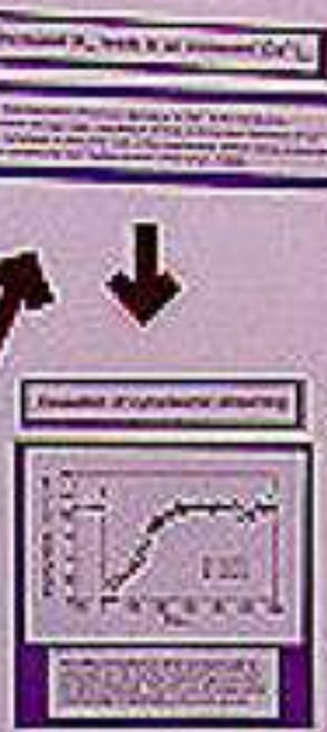
- Remember this poster is specifically for explaining your research to LEGISLATORS - There is a way to bridge the "science talk" into understandable information for the public.

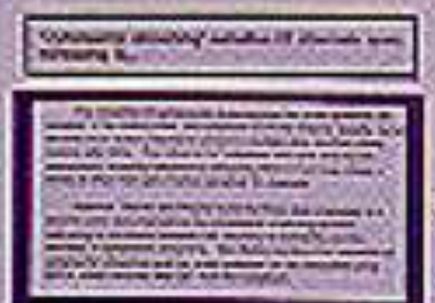
An example of why you should NOT use a photo or graphic as your poster background.

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

Ca^{2+}-Dependent Cl⁻ Action Potentials in Chara: Different Points of View

Rebecca Elliott, Dennis Kochalski, Sarah Cole, Kyong Kim





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) effluent 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 (3 upstream, 4 downstream), 8 aeromonads were resistant to tetracycline (2 upstream, 6 downstream), and 4 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

				Ampicillin resistant		Ofloxacin resistant		Tetracycline resistant	
Date	Site[2]	Total coliforms	*E. coli*	Total coliforms	*E. coli*	Total coliforms	*E. coli*	Total coliforms	*E. coli*
Nov 07	T	[3]	29.9 ± 1.1	2,336.0 ± 20.0	10.2 ± 4.3	4.2 ± 1.1	3.6 ± 0.5	1,678.7 ± 408.7	23.6 ± 2.7
	D	3,986.7 ± 440.1	273.3 ± 126.7	1,699.8 ± 245.1	84.8 ± 10.0	33.0 ± 2.0	5.8 ± 0.6	341.6 ± 31.1	65.7 ± 12.9

[1] MPNs were determined in water samples using the Colilert® quantitray system (IDEXX Laboratories). Values are MPN per 100 ml water ± SEM.
[2] T is water from Tahlequah Creek sampled approximately 0.5 miles upstream of the WWTP. D is the effluent from the Tahlequah WWTP.
[3] No data available.
[4] 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. (25) *Aeromonas hydrophila* (20)
Downstream sediment	28	*Aeromonas* spp. (5) *A. hydrophila* (23)
WWTP effluent	1	*A. hydrophila* (1)

[1] Identification 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%	none
	Tetracycline	45	(43 of 45) susceptible — 95.6% (2) of 45) resistant — 4.4%	
	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 1 resistant to tetracycline and trimethoprim 1 resistant to tetracycline, trimethoprim and ofloxacin
	Tetracycline	28	(24 of 28) susceptible — 85.7% (4 of 28) resistant — 14.3%	
	Trimethoprim	28	(21 of 27) susceptible — 77.8% (6 of 27) resistant — 22.2%	

[1] Kirby-Bauer disk diffusion susceptibility method was used to determine susceptibility to antibiotics based on Clinical Laboratory Standards Institute guidelines.
[2] One isolate was not tested.

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 (0.066 µg/L), ofloxacin (0.039 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 in November 2007 ($P = 0.011$).

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, OSRHE award HR07-124, and by NIH NCRR grant P20RR016478-04.

Development in Potential Anti-HIV & Antimetastatic Drugs: C -Symmetric Tris-Linked Bridged Tetraazamacrocycles as Potential CXCR4 Antagonists

Courtney D. Garcia[1], B. N. Shockey[1], B. Gridley[2], S. J. Archibald[2], Dominique Schols[3], T. J. Hubin[2]

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2. Department of Chemistry, University of Hull, Cottingham Road, Hull, HU6 7RX, UK
3. University of Leuven, Belgium.

1. Societal Impact:

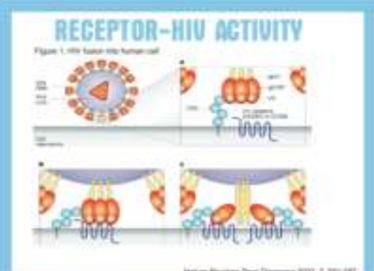
CXCR4 chemokine receptors are found on the surface of immune, and other, cells, and together with the specific natural ligand, CXCL12,have been revealed to play a role in a number of disease states. CXCR4 expression has also been reported in at least 23 different cancers. Target organs for breast metastases such as liver, lung, and bone have high levels of CXCL12. Due to the wide-ranging potential biomedical applications that might result, our aim is to develop new antagonists for the CXCR4 co-receptor.

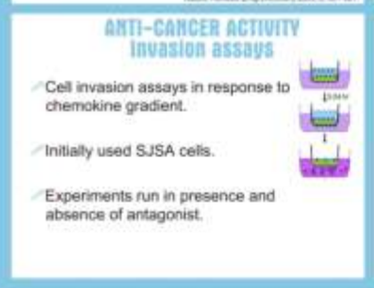
2. Objectives:

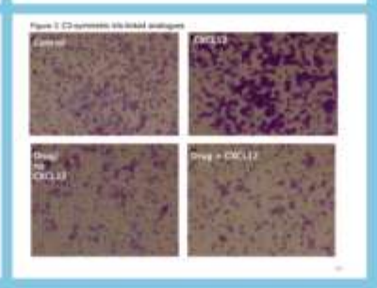
Our objectives were to synthesize C3-symmetric tris-linked analogues of our most effective bis-tetraazamacrocycle metal complexes and to characterize their chemical and physical properties in preparation for determining if the added macrocycle enhances their antagonism of CXCR4.

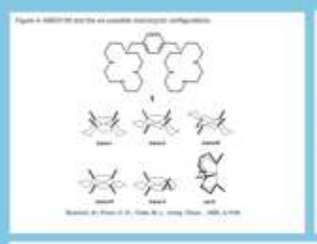
3.Methods:

Synthetic routes extending our bis-linked ligand syntheses to use the C 3-symmetric linker 1,3,5-tris(bromomethyl)benzene were developed. Copper(II), nickel(II), cobalt(II), and zinc(II) complexes were made using our previous methods. Electrospray mass spectra, UV-Visible spectra, cyclic voltammograms, magnetic moments, X-Ray crystal structures, and ^1H and ^{13}C NMR spectra were collected to characterize the complexes.









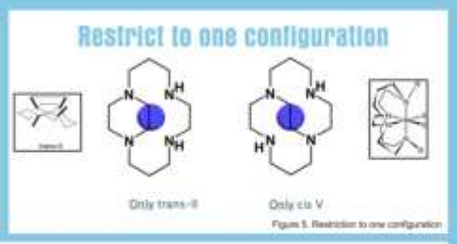


Figure 5. Restriction to one configuration

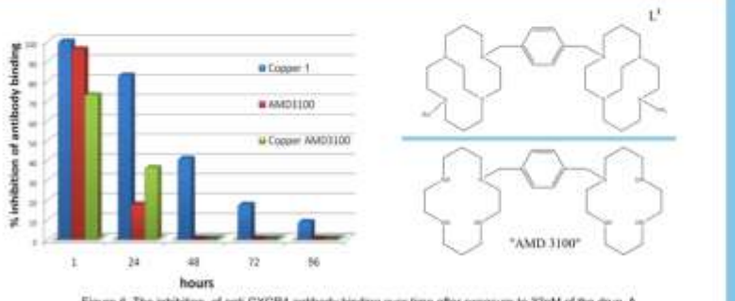
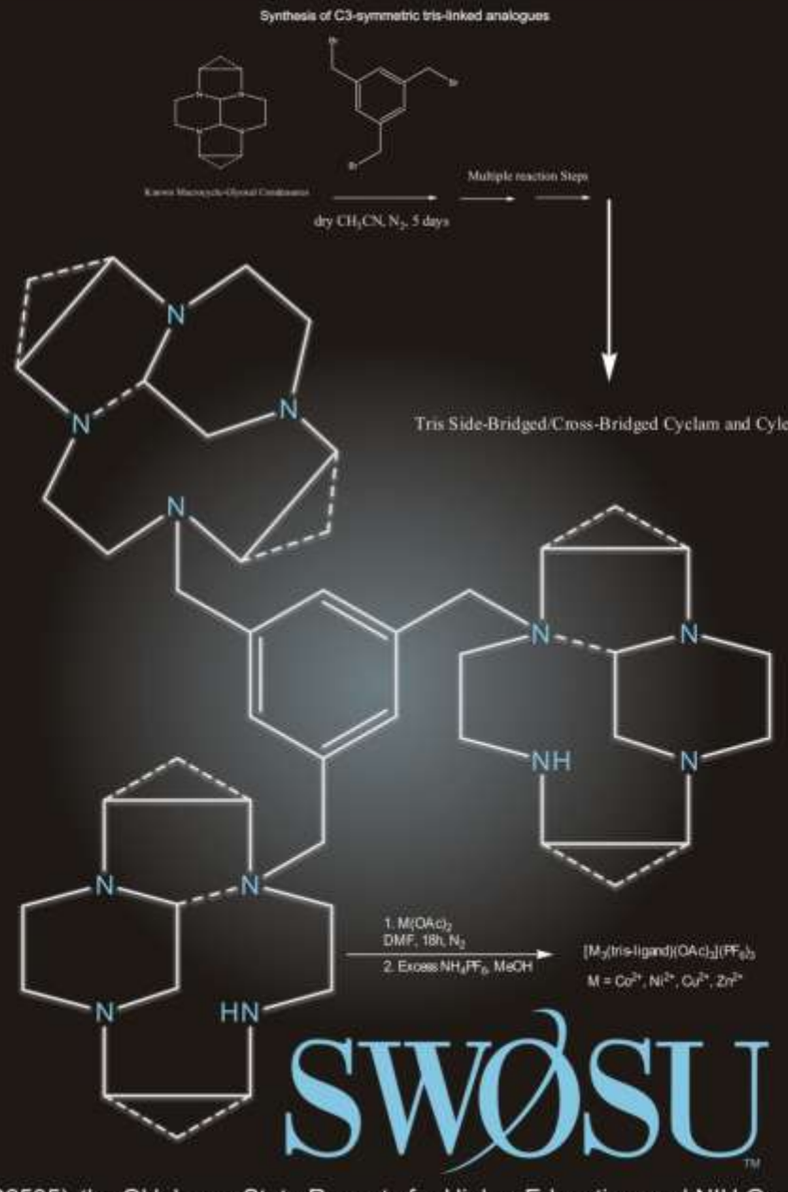


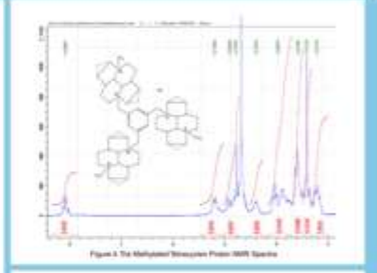
Figure 6. The inhibition of anti-CXCR4 antibody binding over time after exposure to 32nM of the drug. A population of 100,000 cells was isolated for each data point and analyzed by flow cell cytometry using a secondary fluorescein tagged IgG antibody (negative values are not shown).

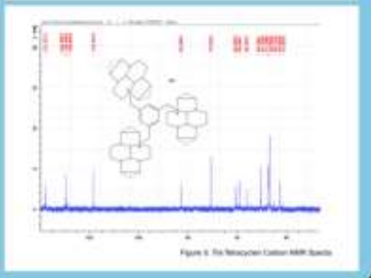
Synthesis of C3-symmetric tris-linked analogues

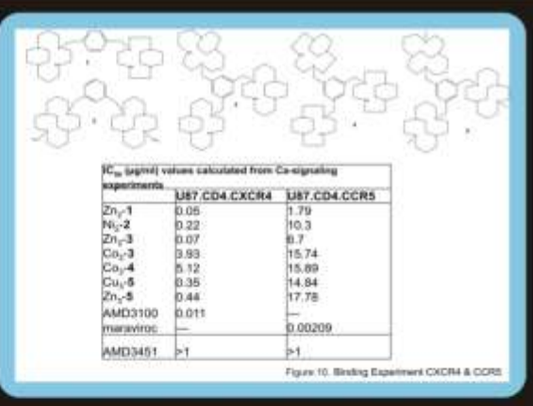


Characterization using NMR

Figure 7. NMR Spectrometer







IC_{50} (μg/ml) values calculated from Ca-signaling experiments	U87.CD4.CXCR4	U87.CD4.CCR5
Zn_2-1	0.05	1.79
Ni_2-2	0.22	10.3
Zn_2-3	0.07	8.7
Co_2-3	3.93	15.74
Co_2-4	5.12	15.89
Cu_2-5	0.35	14.84
Zn_2-5	0.44	17.78
AMD3100	0.011	—
maraviroc	—	0.00209
AMD3451	>1	>1

Figure 10. Binding Experiment CXCR4 & CCR5

4. Results:

The ligand syntheses of the side-bridged and cross-bridged C_2-symmetric ligands proceeded similarly to the previously developed bis-ligand routes. Complexation with the desired metal ions proceeded as expected. Characterization of the metal complexes resulted in publishable quality purity in each step of synthesis. Experiments investigating the Calcium release have shown that the C3-symmetric compounds are highly potent as CXCR4 antagonists, just as in the bis-linked compounds. An unexpected benefit of tris linking is CCR5 binding. CCR5 is another important chemokine receptor.

5. Conclusions:

C3-symmetric tris-linked bridged tetraazamacrocycles are easily produced, using an appropriate linker and following synthetic methods adapted from the bis-linked analogues. Metal ion complexation proceeds smoothly following known procedures. Calcium ion release is observed when the natural ligand for CXCR4, CXCL12, binds. Preventing Calcium release is evidence of strong antagonism by the potential drug molecule. Also, several of the C3-symmetric compounds have demonstrated excellent antagonism of a related chemokine receptor, CCR5, as well. This exciting result may lead to a new class of dual chemokine receptor antagonists.

6. Future plans:

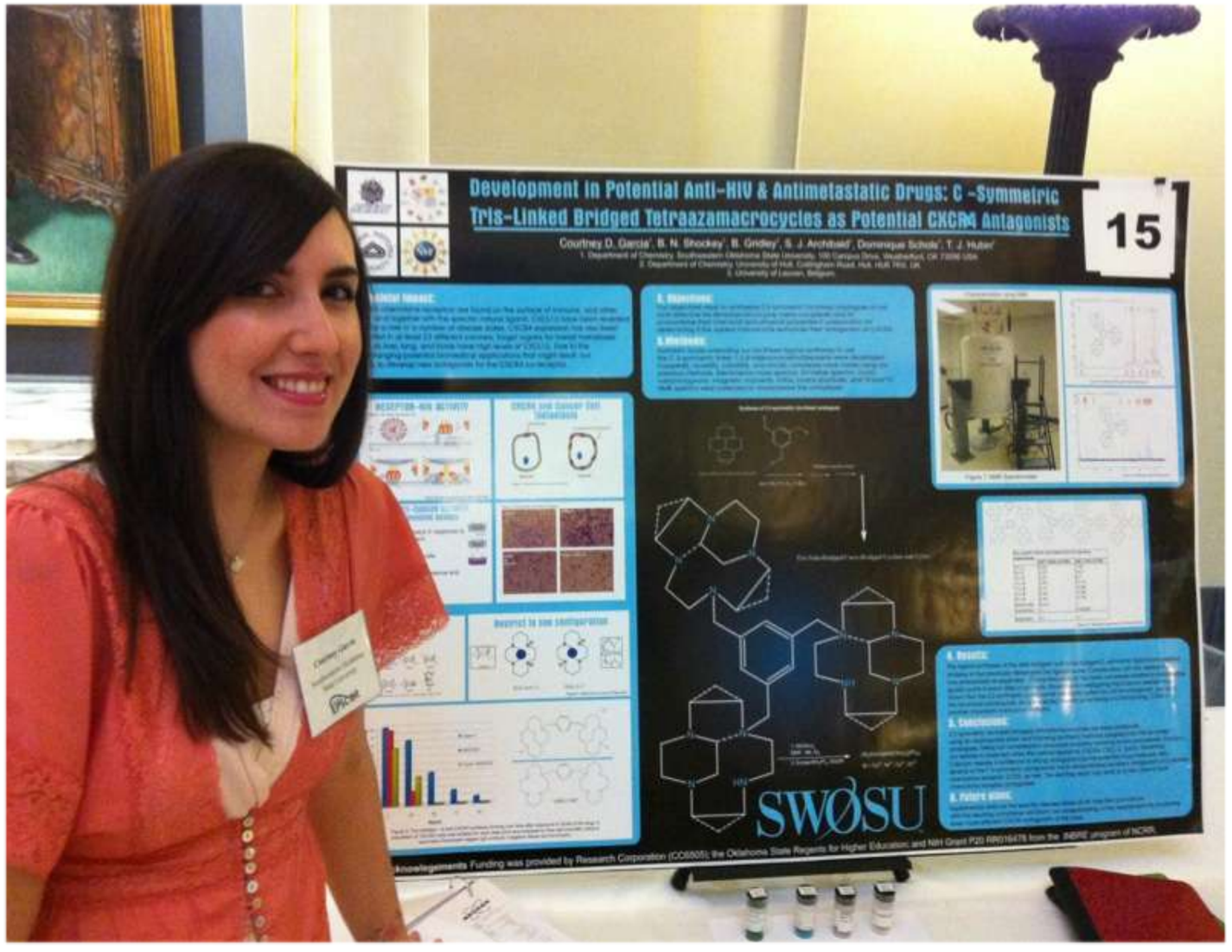
Experimental data on the specific disease states of HIV infection and cancer with the resulting complexes will inform our understanding of the requirements for producing even more efficient CXCR4 antagonists of this class.

Acknowlegements: Funding was provided by Research Corporation (CC6505); the Oklahoma State Regents for Higher Education; and NIH Grant P20 RR016478 from the INBRE Program of the National Resources.

Displaying Your Poster

The Display

- Table-top or free standing (You bring this with you.)
- Provided: table, floor length table cloth, and 2 chairs
- Things to bring: YOUR POSTER!!!! EASEL, PUSH PINS or Clips to attach poster, backing for your poster (foam board), and any visual aids (small enough to set on your table)
- I chose table-top - easel (~$25) & foam board (~$10) from Hobby Lobby



The Judges

Judging

- 4-5 judges - WELL educated, but not experts in your field of study
- 1 judge will be timing you, all others will have clipboards & be taking notes
- When they walk up - SMILE, introduce yourself, be confident (this is your project, you are your own expert on the matter), walk them through what you have done - using your poster as a guide or reference.
- You will have 5 minutes with the judges -
  3 min. to explain your research
  - 2 min. for questions

The Judges

- Questions are to re-affirm or clarify something about your presentation
  - Kinds of questions - Procedural, Social impacts, Future aspirations, etc.

- Other Tips for your presentation
  - Eye contact is important, face them as you reference your poster
  - No gum & keep your hands out of your pockets
  - Use more general terms to clarify complex terms
  - PRACTICE, PRACTICE, PRACTICE - try not to say “um”
  - Be ENTHUSIASTIC about your project yet speak calmly, clearly, and with confidence

KNOW your State Legislators

- This is very critical!
  - They will stop by your poster & expect you to know who they are
  - Explain to them your research in layman's terms making sure to EMPHASIZE your societal impact!
  - Each of you have a Home Representative and Home Senator based on which district you live in
  - You may also have a different School Representative and School Senator
  - www.capitolconnect.com/oklahoma/default.aspx

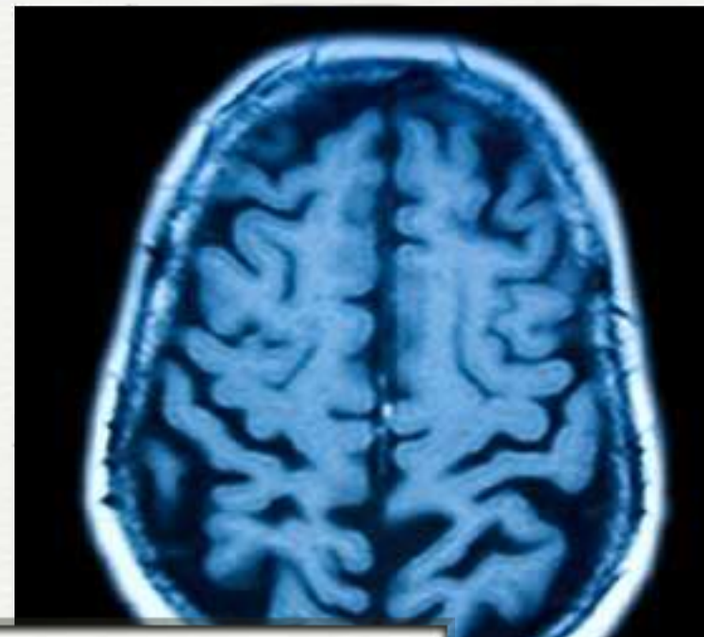
This could be YOU!!!

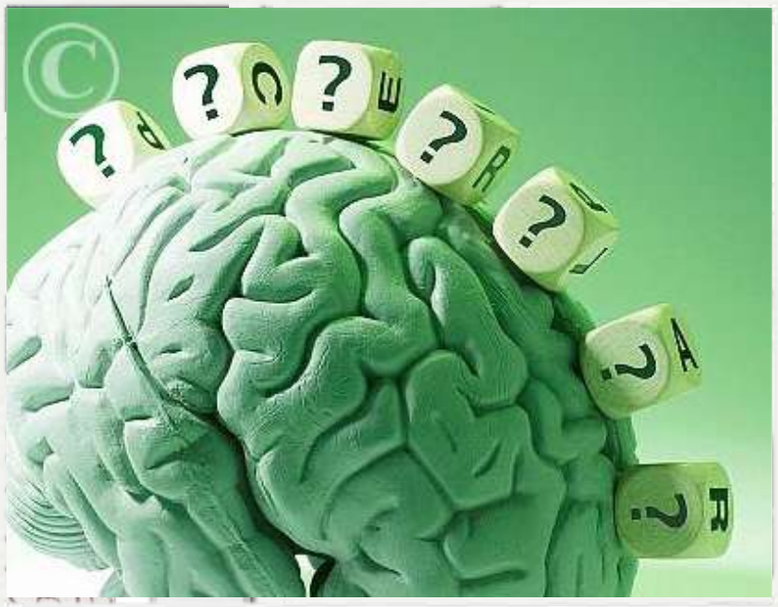
2011 Grand Prize Awardee

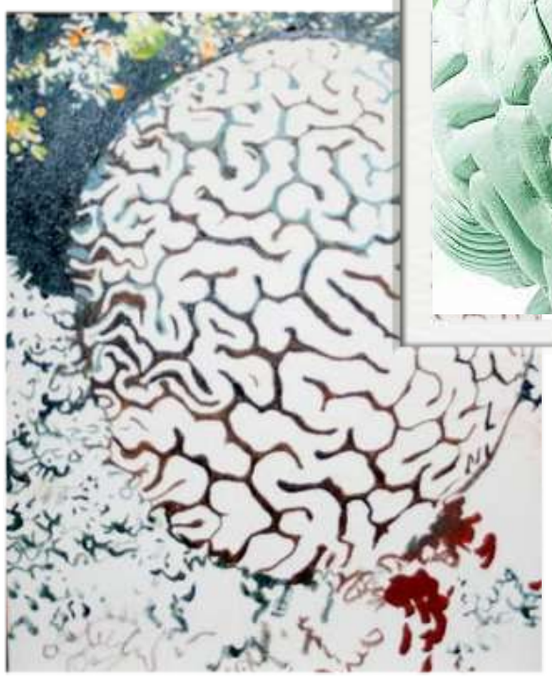
Chancellor Glen D. Johnson will present awards at end of the day

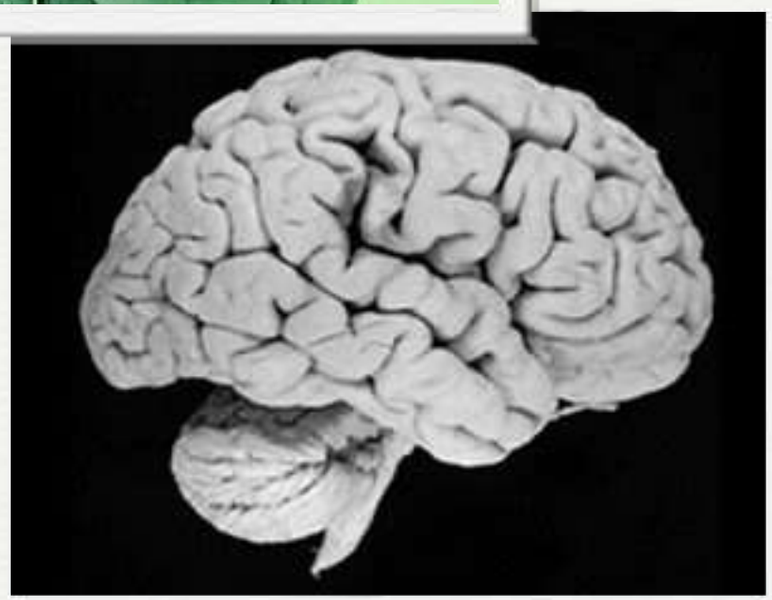
Things to Remember

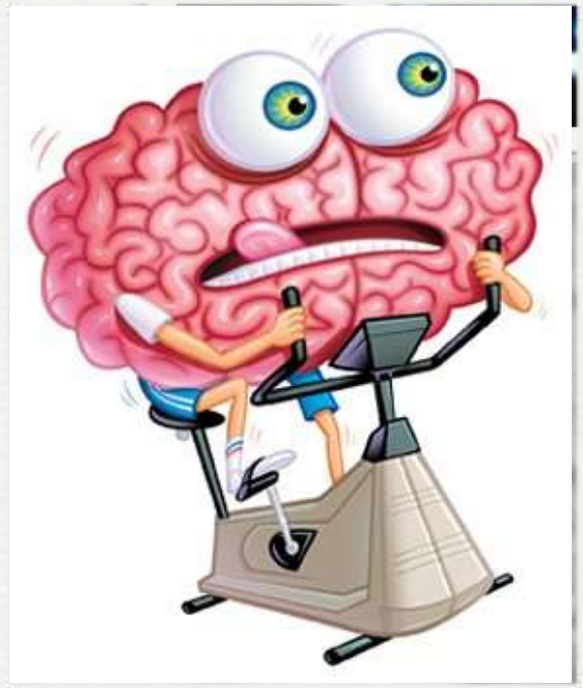
- You were chosen for a REASON!
  - Be Enthusiastic, friendly, and SMILE
  - EMPHASIZE your societal impact!
  - Judges are looking for someone who has the total package!
  - Be prepared and mentally ready
  - Dress professionally and be punctual
  - Know your legislators!











Any questions on your mind?...