



How To Make An Effective Poster



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With information kindly provided by Lolita Adkins and Jeremy Foin



“The more strikingly visual your presentation is, the more people will remember it. And more importantly, they will remember you.”

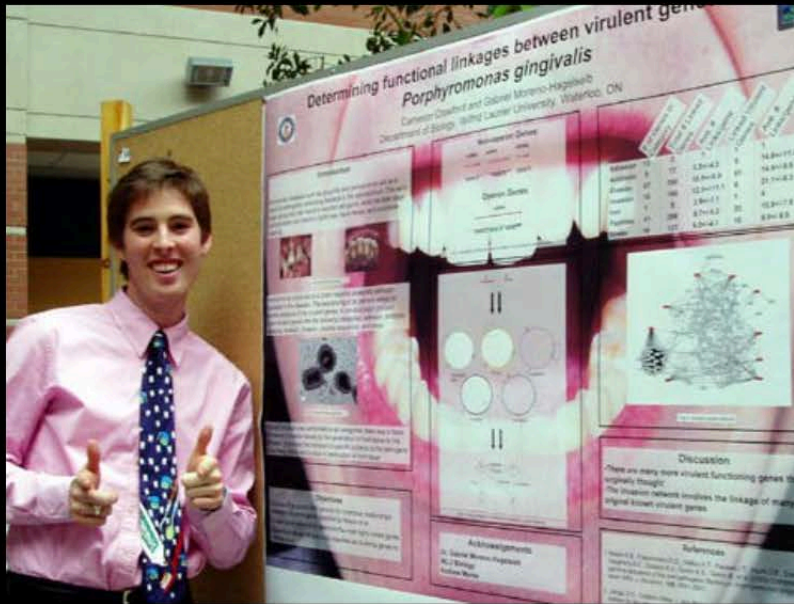
— Paul Arden

What is the purpose of an academic poster?

“...to display information in a clear, concise manner, while generating interest to engage in a discussion”

“...a big piece of paper (or wall-mounted monitor) that can communicate your research at a conference, and is composed of a short title, an introduction to your burning question, an overview of your novel approach, your amazing results in graphical form, some insightful discussion of aforementioned results, a listing of previously published articles that are important to your research, and some brief acknowledgement of the tremendous assistance and financial support conned from others” (Purrington 2014)

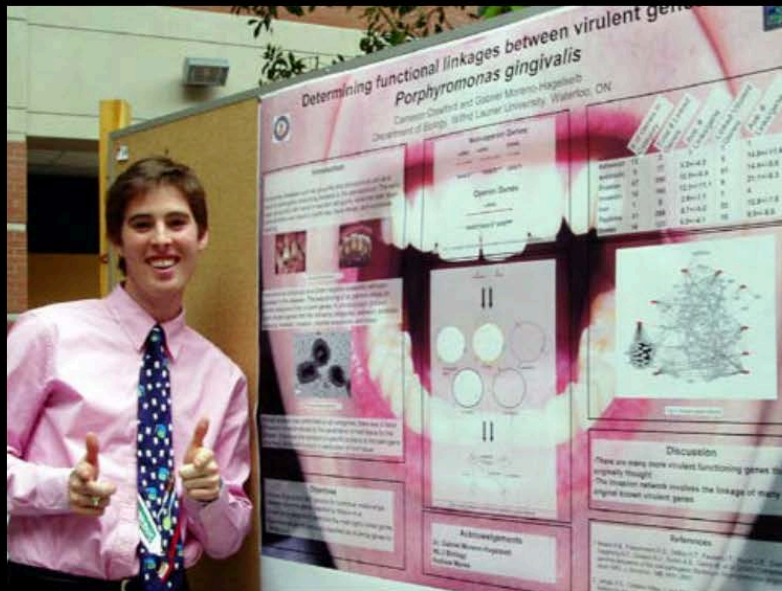
NO



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YES



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The implications, please...

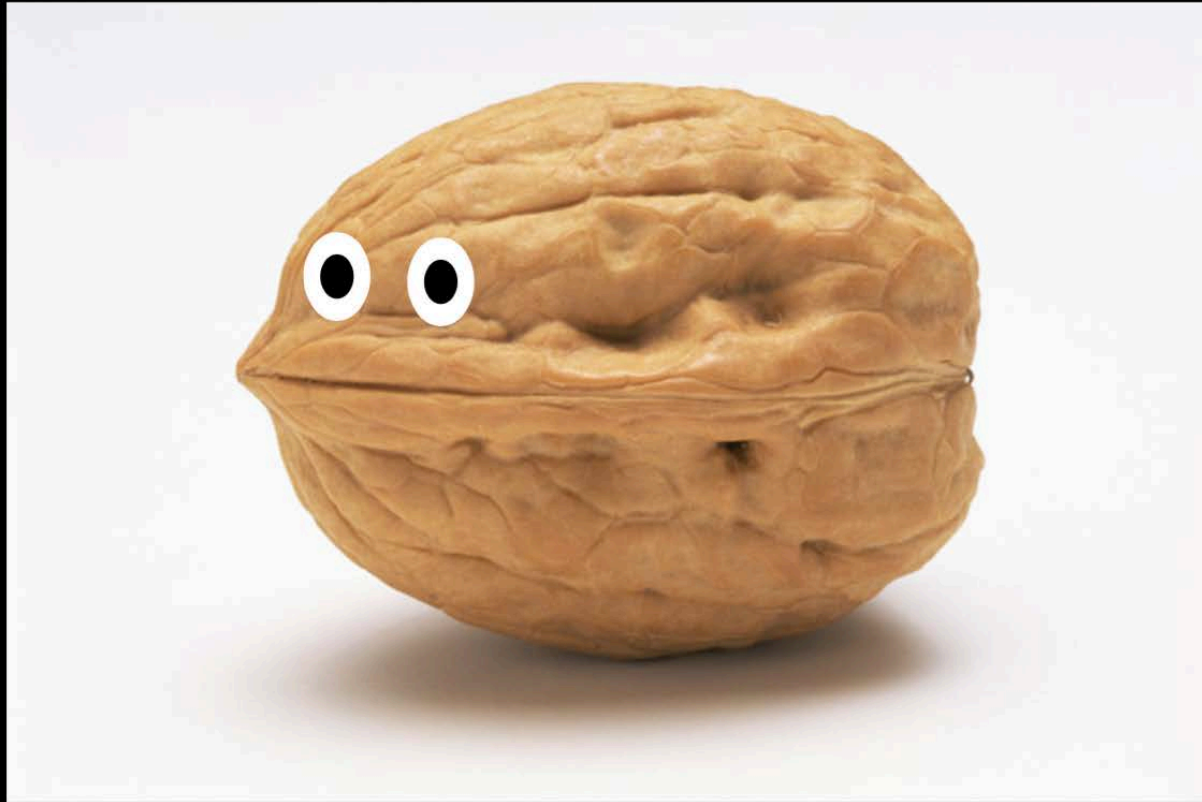
HERETICAL STATEMENT #1:

conference presentations don't really have that much to do with the research.

HERETICAL STATEMENT #2:

in reality, conference presentations are pretty much all about networking and shameless self-promotion.

IN A NUTSHELL:



**YOUR POSTER MUST
GRAB EYEBALLS.**

Poster Presentations Guidelines: The Must Haves



A New Rodent Model of Pediatric Sports-Related Concussion
Angela Avluis, Aaron Shafrick, Angela Echeverri, Stacy Seid, Nick Yin, Lauren Ekman, Marika Zwiernberg-Lee, Gene G. Gurko
Department of Neurological Surgery, University of California, Davis, CA



Introduction

Over 50% of all traumatic brain injury (TBI) occurs in individuals less than 24 years old. The majority of these injuries are mild and, increasingly, they are sports-related. In order to model a sports-related injury, we attached a metal disk directly to the skull and then impacted the disk using the controlled cortical impact device (CCD). The metal disk acts as a hammer to offset the force across the skull allowing for contusive injury in the absence of skull fracture. To test this model in the p30 rat, we generated a range of injuries by using a fixed depth of penetration (2 mm) and varied the lesion velocity from 2 to 5 m/s to generate increasing force. In addition, we assessed the consequences of having a mild injury followed by a second injury either mild or moderate one hour following the initial mild. Behavioral outcome measures included rotarod and Morris water-maze (MWM) performance.

Methods

Experimental Design

- 49 male p30 Sprague-Dawley rats were utilized.
- Prior to injury, animals were pre-trained on the Rotarod until they could maintain continuously for 6 minutes.
- Animals received either a sham, single, or repeat injury with an impact velocity of 1.5, sham (n=12), mild (n=12), moderate (n=12), mild-mild (n=6) or mild-moderate (n=6).
- Animals were tested on the Rotarod on days 1 and 4 post-injury (3 x 120 sec trials).
- Spatial learning was assessed on the MWM on post-injury day 1-4 (8 trials).
- Rats were anesthetized & perfused with paraformaldehyde on post-injury day 1.

Pediatric Sports-Related Concussion

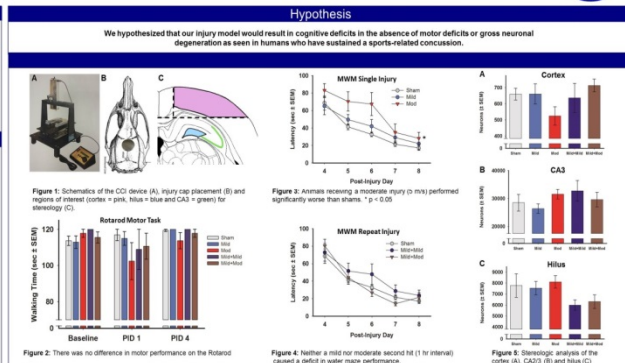
- Surgery was performed under 2% isoflurane (nose cone) in a 1.7 L ISO-5 laminar flow cabinet.
- Muscane was injected under the skin on top of the head as a local anesthetic.
- A mid-line scalp incision was made and a metal disk was glued to the skull midway between Lambda and Bregma (Figure 1A&B). Depth was fixed at 3 mm and fixed at 100 mN. Velocity was varied to create a range of injury severities.
- Based on pilot data, animals received either a sham, mild (2 m/s) or moderate (5 m/s) injury.

Rotarod Performance

Figure 2: There was no difference in motor performance on the Rotarod.

Summary & Conclusions

- Animals with a 2 m/s injury (mild) had neither a motor nor spatial learning deficit.
- Animals with a 5 m/s injury (moderate) also displayed no motor deficit. However, latency to find the hidden platform was significantly increased compared to sham animals.
- Repeat injury animals displayed no motor deficits and performed similarly to sham animals in the water maze.
- Initial stereological counts suggest no hippocampal CA3 damage. Additional counts are needed to assess the hilus and perirhinal cortex.
- It is critical to develop and optimize models of sports-related injury as this is the largest and fastest growing population of mild pediatric TBI in the United States.



Does Perinatal Exposure to DDTs and the Development of Glucose Intolerance Promote Skeletal Muscle Deficiency?

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Department of Animal Science, Department of Environmental Toxicology, University of California, Davis

Abstract

The once ubiquitously used pesticide DDT and its metabolite, DDE (together, DDTs) have been an environmental health concern for many decades. Recent epidemiological and mechanistic data link DDT exposures with devastating diseases such as obesity, hypertension, and of components of Type 2 Diabetes. Our work surrounds perinatal exposure of DDTs and adult phenotyping. C57BL/6J mice were exposed to DDTs from embryonic day 11 to postnatal day 5, raised on normal chow, and switched to high fat diet (HFD) at 4 months to initiate obesity. Three months after exposure, dams exposed to DDE during pregnancy were glucose intolerant, while their female offspring displayed elevated fasting insulin. Disruptions in peripheral glucose utilization prompted us to explore whether tissues that rely heavily on glucose uptake were displaying a phenotypic defect. One month after being put on HFD (6 months after exposure), we measured muscle strength. To assess muscle deficiency, we tested forelimb grip strength (GS) using Chatillon Machinery Grip Strength Machine (Largo FL). GS was tested over three days with 15 trials/day. On days two and three, overall grip strength, max strength, and first and last third of each trial were analyzed. Dams showed a difference in strength between days two and three, however F1 offspring had no significant change between treatment groups. Although we did not find conclusive evidence that DDTs impair skeletal muscle function, further research is needed to examine potential indirect effects that DDTs may have on skeletal muscle.

Introduction

- DDTs are part of a group of toxicants named Persistent Organic Pollutants (POPs) that accumulate in animal tissues.
- DDTs are a risk factor for glucose intolerance.
- One symptom to glucose intolerance is impaired glucose uptake in tissues.
- There is no prior evidence suggesting DDTs directly affecting Grip Strength in skeletal muscle.

Hypothesis

Perinatal exposure to DDTs causes impaired glucose uptake in skeletal muscle resulting in a decrease in GS.

Methods

Figure 1a: Experimental Design Diagram showing gestation, PND1, PND5, and HFD phases.

Results

Figure 2: Average Grip Strength effects of F1 male (a), F1 female (b), and F0 dams (c) when separated by treatment. Data shows no significant differences between groups.

Figure 3: Data from F1 female (left column) and F0 Dam (right column) average GS at 5mo in respect to Day 2 (top row) and Third (bottom row) criteria. Data shows no significant differences.

Results continued

Figure 4: Average Strength of Dams at 5mo. Figure 5: Further analysis of separate treatment groups: Average GS on Dam Day 2 (a), Day 3 (b), and Last Third on Day 3 (c). Figure 6: Maximum strength of F1 females (a) and F0 Dams (b). Top 5 and 15 Stats were analyzed to increase statistical strength differences between treatment groups.

Conclusion

- At 5 mos, DDTs did not effect GS regardless of sex, exposure type, or GS criteria (Avg, GS, Day, Third, & Max Strength).
- Dam GS on Day 3 (Fig 3b) decreased compared to Day 2.
- Given smaller SE and CV (data not shown) we conclude that GS measured on Day 2 is more robust than Day 3 due to possible decrease in endurance of Dam Day 3.
- Optimizing the Last Third on Day 2 is the best strategy to collect Grip Strength.

Acknowledgements

Extreme gratitude to Michele La Merrill Ph.D. for giving me this opportunity to work in her lab. She has encouraged me to build novel skills as well as add upon existing. McNair Scholars Program and California Alliance for Minority Participation (CAMP) Program for providing me the resources for my future career in research.



What is an Academic Poster?

- A form of Academic Expression
- Summary of Research (5 – 10 minutes)
- Visually augmented discussion/interaction
- At conferences viewers come to you (or you can invite)
 - People search published abstracts
 - Posters may be grouped by field & folks may wander
- New Information
- Characteristic Fields
- Appearance/Content varies by Field or Lab



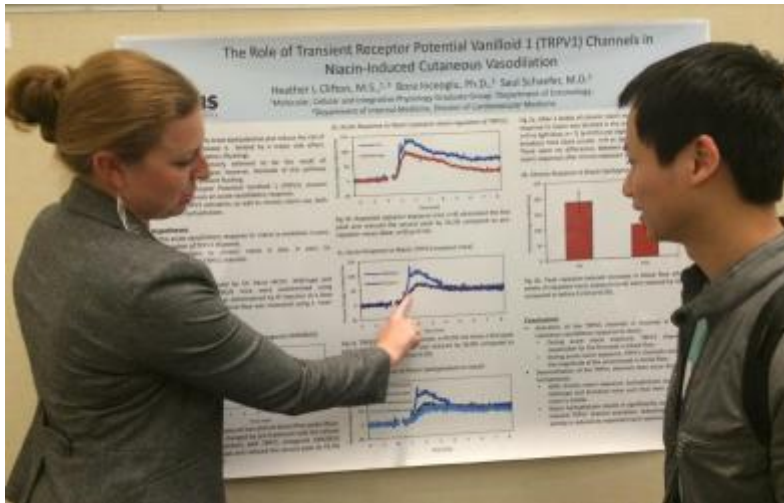
Why are Academic Posters Important?

- Represents you and you sponsor's research at:
 - Conferences
 - Symposia
 - Hallways
 - Informational Days
- Demonstrate expertise
- Demonstrate attention to detail
- Practice public speaking
- Learn about most current results in field
- Deepens understanding of topic
- Opportunity for teaching and learning
- Share ideas
- Create collaborations



Vital: Work with Your Sponsor

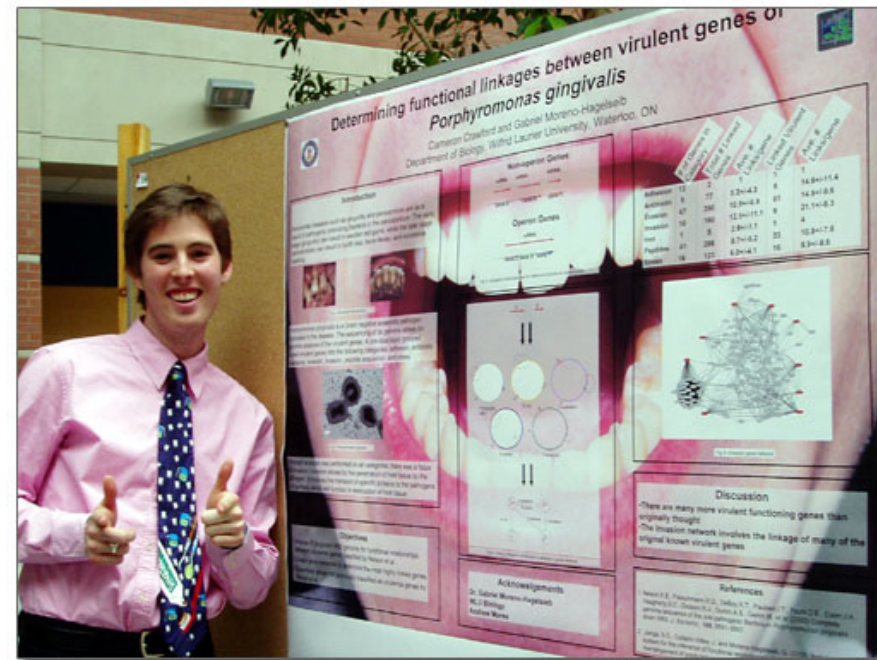
- Represents their laboratory
- They again need to be involved
- New data available – what should be included?
- Will want to make revisions (several times)
- Need final approval



Preparing Your Poster

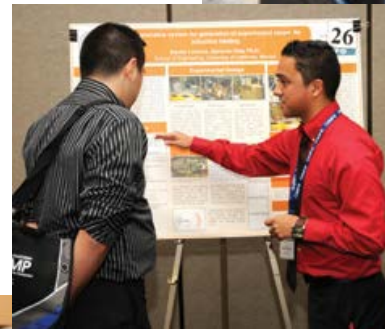
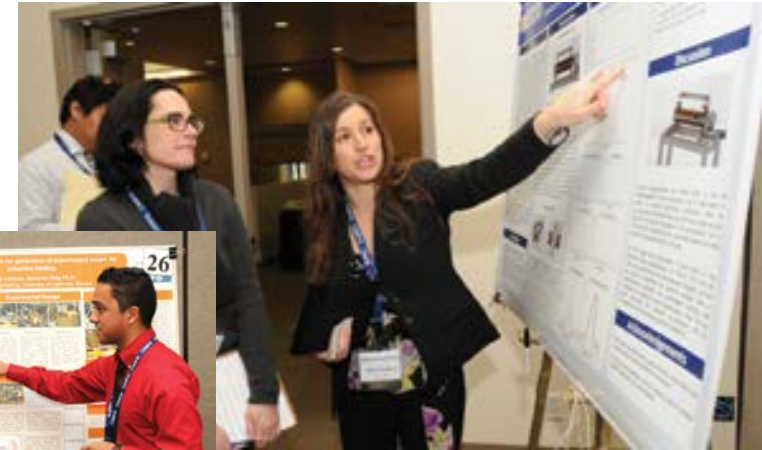
Keep in Mind:

- Characteristic sections with expected information
- Consult rules of conference/rubrics
- Work in collaboration w/ research sponsor
- Decide on experiments that will be presented
- Create a storyboard/plan
- Visually appealing
- Primarily image driven but stand alone
- Simply and tightly written
- Know what to say for each figure
- Transitions between sections
- Practice for your audience
- KNOW all details of project
- Master questions



Your Audience will be??

- Researchers in your field will read even if bad
- Researchers in related fields easily persuaded to view
- Previously uninterested passers by can be attracted by a good poster
- ***You want to attract these people!***
- Don't vary content, vary explanation



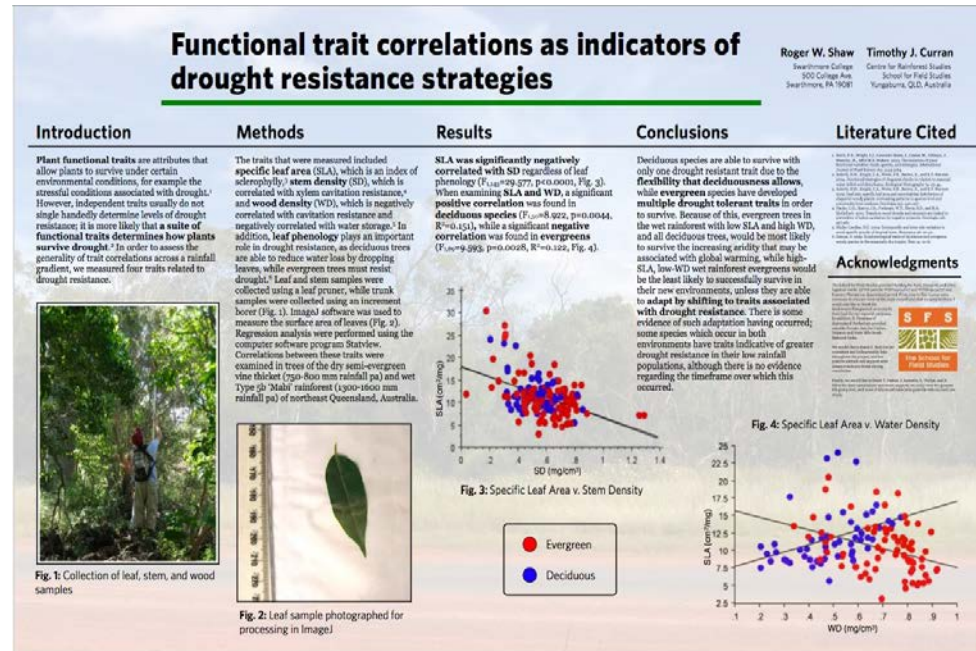
Main Elements of a Poster

- Title (same as submitted abstract)
- Name and Campus
- Core Technical Content
 - Abstract
 - Introduction
 - Results
 - Discussion
 - Literature cites/Resources
 - Acknowledgements
- Visuals
- Font should be legible fonts like:
 - Times New Roman
 - Arial
 - Garamond
 - Berkeley UC Davis Medium
 - Do not use illegible fonts like:
 - *Brush Script*
 - Use the same font type throughout your poster
 - No smaller than 16 pt. font



Poster Appearance

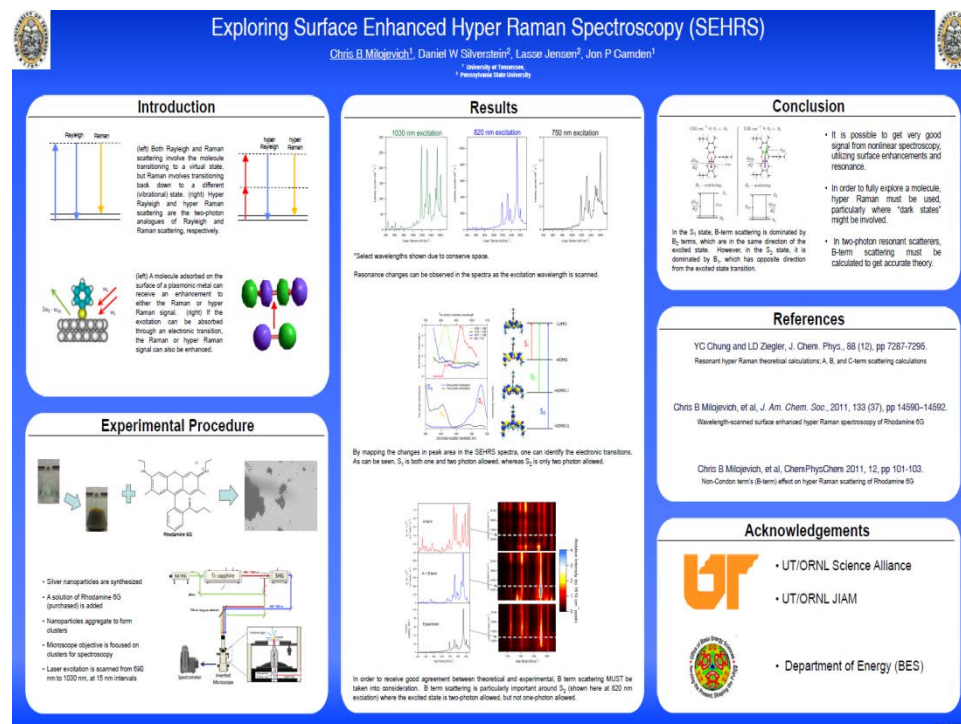
- Make rough plan of your poster
- Will have “standard” headings
- Poster provides visual aids as you talk
- Picture worth 1K words
- Carry information with colorful images and figures
- Estimate space that will be needed –
- How many experiments reported
- How many figures needed?
- What types of figures?
- How much text to explain
- Space for text
- Poster must be “stand alone” (understandable in halls, unstaffed)
- Has to have words
- Word amount varies with field
- Balance your text and images



Poster Appearance

- 36" x 48" good for 3 column (Proposal or one experiment).
- Intro - Can have image of existing model, or eye catching photo
- Methods - can be a flow chart
- Results – Figures, Line Graphs common.
- Discussion – Often bulleted
- Should be Visually Appealing
- Understand reader “gravity”
- Top left to bottom
- Left to right
- Have an obvious flow
- Headings
- Numbers
- Use “white space” or color frames to organize

- Unobtrusive/Neutral backgrounds
 - White
 - Lt grey
 - Lt beige

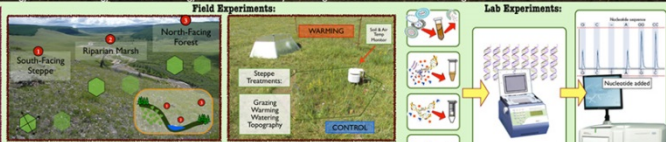
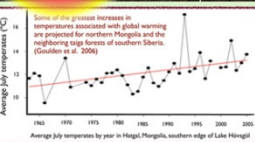


Poster's Appearance



Soil Microbial Diversity in a Mongolian Climate Change Experiment

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¹Department of Biology, University of Pennsylvania, Philadelphia, PA 19104
²Department of Ecology, School of Biology and Biotechnology, National University of Mongolia, Ulaanbaatar 210646, Mongolia



How will microbial communities be affected by, and in turn, affect climate change?

Introduction - 2009 Baseline:

- Hypothesis: Microbial diversity highly correlated with moisture regime
- Between habitats:
 - And steps - lowest diversity
 - Moist forest > intermediate diversity
 - Wet riparian > highest diversity
- Within steppe habitat:
 - more arid upper slope < lowest diversity
 - less arid lower slope > higher diversity

Experimental Design:

- Valley 1:
 - Warming across 3 habitats (replicated 4x)
 - Steps only
 - Upper Slope-Warming & Watering (7x)
 - Lower Slope-Warming & Grazing (8x)
- Valley 2:
 - Warming
 - Grazing
 - Warming & Watering
 - Watering

Molecular Work:

- PCR:
 - 16S barcoded primers (McKenra et al. 2008)
- Pyrosequencing:
 - Roche 454 Genome Sequencer Junior System
 - Stored in Mollo LifeGuard (Carlsbad, CA, USA)
- Bioinformatics software:
 - QIIME (Caporaso et al. 2010)
 - Mothur (Schloss et al. 2009)

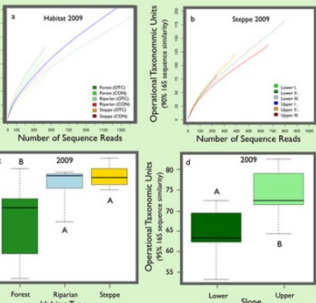


Figure 1. Taxonomic composition at the phyla level (in percentage) of bacterial communities in soil samples from various experimental treatments.

Discussion:

- Taxonomic composition across habitats and years (Fig. 1)
 - The community composition varied significantly between the steppe habitat (P < 0.001)
 - Neither habitat nor topography had an effect on composition at the phyla level
 - Studies over a longer time period and four taxonomic resolutions needed
- Taxonomic composition across habitats (Fig. 2 a-c):
 - Habitat type significantly affected bacterial phyla (P < 0.001, P < 0.01, P < 0.05)
 - The forest had significantly lower diversity than either the riparian or steppe habitats.
- Taxonomic composition within steppe habitat (Fig. 2b,d):
 - There were significantly more species on the upper slope than on the lower slope in the steppe (P < 0.05, P < 0.01, P < 0.001)
- Hypotheses not supported by data!
- Moisture not the major variable affecting microbial diversity at phyla level



Future Directions:

- Compare samples from 2009-2013
- Compare sequence reads
- Compare at species level
- RNA expression studies
- Enzymes assays

Acknowledgements:

Casper, Petraitis, Bushman, Adams & Gallagher Labs
 NSF PIRE Mongolia Project
 NSF EAR01 Program

References: Caporaso, J.C., et al. 2010. Nature Methods. Goulden, C.E., et al. (Eds.). 2006. The Geology, Botany and Ecology of Lake Hovsgul (Mongolia). PCC. Climate Change 2007. Working Group II. McKenra, E., et al. 2008. PLoS Pathogens. Schloss, P.O., et al. 2009. PLoS Currents.

Which do you prefer?

A Randomized, Multi-Center, Prospective Analysis of Diabetic Foot Ulcers treated with TheraGauze alone or TheraGauze+Becaplermin

Adam Landsman, DPM, PhD, Beth Israel Deaconess Medical Center, Harvard Medical School, Boston, MA; Patrick Agnew, DPM, Coastal Podiatry, VA Beach, VA; Robert Joseph, DPM, PhD, Dayton, OH; Lawrence Parish, MD, Thomas Jefferson University, Philadelphia, PA; Robert Galiano, MD, Northwestern University, Chicago, IL

ABSTRACT

This study represents the first randomized, multicenter, prospective study utilizing a moisture-regulating dressing for the treatment of diabetic foot ulcers, in conjunction with Becaplermin (Bepi), a topical membrane growth factor (PDGF-B).

Study subjects (n=12) were randomized to receive either TheraGauze alone or TheraGauze in conjunction with Becaplermin. We found that 48% of the patients in both groups closed within 12 weeks. After 20 weeks, we found that 60% closed with TheraGauze + Becaplermin, and 62% closed with TheraGauze alone. This compares very favorably to historic controls in which only 32% close within 12 weeks, and 41% close in 20 weeks or less. Closure rates, adverse events, and compliance were also evaluated.

Based on this data, we conclude that moist wound healing with a saline-wetted gauze is not enough. Instead, we have demonstrated that Moisture Regulation (i.e. the ability to add or remove moisture as needed) will dramatically improve the rate of wound closure and % of wounds which will go to close.

INTRODUCTION

Moist wound care with saline-moistened gauze has been a cornerstone of local wound care for many years. However, it also clear that moisture without precise regulation can lead to wounds which become either macerated or desiccated, and this can greatly diminish the capacity for healing.

TheraGauze is an example of the new class of SMART dressings which are capable of precise moisture regulation. This TheraGauze is able to add or remove moisture as needed by the wound bed. It's complex microstructure enables it to make fine adjustments across the entire wound surface.

Our purpose was to determine if precise moisture regulation would result in faster closure times by measuring the rate of closure with TheraGauze, with and without Becaplermin. In order to evaluate this effect, a randomized, multi-center clinical trial was designed to evaluate the rate and percentage of wound closure, and compare this value to historic controls using saline-moistened gauze.

EXCLUSIONS

- Patients on anticoagulation
- Wound Grade 1 or 2
- Tissue off healing or non-healing due to diabetes, infection, or VAB
- Age 18 or older
- DDM or NEDDM
- HbA1c > 10%
- Multiple IVP renal phase 1-4
- 1-4

HYPOTHESIS

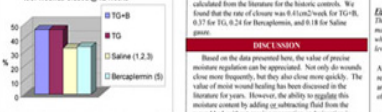
- 1. Precise moisture regulation will increase the rate of wound healing.
- 2. Precise moisture regulation will result in a higher percentage of wound closure, as compared to historic controls with saline-moistened gauze.
- 3. The ability of Becaplermin (1% gels) to achieve wound closure will be improved as compared to historic clinical trials previously reported.

RESULTS

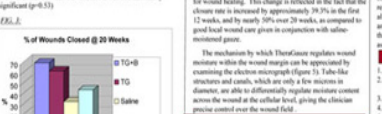
In this study, 12 patients (n=12) were enrolled. As of the time of this analysis, data was available on 26 subjects with 4 total to follow-up before all data could be collected, and 2 had not completed the study at the time of this presentation.

Both cohorts had 13 subjects each, with an average wound size of 3.5cm² (TG-B), and 4.5cm² (TG). There was no statistically significant difference in the size of the wounds between groups (p=0.86).

The 13 of wounds closed after 12 weeks was compared to historical data for saline-moistened gauze and wounds treated with Becaplermin with saline-moistened gauze (Figure 2). The data shows that 48.2% of the wounds closed with TG or TG-B. This compares to an average of 32% closure rate for saline-moistened gauze calculated by combining the data from references 1,2,3, and 14% for Becaplermin 8.0% from reference 5.



Historic data for % of wounds closing after treatment with Becaplermin 8.0% is used after 20 weeks. This information is depicted in Figure 3. Historic value for closure rates increased from 32% with normal saline to 42% and 41.3% with TG-B and TG, respectively. The difference in closure rates between TG-B and TG was not statistically significant (p=0.53).



We hypothesized that:

- 1. Precise moisture regulation will increase the rate of wound healing.
- 2. Precise moisture regulation will result in a higher percentage of wound closure, as compared to historic controls with saline-moistened gauze.
- 3. The ability of Becaplermin (1% gels) to achieve wound closure will be improved as compared to historic clinical trials previously reported.

CONCLUSION (CONTINUED)

On the average size of the wound at initial treatment, and the average time to closure decreased 4.5x, (Figure 4).



Electron Micrographs illustrate the unique structure of TheraGauze. The polymer dressing appears to be a fibrous material - it contains a series of tube-like structures and canals which enable the dressing to regulate moisture at the cellular level across the wound interface.

Although this study clearly demonstrates the benefits of moisture regulation, it was not deemed to be the definitive study in this area. Future studies will undoubtedly demonstrate the benefits of this new technology.

We found that the precise moisture regulating dressing, TheraGauze, appears to support Becaplermin around a wet saline-wetted gauze in a percentage of wounds closed at both 12 and 20 weeks.

Based on the data presented here, it is clear that precise moisture regulation is a powerful tool to help achieve wound closure in patients with diabetes. We anticipate that there will be other scenarios where something other than saline will be regulated with a smart dressing as well. The ability to regulate all types of fluid added to the wound bed, such as antibiotics, and a host of other topical agents, leads us to believe that there could be many custom applications for a dressing such as this.

REFERENCES

1. Studd, D.E., et al. J Vasc Med Biol. 1999; 11(1):114-119.
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ACKNOWLEDGMENTS

This study was funded by Sublyte Systems, LLC, Newport News, VA. The authors would also like to thank the College of William and Mary, Applied Research Center, Materials Characterization Laboratory, Newport News, VA for providing scanning electron micrographs of the TheraGauze material.



what is a visual hierarchy?

“The visual organization of elements within a design format to establish focal points based on their importance to the message to be communicated”

“The organization and prioritization of content as a means to communicate a message”

“Using color, contrast, texture, shape, position, orientation, and size to organize elements in a way that gives users a sense of visual importance”

why use a visual hierarchy?

- humans are primarily visual creatures
- we tend to focus on **differences**, not similarities, when making comparisons
- this is a key consideration for designing an effective poster

POSTER = COMMUNICATION,
and

DESIGN = COMMUNICATION,

SO ...

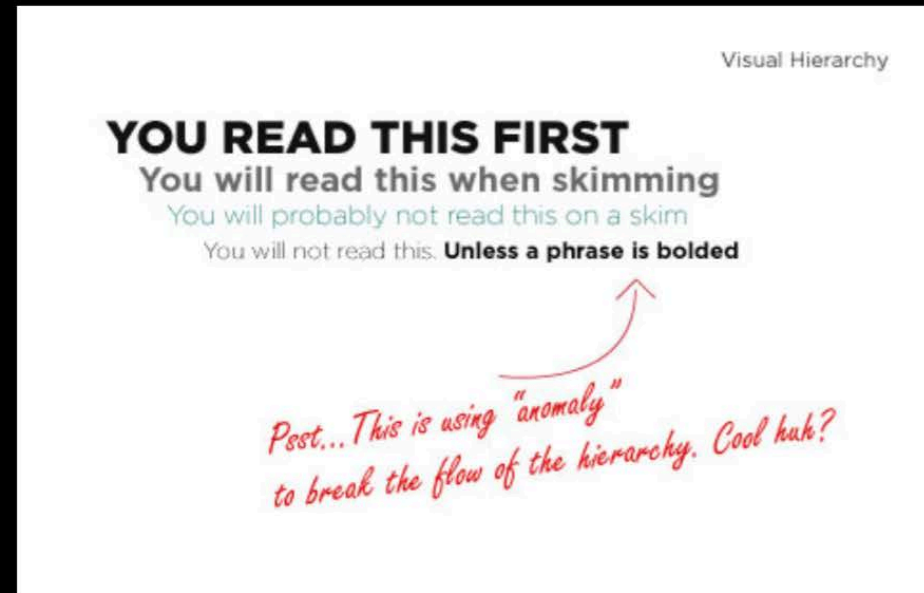
GOOD DESIGN = EFFECTIVE POSTER

*(assuming that your data isn't crap – but
there are ways to get around that as well)*

elements of a visual hierarchy

a visual hierarchy is constructed using some combination of the fundamental principles of graphic design

- negative/positive space
- contrast
- repetition
- proximity
- color
- alignment
- typography (not really a principle)



negative/positive space

- the balance between negative (background) and positive (foreground) space in a composition is very important
 - too much negative space = incomplete or disassociated appearance
 - too little negative space = busy, cluttered, and difficult to read

cramming too much information into too small of a space is far and away the number-one mistake in academic poster designs

types of contrast



color

- color theory is an extremely complicated topic that could take up an entire class on its own
- for our purposes we will focus on two aspects:
 - color as an emotional tool
 - color as an organizational tool

KEY		Other metals	
Alkali metals	Alkali-earth metals	Semimetals	Non-metals
Transition metals	Rare earths	Noble gases	Hydrogen
Radioactive rare earths			

1 H Hydrogen 1																	2 He Helium 2	
3 Li Lithium 3	4 Be Beryllium 4																	10 Ne Neon 10
11 Na Sodium 11	12 Mg Magnesium 12																	18 Ar Argon 18
19 K Potassium 19	20 Ca Calcium 20	21 Sc Scandium 21	22 Ti Titanium 22	23 V Vanadium 23	24 Cr Chromium 24	25 Mn Manganese 25	26 Fe Iron 26	27 Co Cobalt 27	28 Ni Nickel 28	29 Cu Copper 29	30 Zn Zinc 30	31 Ga Gallium 31	32 Ge Germanium 32	33 As Arsenic 33	34 Se Selenium 34	35 Br Bromine 35	36 Kr Krypton 36	
37 Rb Rubidium 37	38 Sr Strontium 38	39 Y Yttrium 39	40 Zr Zirconium 40	41 Nb Niobium 41	42 Mo Molybdenum 42	43 Tc Technetium 43	44 Ru Ruthenium 44	45 Rh Rhodium 45	46 Pd Palladium 46	47 Ag Silver 47	48 Cd Cadmium 48	49 In Indium 49	50 Sn Tin 50	51 Sb Antimony 51	52 Te Tellurium 52	53 I Iodine 53	54 Xe Xenon 54	
55 Cs Cesium 55	56 Ba Barium 56	57-71 La Lanthanum 57	72 Hf Hafnium 72	73 Ta Tantalum 73	74 W Tungsten 74	75 Re Rhenium 75	76 Os Osmium 76	77 Ir Iridium 77	78 Pt Platinum 78	79 Au Gold 79	80 Hg Mercury 80	81 Tl Thallium 81	82 Pb Lead 82	83 Bi Bismuth 83	84 Po Polonium 84	85 At Astatine 85	86 Rn Radon 86	
87 Fr Francium 87	88 Ra Radium 88	89-103 Act Actinides 89	104 Rf Rutherfordium 104	105 Db Dubnium 105	106 Sg Seaborgium 106	107 Bh Bohrium 107	108 Hs Hassium 108	109 Mt Meitnerium 109	110 Ds Darmstadtium 110	111 Rg Roentgenium 111	112 Cn Copernicium 112	113 Nh Nihonium 113	114 Fl Flerovium 114	115 Mc Moscovium 115	116 Lv Livermorium 116	117 Ts Tennessine 117	118 Og Oganesson 118	
89 La Lanthanum 89	90 Ce Cerium 90	91 Pr Praseodymium 91	92 Nd Neodymium 92	93 Pm Promethium 93	94 Sm Samarium 94	95 Eu Europium 95	96 Gd Gadolinium 96	97 Tb Terbium 97	98 Dy Dysprosium 98	99 Ho Holmium 99	100 Er Erbium 100	101 Tm Thulium 101	102 Yb Ytterbium 102	103 Lu Lutetium 103	104 Hf Hafnium 104	105 Ta Tantalum 105	106 W Tungsten 106	
91 Ac Actinium 91	92 Th Thorium 92	93 Pa Protactinium 93	94 U Uranium 94	95 Np Neptunium 95	96 Pu Plutonium 96	97 Am Americium 97	98 Cm Curium 98	99 Bk Berkelium 99	100 Cf Californium 100	101 Es Einsteinium 101	102 Fm Fermium 102	103 Md Mendelevium 103	104 No Nobelium 104	105 Lr Lawrencium 105	106 Rf Rutherfordium 106	107 Db Dubnium 107	108 Sg Seaborgium 108	



color temperature – warm or cool?



color temperature – warm or cool?



color temperature

warm vs. cool colors

- warm
 - hues from red through yellow, including browns and tans
 - seem to advance or appear more active; often evoke feelings of happiness, optimism and energy, but can be visually overwhelming
- cool
 - cool = blue-green through blue-violet, including most grays
 - appear to recede into the background; usually calming and soothing, but can also express sadness

color as an organizational tool



Inorganic Biochemistry of Iron Proteins

Duke University – Department of Chemistry – Durham, NC



Purpose:
To study iron protein biochemistry from the perspective of the iron Protein = Ligand

The Iron Paradox
Iron is needed for nearly every living cell
Iron is toxic and can produce reactive oxygen species & must be controlled

Iron Abundance in Humans
45-55 mg/kg in humans
70% in Red Blood Cells (hemoglobin) & 1% in Transferrin
Turnover of transferrin iron is ~30 mg/24 hours with 80% of this Fe being transported to the bone marrow for hemoglobin synthesis
Bacteria can also target Tf as a source of iron

Proteins act as the 1st & 2nd coordination shell of iron and can modulate the kinetics and thermodynamics of reaction.

Techniques:

Spectroelectrochemistry
UV-Visible Spectroscopy
Fluorescence Spectroscopy
Difference Spectroscopy
Stopped-Flow Kinetics
SUPREX

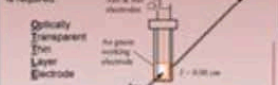
TRANSFERRIN
A mechanistic study of the iron release by receptor-bound transferrin using spectroelectrochemistry

FERRIC BINDING PROTEIN
Role of a synergistic anion on modulating iron uptake in a bacterial transferrin by pathogenic bacteria: A study in kinetics and thermodynamics

HEMOGLOBIN
Effects of subunit cross-linking on hemoglobin oxidation states determined by spectroelectrochemistry

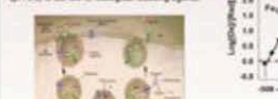


Transferrin
Spectroelectrochemistry utilizes a short pathway created by an OTTLLE cell, to measure the variations in visible spectra as the analyte is oxidized or reduced by an externally applied potential. This technique is ideal for a biological analyte because only a small sample volume is required.



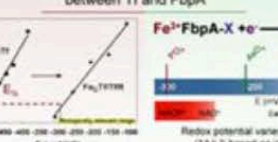
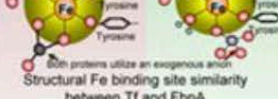
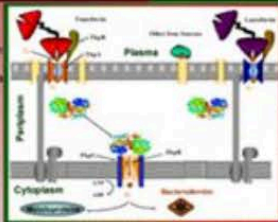
Heterogeneous reactions are complicated because the metal can be buried in the protein and protons diffuse slowly to the electrode surface. Mediators are used to act as electron shuttles.

Iron loaded Tf binds to the ferric receptor and is taken into the cell by endocytosis. Tf releases iron inside in the endosome where the conditions are acidic (Andrews, 1995). However, the chemical mechanism is unclear. The reduction potential of Fe-Tf in the plasma (pH 7.4) and in the endosome (pH 5.0) is too low for biological reducing agents.



The transferrin receptor is capable of shifting the reduction potential into the range accessible by biological reducing agents, allowing for a redox mechanism of Fe release. Transferrin not only supplies iron to mammalian cells, but has been identified as a target for pathogens to mechanically steal iron from their host.

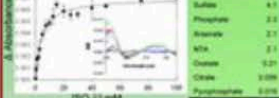
Kraier, Zak, Asen and Cummins. (1998). *Inorg. Chem.* 37, 394.
Chungang, Tabay, Anderson, Vaughan, Asen, Metzner and Cummins. (2003). *PLoS* 100, 3659-64.
Chungang, Tabay, Zak, LeVie, Cummins and Asen. (2004). *Biochem* 43, 220-9.



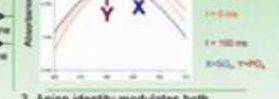
Iron transport can occur by a redox or non-redox mechanism in the periplasm. The thermodynamic stability and reduction potential are both varied by the identity of the synergistic anion. Kinetically labile exchange is possible in the diverse anionic conditions of the periplasm.

Hayman, Weaver, Metzner and Cummins. (2002). *Biophys. J.* 83, 1005-10.
Chungang, Anderson, Metzner and Cummins. (2005). *Biochem* 44, 9036-44.
Rouhal, Powell, Chungang, Weaver, Metzner, Cummins and Fitzgerald. (2006). *Biochem* 45, 15767-74.
Chungang, Tabay, Anderson, Vaughan, Asen, Metzner and Cummins. (2003). *PLoS* 100, 3659-64.

Like Tf, FbpA requires a synergistic anion to facilitate iron binding, which may play a role in ease and rate of Fe uptake by the bacteria.



2. FeFbpA-X can exchange anions
FeFbpA-X + Y^{m-} ⇌ FeFbpA-Y + Xⁿ⁻



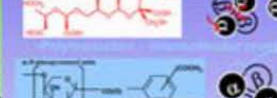
Anion	log K
Phosphate	12.6
Ascorbate	18.1
Oxalate	17.6
NTA	17.3
Pyrophosphate	17.3
Citrate	17.1
Sulfate	16.2

Thermodynamic stability varies by two orders of magnitude (14 kJ) based on identity of X.

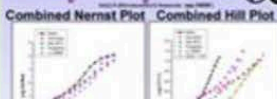
Hayman, Weaver, Metzner and Cummins. (2002). *Biophys. J.* 83, 1005-10.
Chungang, Anderson, Metzner and Cummins. (2005). *Biochem* 44, 9036-44.
Rouhal, Powell, Chungang, Weaver, Metzner, Cummins and Fitzgerald. (2006). *Biochem* 45, 15767-74.
Chungang, Tabay, Anderson, Vaughan, Asen, Metzner and Cummins. (2003). *PLoS* 100, 3659-64.

Chemically modified Hb

- Pyridoxalation
- Peyllation
- Conjugation to polysaccharides & proteins



Intramolecular cross-linking



Sample	E _{1/2} (mV (NHE))	Oxidation (mV)	1/2 E _{1/2} (mV)	Oxidation (mV)
HbA ₂	83	1.3	-0.455	2.28
Hemlock	87	0.7	0.384	0.71
Des-BTC	94	0.9	0.815	1.45
OxyO ₂ Hb	100	0.9	1.028	1.11
aa-OBBP	125	1.0	0.841	1.58

Implications
Rearranging redox center not necessary
Once for autoxidation not thermodynamic
Structural modifications perturb kinetics by altering exposure of heme cavity

Modified Hb Conclusions

Oxygen Transport
Loss of cooperativity
Lower oxygen affinity
T-state stabilization

Anaerobic Reduction Potentials
E_{1/2} potential increased vs HbA₂
Normal physiological range
Decreased tendency to form methis

Berenshteyn, Hershkov, Weaver, Hermitz, Pines, Asayeh and Cummins. (2008). *inorg. Chem.* 47, 1012-1020.
Tabay, Berenshteyn and Cummins. (2002). *Meth. in Enzymology* 353, 187-209.
Rees. (2001). *Chem. Rev.* 101, 2797-2919.

a final word about color...

- color is an extremely powerful tool – use with caution!
 - using too much and/or too many colors drastically reduces effectiveness
 - a limit of 3 colors is usually recommended
 - but not always possible (think pie charts and the like)
 - however, it is possible to substitute pattern for color
 - also avoids potential problems with colorblindness in your audience (it's much more common than you may think)

proximity

- moving elements closer or farther apart to achieve a more organized look
- based on the idea that related items in close proximity will be perceived as a unified group
- your audience will respond by:
 - a) tending to naturally group similar items that are near to each other into a single unit, and
 - b) assuming that items that are not near each other in a design are not closely related to one another

alignment

- arranging elements so that they line up
 - creates order
 - organizes page elements; links disparate groups into a unified whole
 - satisfies the subconscious human desire to line things up (I'm not kidding, this is an actual thing)
 - creates imaginary visual connections

**ignore alignment at
your own peril!**

this poster has some serious alignment issues...

Salvage Archaeology at the Snake River Sandspit Site in Nome, Alaska

Concurrence of No Historic Properties:

• March 10, 1998 – The Corps sent a letter to the SHPO requesting concurrence that their project to improve the harbor at Nome, Alaska “does not have the potential to affect cultural resources.”
 • April 29, 1998 – The Corps received a letter from the SHPO, in which she concurred that “there are no historic properties in the area of potential effect.”
 Despite this, the Corps thought it was a good idea to have an archaeological monitor on site during the groundbreaking. A private archaeologist familiar with the area was subcontracted to monitor the initial construction during May 2005.



First evidence of the second house pit (Loam B), discovered by Corps archaeologist Margan Grover and bulldozer operator Mike Itano



Proposed Mitigation (as agreed upon in the draft MOA):

- 1) Write a site report (Data Recovery Report)
- 2) Provide for an accredited museum conservator to visit the City's Carrie M. McLain Memorial Museum and assist in the conservation and curation of the site artifacts on display
- 3) Assist with the accessioning of site artifacts and archaeofauna (bagging, cataloging, and if appropriate photographing)
- 4) Provide a museum-quality display case to the City's Carrie M. McLain Memorial Museum
- 5) Present information learned from the site in a series of public lectures in Nome
- 6) Prepare a manuscript on information learned from the site that can be utilized by Nome teachers (grades 5-12)
- 7) Present information learned from the site to a conference of peers
- 8) Submit an article about the site for publication in a peer-reviewed journal (if not accepted, publish elsewhere)

Discovery of the Site (Loam A):

• 1st week of May, 2005 – The subcontracted archaeologist identified the remnants of a semi-subterranean house pit while monitoring the construction.
 • The archaeologist took photographs and recovered approximately 25 artifacts, then decided that the house pit was indigible for inclusion on the National Register of Historic Places and allowed the bulldozers to push the remains into the ocean.
 • May 14, 2005 – The Corps received a letter from the subcontracted archaeologist mentioning the discovery and subsequent destruction of the semi-subterranean house pit.
 • May 26, 2005 – The Corps sent a letter to the SHPO stating that the house pit is “not eligible for the National Register of Historic Places” because it “has lost integrity of design, materials, workmanship, and association.”
 • September 27, 2005 – The Corps sent a letter to Nome Eskimo Community (tribe), apologizing for not consulting after the discovery of the site and stating that they will continue to work with the tribe to mitigate the damage done.
 • October 28, 2005 – The SHPO sent a letter to the Corps in which she concurred with the “finding that the house pit no longer retains sufficient integrity to be eligible” and agreed that “appropriate mitigation could include the development of interpretive signs that discuss the Native history of the Nome area.”

Nome Eskimo Community tribal Elder Al Sablin and Corps archaeologist Helen Lindemuth, excavating house pit B while construction of the pavement rock continues nearby.



Excavating the midden: Corps employees Helen Lindemuth, Anna Wilson, Ouy McCaselli, Mark Caswell, and Margan Grover, Nome Eskimo tribal Elder Al Sablin, Kawerak employees



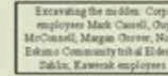
The Excavation:

- Occurred from July 26, 2006 to August 26, 2006.
- Involved over 25 community volunteers, including:
 - City of Nome employees
 - Nome Eskimo Community (tribe) employees, members, and tribal Elders
 - Mr. Karlin Itchoak, the tribe's Historic Preservation Representative, participated in the excavation every day
 - Kawerak, Inc. (regional non-profit Native corporation) employees
 - Interested Nome citizens
- Involved 6 Corps employees, including biologists and chemists as well as archaeologists and archaeology interns

Excavating house pit B while heavy machinery runs nearby: Nome Eskimo Community employee Karlin Itchoak and City of Nome employee Margan Ten Eyck



Discovery of the house's circles at the midden: Nome Eskimo Community employee Karlin Itchoak, Corps archaeologist Anna Wilson, and others



Excavating the midden: Corps employees Mark Caswell, Ouy McCaselli, Margan Grover, Nome Eskimo Community tribal Elder Al Sablin, Kawerak employees



Continued Discovery of the Site (Loam B and C):

• July 2006 – The Corps sent out its own archaeologists, Margan Grover, to monitor the continued project construction.
 • July 26, 2006 – Margan identified the remains of a second semi-subterranean house pit. She called the SHPO and left a telephone message about the discovery of the house pit, along with her contact information. She also contacted the City of Nome, Nome Eskimo Community (tribe), and Bering Straits Native Corporation. She called the SHPO again and spoke with a Review and Compliance Archaeologist at the SHPO's office, who agreed that she should excavate a test pit and do some shovel shimming to identify the boundaries of the feature.
 • July 27, 2006 – Margan called the SHPO again and left another telephone message about the site.
 • July 28, 2006 – Margan called the SHPO again and talked with a Review and Compliance Archaeologist at the SHPO's office. Margan told the SHPO archaeologist that she was assuming the site was eligible for the National Register, and that she was going to excavate at least 50% of the site.
 • August 3, 2006 – A meeting was held in Nome between the Corps, the Nome Eskimo Community, and the City of Nome, with the SHPO participating via teleconference, to discuss the discovery of the site and what to do about it.



Excavating house pit B: Nome Eskimo Community members Boogles Johnson, Karlin Itchoak, and Al Sablin, Corps archaeologists Helen Lindemuth and Mark Caswell, City of Nome employee Margan Ten Eyck



Corps archaeologist Margan Grover, Nome Eskimo Community tribal Elders Al and Margaret Sablin, and King Island Native Community tribal Elders at a public viewing of site artifacts

Corps archaeologist Margan Grover and King Island Native Community tribal Elders at a public viewing of site artifacts

Public Outreach in Nome:

- Public viewing at Old St. Joe's Cathedral (August 10, 2006).
 - Over 200 people attended
- Viewing of artifacts at Nome Eskimo Community's building, for tribal members (August 2006)
- Viewing of artifacts at Kawerak's building during the regional shareholders meeting (August 2006).
- Another public viewing event at Old St. Joe's Cathedral (September 16, 2006)
 - Over 150 people attended
- Margan Grover gave a public lecture at the National Park Service's building (November 2006)



Public viewing of the site artifacts at Old St. Joe's Cathedral



Where We Are Today:

- Multiple drafts of the MOA have been sent out to signatories and concouring parties (on the following dates):
 - November 22, 2006
 - September 22, 2008
 - April 13, 2009
 - August 10, 2009
 - December 14, 2009
- After a stalemated meeting among the signatories to the MOA on December 15, 2009, and numerous unproductive meetings afterwards, advice was informally requested from the Advisory Council on Historic Preservation. On March 19, 2010, the ACHP sent the Corps an edited draft of the MOA.
- A new draft of the MOA is currently under discussion.
- Artifact and faunal analyses are being undertaken by Corps archaeologist Kelly Eldridge, and the Data Recovery Report is being drafted.

a few classic font pairings:

Myriad Caslon

Myriad Black Minion

Franklin Gothic Demi Baskerville

Gill Sans Garamond

Franklin Gothic Medium Caslon

letter size

Q: how large should you make your type?

A: AS! LARGE! AS! POSSIBLE! THIS CANNOT BE OVEREMPHASIZED. MAKE IT AS BIG AS YOU CAN, THEN ADD ANOTHER 10% FOR GOOD MEASURE.

- *rule of thumb*: the smallest text on your poster should be clearly legible from 6 to 10 feet away
 - *at a minimum, type should be approximately:*
 - **72 points for titles**
 - **48 points for headings**
 - **24 points for body copy**

**REMEMBER – THESE ARE MINIMUM VALUES!
BIGGER IS ALMOST ALWAYS BETTER
(within reason, of course)**

Poster Overview- 36" by 48"

Sponsoring logo



Title: Should be seen from 4-5 feet away. Times New Roman or Arial, Bold, at 60-80 point text

Name: in 44 pts., bold
Department: 40 pts., bold
Institution: 40pts., bold

Title Line 1
Title Line 2
Name Line (First, MI, Last)
Department of ?
University of California, Davis, 95616



Institution Logo

INSERT ABSTRACT

Abstract: No more than 250 words

INSERT TEXT

INTRODUCTION

Heading: Legible font, bold, 44pts.
Section: Legible font, bold, 36 pts

**INSERT
FIGURE**

Figure 1: 32 pts, bold

INSERT TEXT

RESULTS

Heading: Legible font, bold, 44pts.
Section: Legible font, bold, 36 pts

INSERT TEXT

METHOD

Heading: Legible font, bold, 44pts.
Section: Legible font, bold, 36 pts

**INSERT
FIGURE**

Figure 2: 32 pts, bold

INSERT TEXT

DISCUSSION

Heading: Legible font, bold, 44pts.
Section: Legible font, bold, 36 pts

ACKNOWLEDGEMENTS
Legible font, 36 pts., bold

REFERENCES
Legible font, 36 pts., bold

First Thing First: The Title and Abstract

- The title of your abstract is very important
 - Reflect the content of the paper
 - Specific and Succinct
 - Use key words for indexing and for searches
- 250 Word Max
- Includes the following:
 - The research question or problem
 - The methods
 - The observations
 - Analysis, assessment and implications
 - Major findings, results and conclusions
 - REVIEW WITH MENTOR

Abstract Example:

ANALYZING THE PHYSICAL INTERACTION BETWEEN Pch2 AND Cdc23 IN SACCHAROMYCES CEREVISIAE.

SOLIS, Ryan D., Senior, Neurobiology, Physiology, and Behavior Major, Dr. Sean M. Burgess, Department of Molecular Cellular Biology, University of California, Davis.

In sexually reproducing organisms, meiosis serves as a specialized form of cellular division that creates four haploid gametes from a single diploid cell. In prophase I of meiosis, homologous chromosomes physically interact by pairing and exchanging genetic material through recombination. This is followed by the separation of chromosomes during the first meiotic division. Inappropriate pairing and failed segregation of chromosomes can lead to improper chromosome rearrangements and aneuploidy. Furthermore, these errors can lead to birth defects, cancer and other diseases. In budding yeast, Pch2 protein is involved in a meiotic recombination checkpoint that is responsible for the proper segregation of chromosomes by arresting cells that show abnormal crossover patterns. To further investigate Pch2 functions, a yeast two-hybrid assay was used that tests for physical binding between Pch2 and potential interactors. The sequences isolated from positive interactors were compared to the yeast genome to search for homology between known proteins. Sequence homology search provided several possible protein interactors and from these results we have focused on conducting further studies with Cdc23. Cdc23 is an essential protein and part of a protein complex called the Anaphase Promoting Complex. This complex is known to participate in ubiquitination of targeted proteins involved in the progression through mitosis and the G1 phase of the cell cycle. Along with Pch2, we suspect that the APC may have a role in chromosome-protein structure. Currently we hope to use a GFP tag to view Cdc23 localization in the cell and create a meiotic null of the protein to further conduct studies to better understand its interaction with Pch2 during meiosis.

Title Example:

Does Perinatal Exposure to DDTs and the Development of Glucose Intolerance Promote Skeletal Muscle Deficiency?



Ciara Main¹, Michele La Merrill Ph.D.₂
Department of Animal Science,¹ Department of Environmental Toxicology,₂ University of California, Davis



Introduction

- Or Background
- This is separate from your abstract!
- State the research question and significance of the study
- Include related current investigations
- If you are there, they won't read it so SAY IT!
- Get viewers interested
- Reason you chose to study
- Foundation for your work (Models)
- General topics to specific
- Equivalent to 1 double spaced 12 pt page
- Usually contain citations/references (cite!)
- May have Purpose and Hypothesis embedded
- Generally completes first column

INTRODUCTION

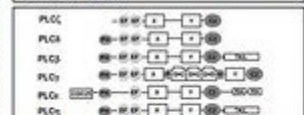
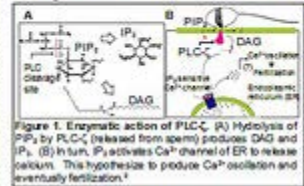
Various implant surface modifications, such as the application of hydroxyapatite (HA) coatings, have been reported to aid in accelerating osseointegration. These improvements in dental implant surfaces have allowed clinicians to replace missing dentitions more effectively and successfully in both fully and partially edentulous subjects. However, failures leading to implant removal still occasionally occur, and these failures occur either early following the installation of the implant or later when the implant supported reconstruction has been in function for various periods of time. In many instances, bacterial adhesion on implant surfaces has a strong influence on healing and long-term outcome of dental implants. In order to improve the life and success of implant therapy, there is a need to investigate the additive anti-bacterial effect in conjunction with the enhancement of rapid bone formation. Since the antimicrobial properties of the silver (Ag) have been exploited for a long time in the biomedical field, the **objective** of this study was to evaluate the initial anti-bacterial adhesion and osteoblast cell proliferation and differentiation on Ag doped HA coating surfaces.

Introduction

- *Francisella tularensis* is highly infectious bacterium that causes the disease tularemia. *F. tularensis* has been classified as a potential biological weapon. There is currently no vaccine approved for human use, and its mechanisms of pathogenesis are poorly understood, in part because of a lack of genetic tools to study this organism.
- *F. tularensis* is divided into several subspecies, including the highly virulent (for humans) subsp. *tularensis*, the moderately virulent subsp. *holarctica*, and the low virulence (for humans) subsp. *novicida*.
- A cluster of genes, the Francisella Pathogenicity Island (FPI), has been shown to be essential for *F. tularensis* virulence.
- The FPI is duplicated in subspecies *holarctica* and *tularensis*.
- The *IglC* gene, located in the FPI, is essential for intramacrophage growth and virulence in mice.
- A lack of efficient genetic tools have hampered the study of subsp. *holarctica* and *tularensis*. Moreover, the duplication of FPI genes has made the study of these genes in the more virulent subspecies cumbersome.
- We have developed a system for gene disruption in *F. tularensis* that utilizes a retargeted Group II intron.
- This "Targetron" system works at high efficiency in subsp. *tularensis*, *holarctica*, and *novicida*, and generates unmarked disruptions

INTRODUCTION

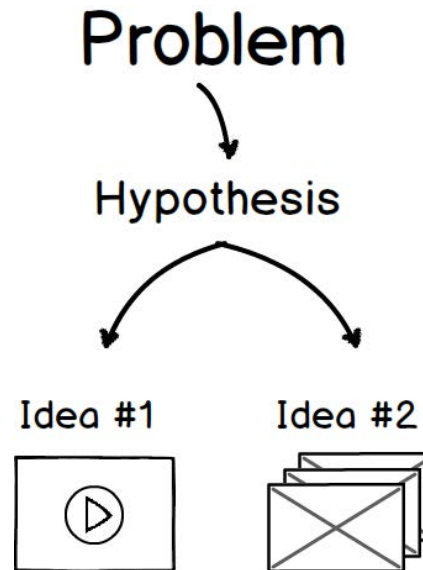
• Phospholipase Cαs (PLC-α), a member of phospholipase C family, was identified as the sperm factor responsible for activating oocytes, and thereby causing fertilization.



• Bioinformatic analysis through sequence alignment and homology modeling revealed that the calcium binding region of C2 domain as well as the catalytic Y-region of PLC-α were expected to be significantly different from empirically determined PLCβ.

Purpose and Hypothesis

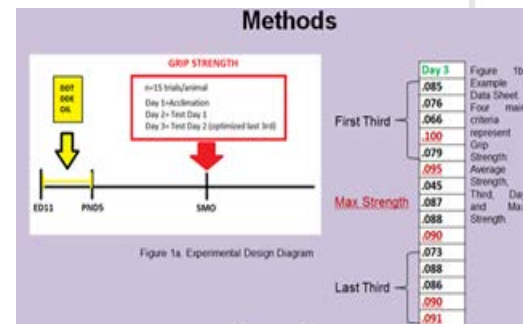
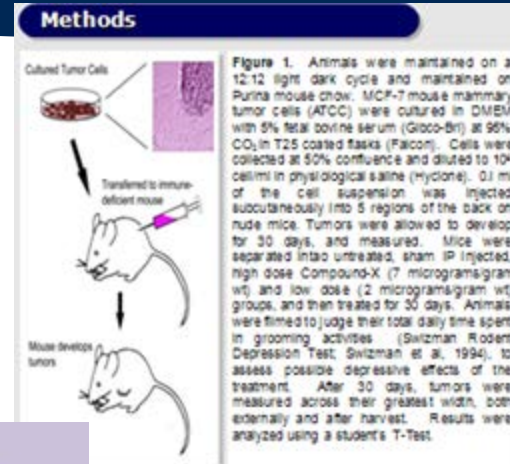
- Can be embedded in Introduction, but
- Sometimes a separate section, to emphasize
- Purpose or Objective, Aim, Goal, etc.,
- Why you did experiment?
- “The purpose of this project...”
- Good for Student Conference
- (Promotes solid judging)
- Hypothesis
- Same as for abstract



hypothesis

Methods

- Describe procedures and methods in detail to allow observer to understand how, when, where data was obtained.
- Describe challenges and lessons learned
- Text with subheadings
- Can include a flow chart to summarize
- May include citations
- Make sure to include:
 - subjects
 - experimental design
 - drugs and equipment used
 - statistical methods
 - why you chose the method



MATERIALS

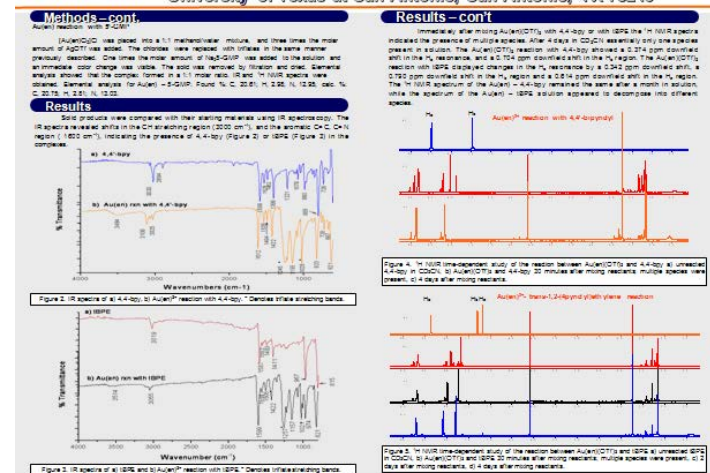
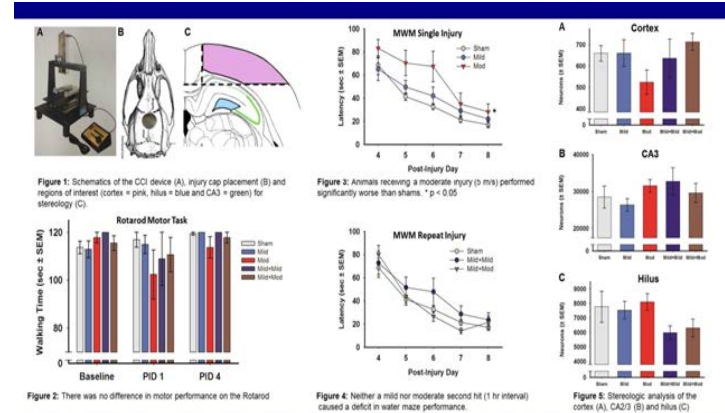
Coating process by Sol-gel methods: Commercially pure titanium (Ti) disks of (15 mm diameter and 2.0 mm thick) were used as substrates. All disks were wet ground with 240, 400 and 600 grit silicon carbide papers, followed by ultrasonic degreasing using acetone and ethanol for 10 minutes each. Deionized water was used for rinsing the disks between applications of each solvent. A passivation procedure was then conducted by exposing the Ti disks to a 40% volume nitric acid solution at room temperature for 30 minutes (ASTMF86-91).

Prior to coating on the passivated Ti surfaces, hydroxyapatite (HA) and 1 wt% silver (Ag)-doped HA (HA-AG) sol were produced. The HA sol was prepared by reacting calcium nitrate tetrahydrate [Ca(NO₃)₂·4H₂O] with methyl alcohol to produce calcium precursors. Phosphorus precursors were also prepared by reacting triethyl phosphite [(OC₂H₅)₃P] in 0.03 ml acetic acid (CH₃COOH). The two precursors were then mixed and 0.1 mol of DCCA (Drying Control Chemical Additive) was added to the mixture. All reactions were carried out in argon atmosphere. Similar to the HA sol, AgHA1.0 sol was produced by mixing the calcium and phosphorus precursors with 1.0 wt % silver nitrate (AgNO₃) and 0.1 mol DCCA. AgNO₃ was chosen for Ag doping because of the easy decomposition of nitrates during heating.

The prepared HA and HA-AG sol were then coated on passivated Ti surfaces by spin coating at 5,000 rpm for 50 seconds. The coated-Ti surfaces were immediately dried at 70°C for 12 hours, followed by a heat treatment at 650°C for 3 hours. The HA-coated surfaces were used as controls in this study. All samples were autoclaved prior to materials characterization and all culture experiment.

Results

- Largest section
- Vary with field
- Often two middle columns
- Summarizes the data and reports results of statistical tests and analyses (- or +)
- Draw implications and considerations
- Don't present raw data
- Make Image-based; use few words
- Maximize use of Figures
 - Make them simple
 - Must be easily seen
 - Make all lines wide enough
 - All text large enough!
 - Consistent axes across poster
- Minimize use of tables
 - Difficult to grasp quickly
- Use figure legends/captions as text
- Put text near figure it's describing
- ~1 paragraph per image/image group



Conclusions/Discussion

- Or discussion or summary
- Very few words
- Bullets good
- Bigger font if needed
- *Summarize “take home” results
 - Interpret the meaning or implications of your results
 - Mention any alternative explanation for results or unanticipated results
- *How did hypothesis work out?
- *Tie back to real world problem
- *Why Important/Implications
- Aim for:
 - Reasonable conclusions were given and strongly supported with evidence
 - Conclusions were compared to hypothesis and their relevance in a wider context was discussed

Conclusions

- We have adapted a group II Intron-based system for efficient targeted mutagenesis of *F. tularensis*
- This system is effective and efficient across *F. tularensis* subspecies: *tularensis*, *holarctica*, and *novicida*
- This system was used to successfully disrupt *blaB* found in single copy in the *F. tularensis* genome.
- This system was used to successfully disrupt both copies of the duplicated *igIC* gene in a single manipulation.
- Targetrons should be a valuable genetic tool for the dissection of *F. tularensis* pathogenesis.

This study was supported by NIH P01AI07996 to MKK, and NIH GM060426 to SAR.

SUMMARY AND CONCLUSIONS

In this study, x-ray diffraction analyses of Ag-doped HA thin film by xRD method indicated peaks corresponding to HA. Contact angles for HA-Ag surfaces were observed to be significantly lower when compared to HA surfaces. *In vitro* bacterial adhesion study indicated a significantly reduced number of *S. glaucopalis* and *S. aureus* on HA-Ag surface when compared to HA surface, whereas significantly reduced adhesion of viable *S. aureus* was observed on HA-Ag surface when compared to Ti and HA surfaces. Additionally, no significant difference of osteoblast activity was observed on three different surfaces tested. Overall, it was concluded that the 1% Ag-doping on HA surfaces were non-toxic to osteoblast cells. Additionally, it was also concluded that the 1% Ag doping was effective in reducing bacterial adhesion.

References/ Literature Cited

- Include sources/resources that supported your work
- If someone's work is cited (usually in introduction), you must include a reference
- Generally "short" (title optional)
- Can use smaller font if needed

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Images borrowed from:

1. Merced County. (2007). Merced County Supervisoral Districts. Retrieved September 20, 2008, from <http://www.co.merced.ca.us/bos/district3.html>.
2. Wikimedia Commons. (2006). Map of California highlighting Merced County. Retrieved September 20, 2008, from http://commons.wikimedia.org/wiki/Image:Map_of_California_highlighting_Merced_County.svg.

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- Acknowledge the faculty and staff who supported you.
- Thank people
 - Mentor
 - Research group
 - Technical assistance, etc.
- Reveal possible conflicts of interest
- Identify funding utilized
 - CAMP, LSAMP-NSF, NIH, etc.
- Font can be smaller than rest of text

Thank You!



Acknowledgements

We would like to thank Mr. Angus Rhododendrum and Suzanne McPerkins for their technical assistance.

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Acknowledgements

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Acknowledgements

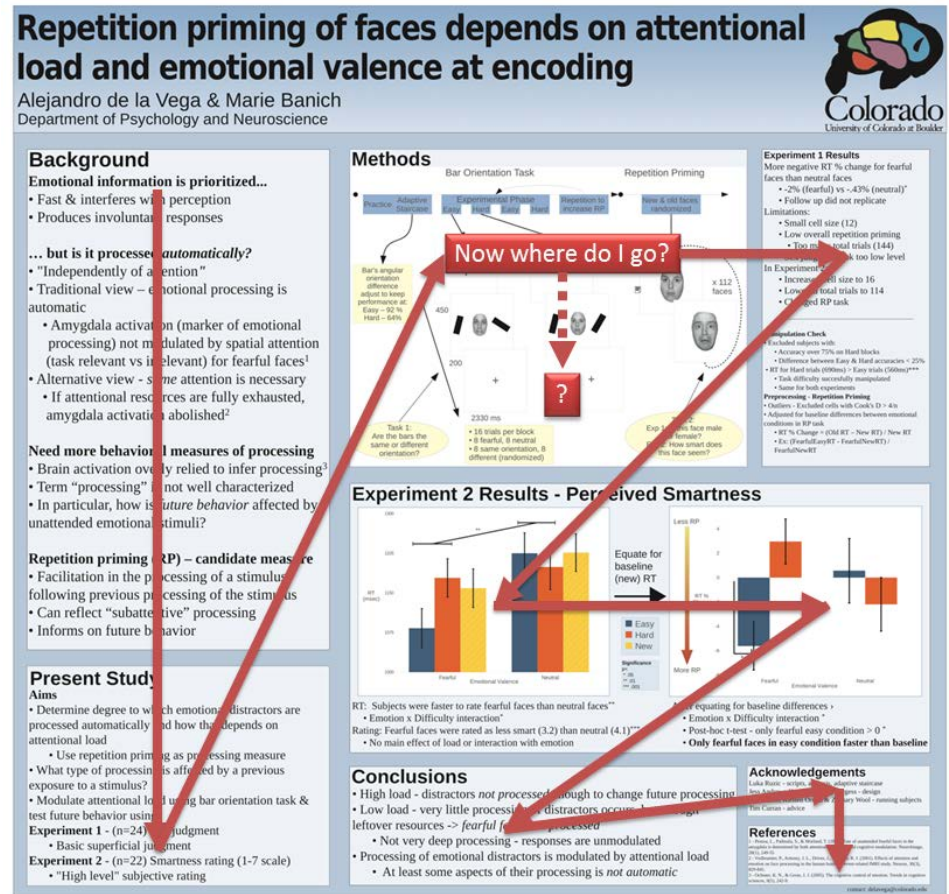
✧ We would like to thank:

- ✧ Our mentors Dr. Stergios Roussos and Dr. Maria G. Pallavicini for their support during the long and strenuous journey of establishing ITCH.
- ✧ All participating ITCH members whose hard work has made this organization a possibility.
- ✧ All community leaders, community professionals, and UCM faculty whose devoted time and patience has been greatly appreciated and has helped with the establishment of ITCH.

Remember to check that:

- All expected components are present, clearly laid out, and easy to follow in the absence of presenter
- The text is concise, legible, and consistently free of spelling or typographical errors; the background is unobtrusive
- The figures and tables are appropriate and consistently labeled correctly
- Photographs/tables/graphs improve understanding and enhance the visual appeal
- For ideas can go to Pimp My Poster:

<http://www.flickr.com/groups/688685@N24/>





High Resolution Reconstructions of Sea Surface Temperatures from Pacific Geoduck Growth Increment Chronologies

Matthew J. Stuckey¹ & Bryan A. Black²

¹University of California, Berkeley, Berkeley CA 94720, USA.

²Oregon State University, Hatfield Marine Science Center, Newport OR 97365, USA.

National Science Foundation Research Experience for Undergraduates

Hatfield Marine Science Center, Oregon State University

March 2008 Ocean Sciences Meeting, ASLO

Introduction

- The Pacific geoduck clam (*Panopea abrupta*) - ranges from Kodiak to California

- Found in the sandy mud of lower intertidal and subtidal zones



- Burrows into sediment - 3 feet
- Filter feeds through siphon (left)



- Form annual growth increments

- Width relates to sea surface temperatures (SST)

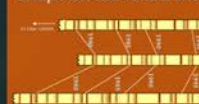
- Long-lived: Up to 150+ years; excellent chronometers of past environmental variability



Methods

- We apply crossdating: a technique used in tree-ring data to ensure that all growth increments have correctly been identified, ensuring annual resolution of the final chronology

Example: tree cores taken in 2000



- Crossdating is based on the tendency of climate to synchronize growth patterns of all samples from a site (poor climate year = narrow ring; favorable year = wide ring)

- Growth 'bar codes' are crossmatched among all samples. If one sample is out of alignment with the others, then an increment was likely overlooked



1. Thin sections of geoduck hinge plates (above) are measured using digital imaging software

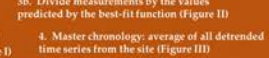
2. Measurements contain age-related growth declines

3. Remove declines via detrending
3a. Fit a negative exponential function to each set of geoduck measurements (Figure I)



- 3b. Divide measurements by the values predicted by the best-fit function (Figure II)

4. Master chronology: average of all detrended time series from the site (Figure III)



Abstract

We demonstrate the potential for reconstructing sea surface temperatures along coastal British Columbia, Canada, using four chronologies developed from the growth increment widths of Pacific geoduck clams (*Panopea abrupta*). The four geoduck chronologies range from the southernmost to northernmost borders of British Columbia and were developed using standard tree-ring (dendrochronology) techniques, including crossdating. Although each geoduck chronology significantly correlated with local records of sea surface temperatures (SST), correlations were unstable over time. In every chronology, the relationship with SST would occasionally dissolve for a period lasting approximately ten years. The timing of these climate-growth breakdowns was inconsistent and varied among the chronologies. For any one chronology, inconsistent climate-growth relationships represented a significant complication for developing accurate SST reconstructions. However, when geoduck chronologies were combined via simple averaging, irregularities in climate-growth relationships canceled out one another to yield strong and highly stable SST reconstructions. Final SST reconstructions captured more than 60% of the variance in the instrumental record and extended more than 120 years, capturing the historical range of variability and providing context for current climatic trends.

Discussion

- Sea surface temperatures are recorded at nine lighthouses off the coast of British Columbia



Figure V: Sea surface temperatures recorded at nine lighthouses off the coast of British Columbia



- Geoduck chronologies strongly correlate with SST records
- Potential tool for SST reconstructions

- However, correlations with SST are inconsistent over time (Figure V)

- Solution: average multiple chronologies
 - Cancels out irregularities and forms more stable climate-growth relationships
 - Example: Average of Tree Nob and Puget Sound is much more stable (Figure V)

Results



Master chronology from Brady's Beach (Figure III) spans from 2001 back to 1934

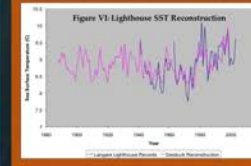
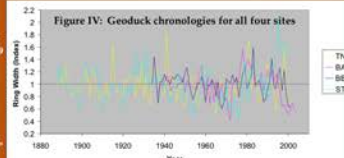
- Chronologies developed from four sites off the coast of British Columbia (below)



- Tree Nob (TN): 1888 - 2002
- Bartlett (BA): 1937 - 2003
- Brady's Beach (BB): 1934 - 2001
- Puget Sound (STR): 1888 - 1999

- All chronologies are fully crossdated and annually resolved (Figure IV)

- Puget Sound (STR) chronology developed by Brian A. Black, 2002. Adapted from unpublished work.



- SST reconstructions provide context for interpreting current climatic trends

- Geoduck chronologies can be further combined with those from trees, mussels, and fish (right)

- Potential applications:
 - Compare diverse ecosystems
 - Multi-proxy reconstructions

- Due to geoduck longevity, sea surface temperature reconstructions substantially predate instrumental records (Figure V)

- Example: Average of Tree Nob and Strom chronologies explains 50% of the variance in the SST record at Langara Lighthouse (left), using linear regression



Acknowledgements

- Many thanks to...
 - JIMSC & OSU for hosting the REU program
 - NSF for funding this project under award OCE-0648315
 - Pacific Biological Research Station of the Department of Fisheries and Oceans Canada for providing our geoducks
 - Ichang Cheung, Dr. George Boehlert, and many others at Hatfield for shaping the REU experience
 - Rose Kormanov for developing the Tree Nob and Bartlett chronologies
 - Arne Strom for developing the Puget Sound chronology
 - Dr. Bryan Black for his ongoing mentorship and tremendous help with this project

For more information, please contact Matt at mstuckey@berkeley.edu or Bryan at bryan.black@oregonstate.edu

Examples of Excellent Posters

Does Perinatal Exposure to DDTs and the Development of Glucose Intolerance Promote Skeletal Muscle Deficiency?



Ciara Main¹, Michele La Merrill Ph.D.₂

Department of Animal Science¹, Department of Environmental Toxicology², University of California, Davis



Abstract

The once ubiquitously used pesticide DDT and its metabolite, DDE (together, DDTs) have been an environmental health concern for many decades. Recent epidemiological and mechanistic data link DDT exposures with devastating diseases such as obesity, hypertension, and of components of Type 2 Diabetes. Our work surrounds perinatal exposure of DDTs and adult phenotyping. C57BL/6J mice were exposed to DDTs from embryonic day 11 to postnatal day 5, raised on normal chow, and switched to high fat diet (HFD) at 4 months to initiate obesity. Three months after exposure, dams exposed to DDE during pregnancy were glucose intolerant, while their female offspring displayed elevated fasting insulin. Disruptions in peripheral glucose utilization prompted us to explore whether tissues that rely heavily on glucose uptake were displaying a phenotypic defect. One month after being put on HFD (5 months after exposure), we measured muscle strength. To assess muscle deficiency, we tested forelimb grip strength (GS) using Chatillon Machinery Grip Strength Machine (Largo, FL). GS was tested over three days with 15 trials/day. On days two and three, overall grip strength, max strength, and first and last third of each trial were analyzed. Dams showed a difference in strength between days two and three, however F1 offspring had no significant change between treatment groups. Although, we did not find conclusive evidence that DDTs impair skeletal muscle function, further research is needed to examine potential indirect effects that DDTs may have on skeletal muscle.

Introduction

- DDTs are apart of a group of toxicants named Persistent Organic Pollutants (POPs) that accumulate in animal tissues.
- DDTs are a risk factor for glucose intolerance.
- One symptom to glucose intolerance is impaired glucose uptake in tissues.
- There is no prior evidence suggesting DDTs directly effecting Grip Strength in skeletal muscle.

Hypothesis

Perinatal exposure to DDTs causes impaired glucose uptake in skeletal muscle resulting in a decrease in GS.

Methods

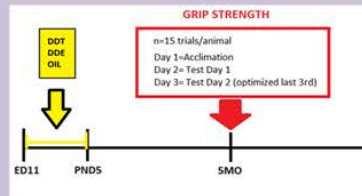


Figure 1a. Experimental Design Diagram

	Day 3
Example	.085
Data Sheet	.076
Four main criteria represent	.066
Grip Strength:	.100
Average Strength:	.079
Third, Day and Max Strength:	.095
	.045
	.087
	.088
	.090
	.073
	.088
	.086
	.090
	.091

Figure 1b. Example Data Sheet. Four main criteria represent Grip Strength: Average Strength, Third, Day and Max Strength.

Results

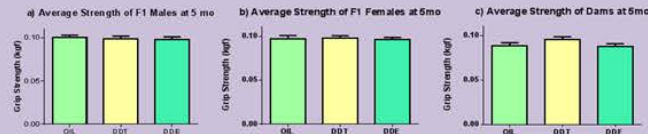


Figure 2. Average Grip Strength effects of F1 male (a), F1 female (b) and F0 dams (c) when separated by treatment.

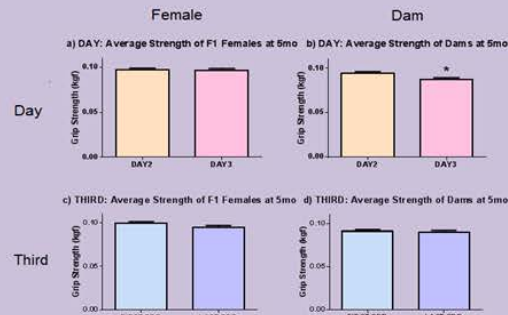


Figure 3. Data from F1 female (left column) and F0 dam (right column) average GS at 5mo in respect to Day (top row) and Third (bottom row) criteria.

Results continued

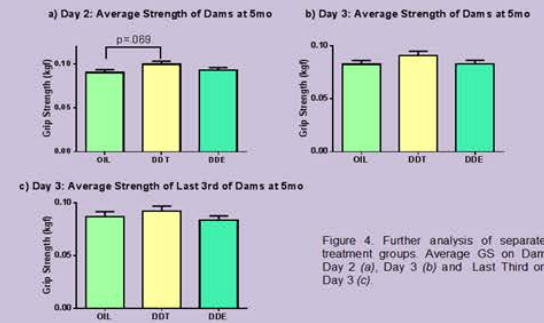


Figure 4. Further analysis of separate treatment groups: Average GS on Dam Day 2 (a), Day 3 (b) and Last Third on Day 3 (c).

Max Strength

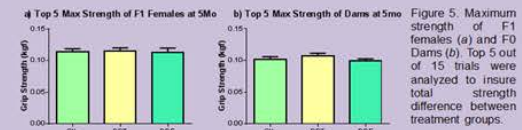


Figure 5. Maximum strength of F1 females (a) and F0 Dams (b). Top 5 out of 15 trials were analyzed to insure total strength difference between treatment groups.

Conclusion

- At 5 mos, DDTs did not effect GS regardless of sex, exposure type, or GS criteria (Avg. GS, Day, Third, & Max Strength).
- Dam GS on Day 3 (Fig 3b.) decreased compared to Day 2.
- Given smaller SE and CV (data not shown) we conclude that GS measured on Day 2 is more robust than Day 3 due to possible decrease in endurance of Dam Day 3.
- Optimizing the Last Third on Day 2 is the best strategy to collect Grip Strength.

Acknowledgements

Extreme gratitude to Michele La Merrill Ph.D for giving me this opportunity to work in her lab. She has encouraged me to build novel skills as well as add upon existing. McNair Scholars Program and California Alliance for Minority Participation (CAMP) Program for providing me the resources for my future career in research.

Examples of Excellent Posters

Expression, purification, and crystallization of recombinant mouse phospholipase c-zeta (PLC- ζ)



Pang, Allan

BSc Genetics | School of Biosciences, Cardiff University, Cardiff, Wales CF10 3US



ABSTRACT

The aim of this study is to express and purify recombinant PLC- ζ protein fit for structure identification through X-ray crystallography. To date, there is no available empirical data of the 3D structure of PLC- ζ . The identification of the structure is crucial as it presents information that will facilitate understanding of the protein mechanism and regulation, both of which remained unknown. Bioinformatic analysis was also utilized to draw initial structural information, specifically on the domain differences of PLC- ζ and empirically determined structure PLC- $\beta 1$.

INTRODUCTION

Phospholipase C-zeta (PLC- ζ), a member of phospholipase C family, was identified as the sperm factor responsible for activating oocytes, and thereby causing fertilization¹.

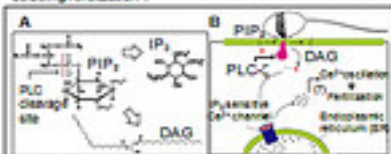


Figure 1. Enzymatic action of PLC- ζ . (A) Hydrolysis of PIP₂ by PLC- ζ (released from sperm) produces DAG and IP₃. (B) In turn, IP₃ activates Ca²⁺ channel of ER to release calcium. This hypothesize to produce Ca²⁺ oscillation and eventually fertilization.¹

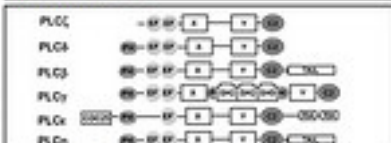


Figure 2. PLC Domain Organization. PLC- ζ consists of EF-hand domain, catalytic (X and Y) domain and C2 domain. These domains are also found in other PLC isoforms. PLC- β showed closest resemblance to PLC- ζ .^{1,2}

Bioinformatic analysis through sequence alignment and homology modelling revealed that the calcium binding region of C2 domain as well as the catalytic Y-region of PLC- ζ were expected to be significantly different from empirically determined PLC- $\beta 1$.

EXPERIMENTAL RESULTS

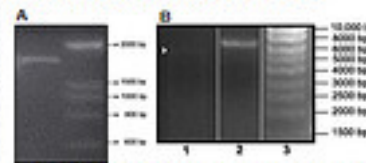


Figure 3. Molecular cloning of PLC ζ 124 construct. (A) Two step PCR amplification successfully produce a PLC- ζ construct with 6-HIS and 3C protease cleavage site (1813 bp in size). (B) Construct was ligated into pET102/D-TOPO vector. This is validated by restriction digest using *Sal*I. Vector alone (1) showed a lower band compared to vector with the construct (2).

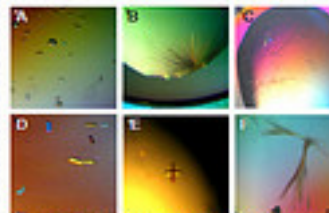


Figure 5. Crystallization of PLC ζ 124 Construct. Six different screening conditions were found to be suitable for crystallizing the protein. Crystals were confirmed to be protein due to birefringence characteristic under polarized light. Protein crystals A-E were needed to be optimized to obtain larger crystal. Protein crystal F was tested for X-ray diffraction. Preliminary analysis, however, revealed that X-ray diffraction pattern was hindered by presence of high salt concentration.

EXPERIMENTAL PROCEDURE

PLC ζ 124 construct was generated using two-step PCR to incorporate 6-HIS and 3C protease recognition site. Construct was ligated into pET102-D/TOPO vector and transformed into *E. coli* BL21(DE3). Protein expression was induced using IPTG. Bacterial lysis was carried out using French Press. Protein construct was captured using Ni²⁺ beads and cleavage of the protein from the tags were completed by 3C protease. Further purification was carried out using FPLC (ion-exchange and gel filtration chromatography). Crystallization of protein was carried out using sitting drop vapor-diffusion method.

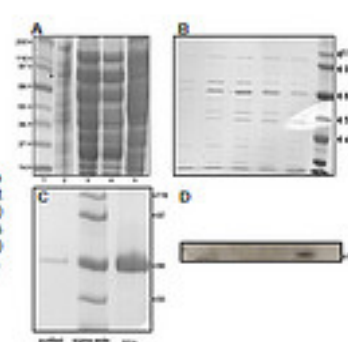


Figure 4. Protein expression and purification. (A) Molecular weight marker (lane 1). Protein bands after IPTG induction (lane 2). Protein construct migrated at 83 kDa. Nickel beads were used to capture protein (lane 3) and the beads were washed with high salt concentration (lane 4) to remove contaminants (lane 5). (B) Fractions collected after cleaved protein (by 3C protease) passed through FPLC-ion exchange method. Bands migrating at around 66 kDa (which corresponds to PLC ζ 124 protein) are found. (C) Further purification through FPLC-gel filtration method to obtain purified sample. (D) To verify that indeed the protein band is PLC- ζ , Western blot was employed using antibody specific to X/Y linker.

CONCLUSION

- It was predicted from the bioinformatic analysis that PLC- ζ will fold in the same general topology as PLC- $\beta 1$ (without PH domain).
- Specific differences were predicted to be in the Y-region of catalytic domain and C2 domain.
- This hypothesis, however, was not tested as X-ray diffraction data collection failed. This was due to presence of high salt concentration. Future study may need to alter buffer systems to obtain this structural data.
- The recombinant mouse PLC- ζ was successfully expressed, purified and crystallized. However, the expression level is low.
- It was assumed that the protein was catalytically active in bacterial cell and overproduction caused toxicity and metabolic stress.
- To obtain higher protein expression, different vector system and bacterial strain may be used.¹
- The ultimate aim is to reveal the 3D structure of human PLC- ζ . However, the expression of the human PLC- ζ was much lower. It is possible though to construct a more accurate model if an empirical 3D structure of mouse PLC- ζ was determined and used as a template.

ACKNOWLEDGEMENTS

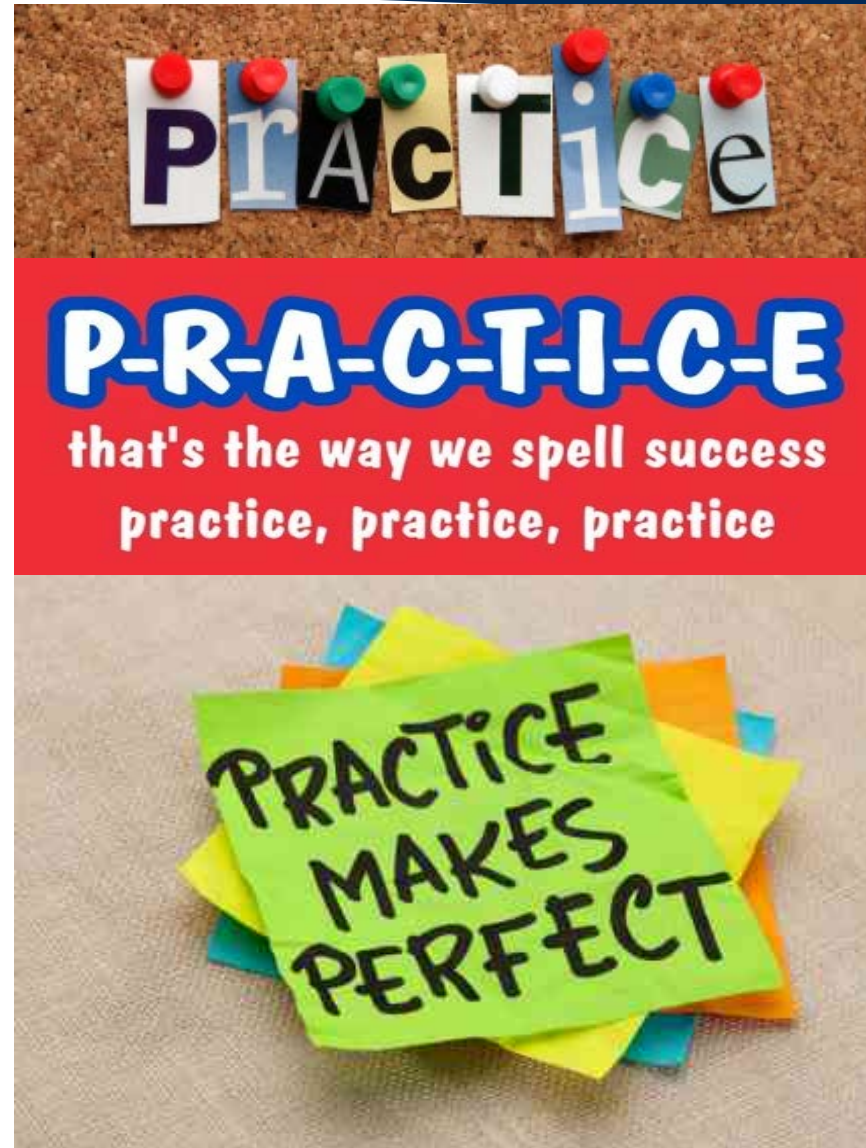
I would like to thank Dr A. Rosbash for the antibody used in Western blotting, Dr LG D'Arcy for the PLC ζ 124 construct, 3C protease and his supervision, Mr Peter Wilson for technical support.

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Practice Makes Perfect

- Finish early enough to practice
- MAKE SURE TO PRACTICE!
- Develop 5 minute presentation
- Know first sentence
- What to say for each figure (3 pts...)
- Transitions between figures
- What to point at for each figure
- Practice with lab mates and laypersons
- Run through ENTIRE poster
- Be friendly
- Don't sound like you've memorized
- Be excited about your work
- Remember to refer to your poster!
- They may interrupt with questions
- Pause long enough for them look at figure
- Know what questions may be asked....
 - Can practice them



First Contact

- Stand to left of poster (where start reading)
- Take initiative
- Smile, but stay near poster
- If they come closer
- Say, “Hello” and shake hands
- Give name. Get their name.
- Give level, and university (UC Davis)
- Ask if they’d like “you to walk them through your poster”
 - YES? Then GO!
- This is work that I performed this summer in the ___ program in the laboratory of Dr. _____ at UC Davis.
- (Optional) Ask if they are familiar with this field of research
 - No- More introduction, careful with acronyms
 - Yes- Can go more quickly through intro



The Flow of Things

- Start with Intro that will catch them
 - No pointing if you have no figure!
- Move to Methods
 - Briefly summarize
- Move to Results
 - Longest section
 - Indicate at beginning if did not work
 - Walk thru all figures
- Transition to Conclusions
- Say Conclusions
- Acknowledgements (optional)
- Any Questions?

Repetition priming of faces depends on attentional load and emotional valence at encoding

Alejandro de la Vega & Marie Banich
Department of Psychology and Neuroscience



Background

Emotional information is prioritized...

- Fast & interferes with perception
- Produces involuntary responses

... but it processes automatically?

- "Independently of attention"
- Traditional view – emotional processing is automatic
 - Amygdala activation (marker of emotional processing) not modulated by spatial attention (task relevant vs irrelevant) for fearful faces¹
- Alternative view – spatial attention is necessary
 - If attentional resources are fully exhausted, amygdala activation is abolished²

Need more behavioral measures of processing

- Brain activation overly relied to infer processing³
- Term "processing" is not well characterized
- In particular, how is future behavior affected by unattended emotional stimuli?

Repetition priming (RP) – candidate measure

- Facilitation in the processing of a stimulus following previous processing of the stimulus
- Can reflect "subattentive" processing
- Informs on future behavior

Present Study

Aims

- Determine degree to which emotional distractors are processed automatically and how this depends on attentional load
- Use repetition priming as processing measure
- What type of processing is affected by a previous exposure to a stimulus?
- Modulate attentional load using bar orientation task & test future behavior using judgment

Experiment 1 - (n=24) Judgment

- Basic superficial judgment
- Experiment 2** - (n=22) Smartness rating (1-7 scale)
- "High level" subjective rating

Methods



Experiment 2 Results - Perceived Smartness



Conclusions

- High load - distractors not processed enough to change future processing
- Low load - very little processing of distractors occurs -> fewer leftover resources -> fearful faces processed
- Not very deep processing - responses are unmodulated
- Processing of emotional distractors is modulated by attentional load
- At least some aspects of their processing is not automatic

Acknowledgements

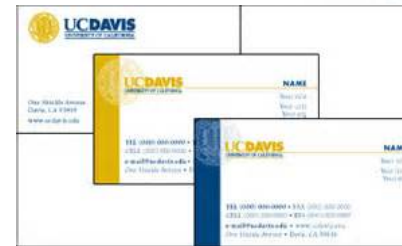
Laura Rosen - artwork, Allison Caplan - data management, David Glick - data management, David Glick - data management, David Glick - data management

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1. Cook, R.G., & Gauthier, I. (2009). The amygdala and the perception of faces. *Neuroscience & Biobehavioral Reviews*, 33(2), 230-249.

The Just in Case Items:

- Carry your poster with you at all times (do not leave as checked baggage)
- Dress for situation
 - Follow culture of conference
 - Student conference – suit...or minimally khaki's
 - Comfortable shoes
- Be there on time!
- Don't leave unless it is very important to do so (if so, leave a friend there momentarily)
- Mini-poster printed out
- Pins
- Water
- Business cards (check your email!)
- Notebook
 - Networking – write down ideas and names!



Remember

- If you network please remember to email them!
- Keep promises that you've made
- Hang poster outside your lab
- Sample posters can be seen online
 - google search
- A “template” can be found at:
 - <http://urc.ucdavis.edu/conference/index.html>



References and Sites to Visit

- How to Write an Abstract: <http://vimeo.com/3968357>
- How to Present: <http://www.vimeo.com/3968357>
- Click [here](#) for PosterTalk helpful presentation, which was used to create parts of this presentation. Thank you Dr. Gail P. Taylor!
 - Or visit:
http://r.search.yahoo.com/_ylt=A86.J7.Ct6FU_AIAj4wPxQt.;_ylu=X3oDMTByNzhwY2hkBHNIYwNzcgRwb3MDMgRjb2xvA2dxMQR2dGlkAw--/RV=2/RE=1419913218/RO=10/RU=http%3a%2f%2fwww.utsa.edu%2fmbrs%2fresources%2fcourses%2frescar%2fPosterTalk.pptx/RK=0/RS=8753.li dne73Y6qpS9cTFIPF8_0-
- Colin Purrington: Advice for designing scientific posters.
<http://www.swarthmore.edu/NatSci/cpurrin1/posteradvice.htm>
- Knowledge Management in Health Services; HSERV 590A: Creating a Poster Using MS PowerPoint – University of Washington
<http://courses.washington.edu/~hs590a/weblinks/poster.html>
- Creating Effective Poster Presentations – Hess and Liegel.
<http://www4.ncsu.edu/~grhess/posters/>
- University of Buffalo- Designing effective poster presentations
<http://ublib.buffalo.edu/libraries/units/sel/bio/posters.html>
- University of Kansas- Jeff Radel
http://www.kumc.edu/SAH/OTEd/jradel/Poster_Presentations/PstrStart.html

GOOD LUCK ON YOUR POSTERS!!

