

School of Math and Sciences
4th Annual Spring Research Day – April 12, 2013

1:00 – 1:10 Welcome Address and Acknowledgements Dr. Herb Grover, Dr. Andrew Kasner

1:10 – 1:25 Presentation 1 *Brittnay Walton*
Nest site characteristics of Mourning Dove and Eurasian Collared-Dove nests in an urban environment

1:30 – 1:45 Presentation 2 *Taylor Eaves*
Purification and characterization of 4T1 breast cancer cell cytotoxins from *Rosmarinus officinalis* (Rosemary)

1:50 – 2:05 Presentation 3 *Libby Saultz*
Cytotoxic and apoptotic effects of *Zingiber officinale* (Ginger Root) and *Sanguinaria canadensis* (Blood Root) in 4T1 murine breast cancer cell lines

2:10 – 2:25 Presentation 4 *Trevor Burrow*
Purification and partial characterization of 4T1 cell cytotoxins from Ginger

2:30 – 3:30	Poster Session I (MSB First Floor Hallway) – See Poster List on next page
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3:30 – 3:45 Presentation 5 *B. Gonzalez, M. Huerta, J. Januta, R. Sauer, A. Westerman*
Engineering and producing mutants of glutaredoxin to understand protein structure

3:50 – 4:05 Presentation 6 *J.M. Avila, J. Killerlain, E. McElwain, M. Post, S. Robinson*
Purification of mutant glutaredoxin proteins to understand its structure and function

4:10 – 4:25 Presentation 7 *Garrett Williamson*
Geological mapping of the late Cretaceous to early Eocene strata within the Indian Creek Area, Buffalo Gap National Grasslands, South Dakota

4:30 – 4:45 Presentation 8 *Hunter Green*
A taxonomic and taphonomic description of an ungulate fossil from the Chadron Formation of the Buffalo Gap National Grasslands, South Dakota

4:50 – 5:05 Presentation 9 *Taryn Shadden*
Depositional interpretation using integrated sedimentological and paleontological data from a fossil-bearing unit within the Blackwater Draw Formation, Plainview, Texas

5:05 – 5:35	Poster Session II (MSB First Floor Hallway) – See Poster List on next page
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5:45 – 7:00 Dinner and Awards Ceremony (Multipurpose Room)

Research Day 2013 Posters

- 1) Joshua Houghtaling, Craig Cook, and Herbert D. Grover
Carbon footprint analysis for the vehicle fleet on Wayland Baptist University's main campus in Plainview, Texas
- 2) Zoe Benson, Paige Mattingly, Olivia Patterson, Melissa Perez, Kylie Smith, Brittney Walton, and Herbert D. Grover
Effects of intra-specific competition on seedling growth of several crop species
- 3) Hailey Budnick, Jessica Kenneson, and Robert Moore
A novel application of EMSA and DSLR technology for detecting RecA binding to *Mycobacterium tuberculosis* DNA sequences
- 4) Melissa Perez, Regina Vendramini, Laurival De Luca Jr., and Daniela Pereira-Derderian
Social interaction precludes spontaneous salt intake sensitization and prematurely increases sodium appetite enhancement
- 5) Ashley Rivera, Laurival De Luca Jr., Daniela Pereira-Derderian
Repeated episodes of water deprivation sensitize animals to crave salt
- 6) Jacob Kemmer, Trevor Burrow, Victoria Chavez, Kady Pryde, Jarrett Ross, Edward Taragon, and Andrew C. Kasner
Aquatic invertebrate community composition and similarity among playas with different land use
- 7) Diana G. Muturia and Sayra Cardiel
Mechanical snow chains
- 8) Hailey Budnick, Trevor Burrow, Taylor Eaves, Anna Kite, Jarrett Ross, Nati Sandoval, Libby Saultz, Adam J. Reinhart, and Robert Moore
Determination of kinetic parameters of mushroom tyrosinase
- 9) Taylor Eaves, Jessica Killerlain, Evan McElwain
Rain, Rain Go Away, I Don't Want a Disease Today
- 10) John Mark Avila, Emarie Holland, and Edward Taragon
A comparison of global mean temperature and CO₂ emissions

Acknowledgments

2013 Research Day was organized by the officers and members of the Wayland Baptist University Student Chapter of the Texas Academy of Science.

Committee Members

Natividad Sandoval, TX Academy of Science - WBU Chapter President

Trevor Burrow, TX Academy of Science – WBU Chapter Vice President

Erin Miller, TX Academy of Science – WBU Chapter Treasurer

Jacob Kemmer, TX Academy of Science – WBU Chapter Secretary

WBU-TAS Faculty Advisor: Dr. Andrew C. Kasner

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Abstracts for Research Day Presentations

1) Nest site characteristics of Mourning Dove and Eurasian Collared-Dove nests in an urban environment . *Brittnay Walton and Dr. Andrew C. Kasner, Wayland Baptist University.*

During Nov. 2012-Feb. 2013, searches were conducted for previously used Mourning Dove (*Zenaida macroura*) and Eurasian Collared-Dove (*Streptopelia decaocto*) nests along 10 ha of riparian corridor at Running Water Draw (RWD) and 15 ha of landscaped campus at Wayland Baptist University (WBU) in Plainview, Hale County, Texas, where both species occur during the breeding season and throughout the year. At RWD there was a total of 44 nests in 42 trees (Elm=41 nests, Hackberry=3, Honey Locust=0). At WBU there was a total of 38 nests in 27 trees (Elm=19 nests, Honey Locust=5, Cottonwood=2, Button Ball=1, Ornamental Pear=5, Live Oak=4, Red Oak=2). At RWD, Hackberry was used more than expected and Honey Locust was used less than expected based on relative abundance ($\chi^2=29.02$, $P<0.001$), with the single Hackberry used containing 3 nests. At WBU, Elm, Pear, and Oak were used more than expected and Honey Locust and Cottonwood were used in proportion to availability ($\chi^2=35.97$, $P<0.001$), with most containing only one nest. There was no difference in diameter-at-breast-height (DBH) between nest trees and non-nest trees in the mixed-species area of RWD (RWD-1) or WBU (RWD-1: Non-nest DBH = 4.79 ± 0.69 cm, Nest DBH = 6.24 ± 0.79 cm, $T=1.38$, $P=0.173$; WBU: Non-nest DBH 42.1 ± 4.8 cm, Nest DBH = 45.7 ± 3.1 cm; $T=0.63$, $P=0.531$). However, in a separate area of RWD where all trees were Elms (RWD-2), DBH of nest trees was larger than non-nest trees ($T=3.38$, $P=0.002$). Favorability for certain trees may lead to competition between the two dove species as they establish nests.

2) Purification and characterization of 4T1 breast cancer cell cytotoxins from *Rosmarinus officinalis* (Rosemary). *Taylor Eaves, Trevor Burrow, Libby Saultz, Jarrett Ross, Dr. Adam Reinhart, and Dr. Gary Gray, Wayland Baptist University.*

Breast cancer is one of the leading causes of cancer-related deaths in America. Anti-inflammatory drugs have been evaluated as possible treatments, due to their ability to inhibit the COX-2 enzyme. Rosemary is an herb with a long history of use in ayurvedic medicine as an anti-inflammatory agent. Powdered Rosemary root was subjected to Soxhlet extraction. The extract components were isolated by thin-layer chromatography (TLC). Purities of the isolated compounds were evaluated via High Performance Liquid Chromatography (HPLC) and TLC with appropriate standards (carnosic acid and ursolic acid) in attempting to identify the unknown compounds. The compounds isolated from the root extract via TLC were evaluated for cell toxicity on 4T1 cancer cells grown in culture, looking specifically for the induction of apoptosis. From the MTS assay and Bioluminescence assay, one compound (Band 8) was effective in killing 4T1 breast cancer cells. Based upon chromatographic behavior (comigration on HPLC and TLC analysis), it appears likely that Band 8 is carnosic acid.

3) Cytotoxic and apoptotic effects of *Zingiber officinale* (Ginger Root) and *Sanguinaria canadensis* (Blood Root) in 4T1 murine breast cancer cell lines. *Libby Saultz, Jarrett Ross, Trevor A. Burrow, Dr. Gary O. Gray, and Dr. Adam J. Reinhart, Wayland Baptist University.*

Breast cancer is the second leading cause of cancer related deaths among females in the United States. For many years, traditional methods of treatment, such as surgery and various forms of therapy, have been viewed as the only form of cancer treatment available. However, in recent years, an increasing number of people have been turning to medicinal plants as a possible option for cancer treatment. In

previous studies, we have demonstrated that ethanolic extracts of several medicinal plants were found to be cytotoxic on the 4T1 murine breast cancer cell line. This study sought to further investigate whether two of these plant extracts, *Zingiber officinale* (Ginger Root), and *Sanguinaria canadensis* (Blood Root) were causing apoptosis and / or cell cycle arrest. Cells were assayed for apoptosis and cell cycle arrest using caspase activity assays and western blots to determine activity and / or presence of caspase and cell cycle proteins following treatment of 4T1 cells with blood root and ginger root. The assays showed differences in expression of cell cycle proteins for cells treated with both plants. Additionally, western blots showed activation of Caspase-3, Caspase-12, and cleavage of PARP, suggesting that cells treated with both plants may be going through apoptosis via the endoplasmic stress pathway.

4) Purification and partial characterization of 4T1 cell cytotoxins from Ginger. *Trevor Burrow, Libby Saultz, Taylor Eaves, Jarrett Ross, Dr. Adam Reinhart, and Dr. Gary Gray, Wayland Baptist University.*

Previous work in the laboratory of Dr. Adam Reinhart has shown ethanolic extracts of powdered ginger root extract to be cytotoxic to murine 4T1 breast cancer cells grown in culture. Recent western blot analysis has also demonstrated that stimulation of the apoptotic pathways is involved in the 4T1 cell death induced by these ginger extracts. In this study, the purification and identification of the compounds in ginger root cytotoxic to 4T1 breast cancer cells was undertaken. Powdered ginger root was subjected to acetone reflux, and the resulting extract resolved into its component compounds by two rounds of thin layer chromatography (TLC). The isolated compounds were analyzed by high performance liquid chromatography (HPLC) and TLC in attempts to identify these compounds. Biological activity of the isolated compounds was evaluated by bioluminescent assay of 4T1 cell viability. HPLC and TLC analysis showed the presence of at least two compounds in the ginger extract that did not co-migrate with 6-gingerol, 6-shogaol or any of the other derivatives of these compounds reported in the literature to be cytotoxic in other cultured cancer cell lines. UV-visible spectroscopic data indicate that one of these compounds absorbs UV light at 280 nm, suggestive of a protein structure. Future studies will include the characterization of the isolated compounds by mass spectrometry and nuclear magnetic resonance, as well as western blotting to determine the mechanism of 4T1 cell death induced by these isolated compounds.

5) Engineering and producing mutants of glutaredoxin to understand protein structure. *Bernardo Gonzalez¹, Megan Huerta¹, Justin Januta¹, Ryan Sauer¹, Ashlyn Westerman¹, Adam Reinhart¹, Rohan Nandkumar², Kerry Fuson², and Roger Sutton², ¹Wayland Baptist University, ²Texas Tech University.*

Protein engineering is a term used in biotechnology to describe the process of changing and developing proteins in a laboratory setting. Much can be learned about how a protein adopts its eventual 3D structure and function through changing, or mutating specific amino acid then analyzing the differences between the mutated and wild type proteins. Glutaredoxin is a small redox enzyme that was chosen to be manipulated in this experiment. Glutaredoxin is an 88 amino acid protein found in cyanobacterium and was chosen for this experiment due to its small size, and capability to be purified without difficulty, and its ability to be crystallized easily. The purpose of the mutagenesis of the glutaredoxin A protein in the experiment is to gain data for future advances in protein engineering. To determine the contribution of each amino acid in glutaredoxin, each amino acid in the glutaredoxin protein will be mutated into every other amino acid and the differences in structure and activity will be assessed. Our Cell and Molecular biology course chose, at random, 4 such mutations: S13W, H66F, R55A and A49W. Mutations were designed and introduced into the wild type DNA sequences using the Stratagene Quick Change II PCR-based mutagenesis system. Mutated DNA was then transformed into E. coli and 3 ml

cultures were grown and plasmid DNA was isolated and the DNA sequence of the mutations was obtained, confirming all 4 mutations were as designed and correct.

6) Purification of mutant glutaredoxin proteins to understand its structure and function. *John Mark Avila¹, Jessica Killerlain¹, Evan McElwain¹, Michelle Post¹, Sharon Robinson¹, Adam Reinhart¹, Rohan Nandkumar², Kerry Fuson², and Roger Sutton², ¹Wayland Baptist University, ²Texas Tech University.*

Protein engineering is a term used in biotechnology to describe the process of changing and developing proteins in a laboratory setting. Much can be learned about how a protein adopts its eventual 3D structure and function through changing, or mutating specific amino acid then analyzing the differences between the mutated and wild type proteins. Glutaredoxin is a small redox enzyme that was chosen to be manipulated in this experiment. Glutaredoxin is an 88 amino acid protein found in cyanobacterium and was chosen for this experiment due to its small size, and capability to be purified without difficulty, and its ability to be crystallized easily. The purpose of the mutagenesis of the glutaredoxin protein in the experiment is to gain data for future advances in protein engineering. Our Cell and Molecular biology course generated, 4 such mutations: S13W, H66F, R55A and A49W. These mutations were transformed into a strain of *E. coli* that produces large amounts of protein. Two liters of bacterial culture containing mutated glutaredoxin DNA was induced to produce histidine flagged glutaredoxin from the plasmid DNA using IPTG. Bacterial cells were lysed, and the glutaredoxin protein was specifically purified using a his-tag purification column technique. The isolated protein was concentrated and further purified using a sepharose column and further concentrated to 6mg/ml. Protein crystals were grown using hanging drop diffusion in varying concentrations of PEG 400 and ammonium sulphate. Protein crystals grown using these methods will be structurally analyzed using X-ray crystallography.

7) Geological mapping of the late Cretaceous to early Eocene strata within the Indian Creek Area, Buffalo Gap National Grasslands, South Dakota. *Garrett Williamson, Dr. David Schmidt, and Dr. Tim Walsh, Wayland Baptist University.*

During the summer field season of 2012, it was recognized that a detailed geologic map of the Indian Creek area within the Buffalo Gap National Grasslands of South Dakota could be established. According to current knowledge, no detailed geologic map of the permitted field area has been published. Therefore, a preliminary map that includes members (Ahearn, Crazy Johnson, and Peanut Peak) of the Chadron Formation as well as the Chamberlain Pass and Pierre Shale Formations has been constructed. Each member and formation were located, measured, lithologically described, and compared to previous interpretations. Other collected data consisted of coordinates and elevations between stratigraphic boundaries. This information was acquired using a Trimble Geo XH with Terrasync 5.30 software. Once field data was transferred into ArcGIS 10.0, a map scale of 1:8000 was selected to show detail covering an area of 1.4 km². The data was overlaid with Digital Raster Graphs (DRG) and Digital Orthophoto Quarter Quadrangles (DOQQ). Contact lines of stratigraphic boundaries were digitized through coordinate points and correlated with surface topography to create a current geologic map. A detailed map of discernible stratigraphic units within the Indian Creek area will be a valuable tool for future paleontological and geological investigations. Since, more information is needed to cover the entire designated field area of 9 km², field work will continue in the summer of 2013 to obtain the necessary data for completion of this project.

8) A taxonomic and taphonomic description of an ungulate fossil from the Chadron Formation of the Buffalo Gap National Grasslands, South Dakota. *Hunter Green and Dr. David Schmidt, Wayland Baptist University.*

In a recent field expedition to the Indian Creek area within the Buffalo Gap National Grassland, South Dakota, a field team from Wayland Baptist University collected fossil specimens from the White River Group. This area is recognized as one of the most fossiliferous localities spanning late Cretaceous to early Miocene strata. A partial mandible of a large fossil ungulate was recovered from the upper Chadron Formation and is being investigated for its taxonomic relationship and condition of preservation. A preliminary description and morphometric analysis has been conducted on recovered skeletal elements. The left dentary is highly fractured and measures 30.7 cm in length and 9.2 cm diagonally from the angular process to the curved antero-dorsal margin of the ramus, approximately 3 cm behind molar 2. Additionally, the left dentary contains an incomplete tooth row that measures 13.7 cm in length consisting of molars and premolars. The right dentary is represented by several bone and tooth fragments with an incomplete dentition while possessing enough material for a partial description. Based on dental and skeletal morphological comparisons to other large ungulates from the Chadron formation, Brontotheriidae and Hyracodontidae families are currently considered for taxonomic assignment. Most of the observed fractures in the left dentary appear to have occurred after fossilization. However, bone weathering and fracturing prior to fossilization is indicated by fracture-filling clay and flakes of bone within the matrix.

9) Depositional interpretation using integrated sedimentological and paleontological data from a fossil-bearing unit within the Blackwater Draw Formation, Plainview, Texas. *Taryn Shadden, David Schmidt, and Bryan Steffen, Wayland Baptist University.*

Sediments of a fossil-bearing layer within the Blackwater Draw Formation are exposed in an abandoned quarry wall inside the city limits of Plainview, Texas. These sediments were previously interpreted as being deposited in an ancient stream channel by fluvial processes. This layer was horizontally sampled at three locations (PS 1, 2, and 3) to investigate if sediment deposition was restricted to stream flow. Several criteria were used to determine deposition of sediments, including 1) minerals present, 2) size of grains, and 3) taxonomic variation of fossil molluscs (bivalves and gastropods). Mineral grains consist primarily of quartz sands with minor amounts of calcite and feldspar. Samples PS 1 and 2 contain coarse grained cross-beds, and mollusc biodiversity which indicate deposition by stream flow. Location PS 3 was separated into two categories (PS 31 and PS 32) due to textural differences. Sample PS 31 contains fine sands of calcite and calcite-coated quartz, and low biodiversity but high abundances of *Gyraulus parvus* and *Sphaerium transversum*. Such findings suggest deposition from isolated bodies of concentrated water in the stream channel. Sample PS 32 possesses finer grain sizes and lacks fossil content, both of which are typical of deposition by wind. Therefore, current data and comparisons to modern stream deposits support the presence of microenvironments within the ancient stream channel, and signifies that sediment deposition and mollusc diversity are not completely controlled by stream flow.

Abstracts for Research Day Posters

- 1 Carbon footprint analysis for the vehicle fleet on Wayland Baptist University's main campus in Plainview, Texas.** *Joshua Houghtaling, Craig Cook, and Herbert D. Grover, Wayland Baptist University.*

The objectives of this project were to characterize the vehicle fleet of Wayland Baptist University's main campus, compare this fleet to a representative sample of the Plainview community, and to estimate the annual carbon footprint of the Wayland and community vehicle fleets. Standard vehicle categories were defined using the website <http://usefulcharts.com>. The categories were cars, SUVs, CUVs, trucks, and hybrids, with appropriate subcategories (e.g., sub-compact, compact, full size). Vehicle types in the Wayland fleet were sampled on three different days for main-campus parking lots during normal class/working hours. For a representative community-wide vehicle fleet, the parking lot at Wal Mart was sampled on three weekdays between 5:00 and 6:00 pm. With an average of 315 vehicles in the Wayland sample and 215 in the Wal Mart sample, the proportions of vehicle types were very similar for both sites, with cars 40%; trucks 25%; SUVs 24%; CUVs 11%; and hybrids <1%. Carbon dioxide emissions for the Wayland fleet were estimated using EPA estimated average annual miles driven by passenger vehicles (11,489 miles per year) and representative miles per gallon data for vehicles types published by EPA. Using these values and the vehicle type distribution acquired by our sampling, we estimate the total carbon dioxide emissions for the Wayland main-campus vehicle fleet to be approximately 1,644 metric tonnes, or 3.6 million pounds per year. The contribution of vehicle types to the overall carbon footprint was equivalent to their proportional distribution in the fleet.

- 2 Effects of intra-specific competition on seedling growth of several crop species.** *Zoe Benson, Paige Mattingly, Olivia Patterson, Melissa Perez, Kylie Smith, Brittnay Walton, and Herbert D. Grover, Wayland Baptist University.*

The objective of this experiment was to examine the effect of seedling density on seedling shoot and root growth for several crop species. The species were chosen based on crops commonly grown in West Texas, which included sorghum, wheat, millet, corn, cucumber, and cotton. Preliminary seed germination tests showed a greater than 95% viability rate for seeds of all species selected for study. Seedlings were grown in 16 oz. cups with Miracle Grow potting soil at densities of 2, 8, and 16 seeds per cup. The plants were grown and watered in the Wayland greenhouse on a regular basis for 6 weeks, except for the cucumber that grew for only 4 weeks before harvesting. After oven drying for a minimum of 48 hours, harvested plant material from each pot was separated into roots and shoots and weighed on a digital precision scale. Of the six species included in our seedling growth study, wheat, cucumber, and cotton exhibited an average success rate of 84% in getting planted seeds to sprout into seedlings, whereas sorghum had a 66.7% sprouting rate, millet had a 59.3% sprouting rate, and corn fell to a 34.3% sprouting rate. With increasing seedling density from 2 to 16 seedlings per pot, average total seedling mass, average shoot mass per plant, and average root mass per plant decreased by 50 % or

more for each species tested. Corn exhibited the greatest decline, with cucumber showing the least impact of competition on seedling growth, possibly due to the shorter growth period. Trends in root to shoot mass ratios were mixed, but indicated that for millet, corn, and cucumber, shoot mass may have been reduced more than root mass with increasing seedling density.

3 A novel application of EMSA and DSLR technology for detecting RecA binding to *Mycobacterium tuberculosis* DNA sequences. Hailey Budnick, Jessica Kenneson, and Robert Moore, Wayland Baptist University.

Mycobacterium tuberculosis is a pathogenic bacterium with no known DNA proofreading mechanism, but does use the enzyme RecA to carry out DNA replication and repair via homologous recombination. As a result of these repairs, mutations may be introduced into the sequence. This could explain the rapid appearance of drug resistant strains in populations where proper drug regimens are not administered. We seek to investigate whether RecA favors binding to certain drug-resistant Mtb DNA sequences. As an alternative to accepted X-ray and phosphorimaging techniques, we will develop a new technique with DSLR camera technology and Image J software to analyze chemiluminescent EMSA gels. Through this technique, the binding affinity of RecA protein to DNA sequences will be quantified. These assays will be used to determine if RecA is attracted to certain nucleotide concentrations, certain nucleotide sequences, or has no preference at all.

4 Social interaction precludes spontaneous salt intake sensitization and prematurely increases sodium appetite enhancement. Melissa Perez¹, Regina Vendramini², Laurival De Luca Jr.², and Daniela Pereira-Derderian¹, ¹Wayland Baptist University, ²São Paulo State University.

Social Interaction positively drives reward behavior. Spontaneous and induced salt intake enhancement can be produced by repetition of water deprivation (WD)-partial rehydration (PR) protocol in individually-housed (IH) animals. We investigated how repeated episodes of WD-PR affect salt intake enhancement in group-housed (GH) animals. Adult male Holtzman rats were GH (n=20) or IH (n=16) and had access to chow, water, and 0.3 M NaCl ad libitum. WD-PR protocol consisted of 36h of WD with only chow available and 2h of PR with only water available. Sodium appetite test (SAT) followed WD-PR protocol and consisted of 2h access to 0.3 M NaCl and water, without chow. Both groups were either subjected to zero (GH or IH non-dep) or three (GH or IH dep) WD-PR followed by SAT at 7-day intervals. Spontaneous or daily salt intake was recorded during each week. GH dep significantly (*p<0.05) increased 0.3 M NaCl intake in the 2nd and 3rd SAT compared to the 1st (3.2±0.0, 4.5±0.1*, 5.0±0.1* mL, respectively). IH dep significantly (*p<0.05) increased 0.3 M NaCl intake only in the 3rd SAT compared to the 1st (4.1±0.3, 3.9±0.4, 5.1±0.3* mL, respectively). GH dep did not alter daily sodium intake throughout the experiment (5.3±0.7, 5.2±0.8, 6.2±0.7, 5.2±0.4 mL, respectively). Daily salt intake in IH dep significantly (*p<0.05) increased after the 1st week (1.7±0.5, 2.5±0.7*, 3.3±0.8*, 2.6±0.6* mL, respectively). Non-dep groups did not alter daily or induced sodium intake. These results suggest that social interactions prevented daily salt intake overconsumption. Conversely, it speed induced salt intake overconsumption.

5 Repeated episodes of water deprivation sensitize animals to crave salt. *Ashley Rivera¹, Laurival De Luca Jr.², Daniela Pereira-Derderian¹, ¹Wayland Baptist University, ²São Paulo State University.*

Animals and humans frequently undergo periods of water deprivation. Water deprivation-partial rehydration (WD-PR) protocol is a laboratory methodology to measure salt appetite. It consists of 36h of WD and 2h of PR. Sodium appetite test (SAT) follows WD-PR and consists of 2h access to sodium and water. We analyzed WD-PR and SAT repetition in spontaneous and induced salt intake and urinary electrolytes. Adult male Holtzman rats had access to chow, water, and 0.3 M NaCl ad libitum. Spontaneous intakes were measured for 4 weeks. "Basic" group (n=10) was water deprived thrice at 7-day intervals. "Control B" group (n=6) was WD only in the 3rd episode. Urine was collected during 3rd WD-PR, 3rd SAT, and 4 days after. Urinary volume, sodium, potassium, and osmolality were analyzed. Repeated WD-PR episodes significantly (*p<0.05) enhanced "Basic" daily 0.3 M NaCl intake in 3rd and 4th week compared to 1st (9±1, 13±2, 17±3*, 18±3* mL, respectively). "Control B" did not alter daily sodium intake (9±3, 9±2, 10±3, 11±3 mL). Repeated WD-PR episodes significantly enhanced "Basic" induced sodium intake in 2nd and 3rd SAT compared to 1st (8.9±1.2, 12.3±1.0*, 13.1±1.5* mL). "Control B" significantly ingested more sodium when deprived compared to its non-deprived tests (0.3±0.2, 0.1±0.0, 3.2±1.2* mL). There were no significant changes in urinary output between groups and conditions. Repeated WD-PR episodes sensitize spontaneous and induced salt intake in rats. Similar urinary output between groups suggests that salt intake sensitization is not related to bodily fluid electrolytes imbalances and thus, may be due to neuroplasticity.

6 Aquatic invertebrate community composition and similarity among playas with different land use. *Jacob Kemmer, Trevor Burrow, Victoria Chavez, Kady Pryde, Jarrett Ross, Edward Taragon, and Andrew C. Kasner, Wayland Baptist University.*

The objective of this study was to determine patterns of aquatic invertebrate richness and abundance of five playas surrounded by different land uses in Hale and Swisher counties in the Southern High Plains of Texas. Invertebrates were collected from late June-early July 2012 in playas with different land uses: one urban playa, one in Wetland Reserve Program (WRP) surrounded by grazed, unplowed pasture; one permanent playa filled with groundwater surrounded by grazed pasture; one surrounded by grazed, expired Conservation Reserve Program (CRP) grassland; and one surrounded by wheat and a narrow natural buffer. Water chemistry (hardness, pH, dissolved oxygen, salinity, turbidity, and temperature) was measured at each site to determine chemical differences between the playas, with no differences found among playas relative to land use. The urban and expired CRP playas had the lowest aquatic invertebrate species richness (n=7 species in each) compared to the permanent playa (n=16 species), WRP playa (n=16 species), and wheat playa (n=15 species). Jaccard's Community Similarity Coefficient (CCj) showed the greatest similarity between the WRP and wheat playas (CCj=0.48), while the least similarity occurred between the permanent playa and expired CRP (CCj=0.11). The permanent playa community was dissimilar to all other playas (CCj<0.21 for all comparisons) followed closely by the urban playa (CCj<0.29). There was also a significant difference in the average number of branchiopods per dip net sample among playas (H=17.73, df=4, P=0.001), with branchiopods most abundant in the WRP playa and absent in urban playa and permanent playa. The results suggest that land use surrounding playas may be an important determinant of playa invertebrate community composition.

7 Mechanical snow chains. Diana G. Muturia and Sayra Cardiel

The available snow chains or snow studs in the market do not currently work on tires automatically. A tire was theoretically designed to solve the issue of having to physically mount and assemble snow studs on a tire. Sometimes, physically strapping a snow chain or snow studs on a tire might be too late for the situation at hand. If a vehicle is already stuck in snow, snow chains seem ineffective. The result of the questionnaire indicates chains and studs are ineffective when it comes to getting out of snow one is already stuck in. Snow chains also take a large amount of time to untangle and mount. The automatic tire created is a honey comb shaped tire that pushes studs through the tire using hydraulics. Using a three dimensional program, the research indicates the tire's use.

8 Determination of kinetic parameters of mushroom tyrosinase . *Hailey Budnick, Trevor Burrow, Taylor Eaves, Anna Kite, Jarrett Ross, Nati Sandoval, Libby Saultz, Adam J. Reinhart, and Robert Moore, Wayland Baptist University.*

Analyzing kinetic parameters including the K_m and V_{max} of mushroom tyrosinase may be used to compare the efficiency of tyrosinase present in different parts of the common mushroom, *Agaricus bisporus*. Several centrifugations and two salting-outs were used to isolate the tyrosinase enzyme from the skin, gills, and stalk of *Agaricus bisporus*. Tyrosinase from each of the three parts of the mushroom was then assayed using UV-Visible Spectrometry to measure dopachrome formation at 475 nm. The appearance of dopachrome indicated enzyme activity. Based on these assays, a non-linear regression plot was created. Using the plot, K_m was found to be lowest for gills. Based on this data, the tyrosinase isolated from the gills was the most efficient of all the tyrosinase tested.

9 Rain, Rain Go Away, I Don't Want a Disease Today. *Taylor Eaves, Jessica Killerlain, Evan McElwain, Wayland Baptist University.*

The possibility of correlating weather features with the frequency of diseases could prove to be an invaluable tool for predicting disease trends. We compared the number of cases for six severe diseases (Pertussis, Legionellosis, Rabies, Salmonellosis, Syphilis, and Varicella) broken down by region of the United States with the monthly precipitation, average high and average low temperature for those regions in 2011. Increases in cases of Legionellosis, Salmonellosis, Varicella and Pertussis all appear to be tied to the summer. This could be significant in aiding in the research of prevention of the diseases if the most prominent times of the year for contraction are known.

10 A comparison of global mean temperature and CO₂ emissions. *John Mark Avila, Emarie Holland, and Edward Taragon, Wayland Baptist University.*

Global mean temperature as well as Carbon Dioxide emissions has been steadily on the rise from 1965 through 2011. The trends of both CO₂ emissions and global mean temperature were compared. Developing countries contributed the most emissions with China contributing the most of any country. As other countries as well regions began to regulate and reduce energy usage China and the Asian Pacific region continued an uprising trend, more than offsetting the progress of other countries.