



*WKU Students Participate  
in*

# **Posters-at-the-Capitol**

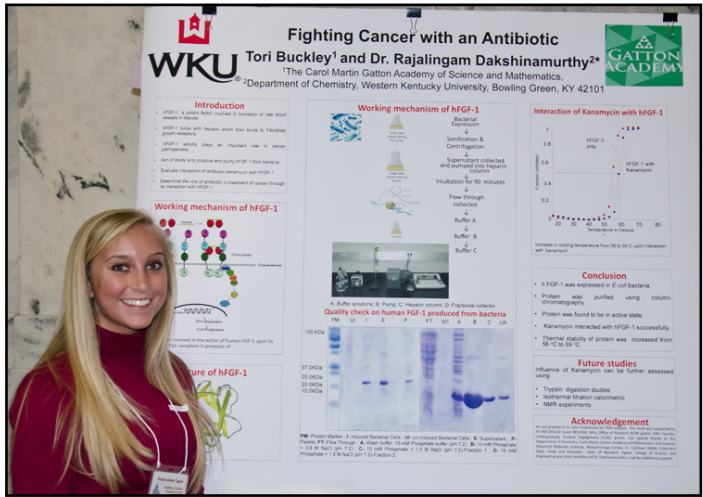
*Transforming Education  
for a Brighter Tomorrow*

**February 27, 2014**



**Tori Buckley**  
**Western Kentucky University**  
**Mentor: Rajalingam Dakshinamurthy**  
**Molecular Level Interaction of an Aminoglycoside**  
**Antibiotic with Human Fibroblast Growth Factor 1**

Fibroblast growth factors (FGF) work as modulators of different cell activities like mitosis, differentiation, and cell survival. Within the FGF family human FGF -1 is the potent angiogenic factor, involved in the formation of new blood vessels in tissues. Human FGF-1 binds with heparin and forms a binary complex, which further binds to fibroblast growth factor receptors (FGFRs), this binding triggers downstream events involving different cell signaling pathways and ultimately leads to cell proliferation. Human FGF-1 is one of the targets in cancer inhibition and obesity due to its involvement in blood vessel formation in cancerous regions and adipose tissues. Results of recent studies have indicated that there is a decrease in cell proliferation capacity of patients who have been on antibiotics for longer periods. It could be due to interaction of antibiotics with proteins involved in cell proliferation like FGFs. Recently anticancer activity of an antibiotic called



Lidamycin, which is an aminoglycoside, was noticed in cancer cell lines. Antibiotics like aminoglycosides have resemblance in their molecular structure with heparin, hence the amino glycosides can compete with the heparin in order to bind with the hFGF-land these interactions may affect the normal cell proliferation process. On the basis of above experimental studies and associated hypothesis, we designed a project to study the interaction between hFGF -1 and kanamycin, which is an aminoglycoside antibiotic.

**Maggie Day & Angelia Calvo**  
**Western Kentucky University**  
**Mentor: Barbara Bush**  
**Serving the Underserved**

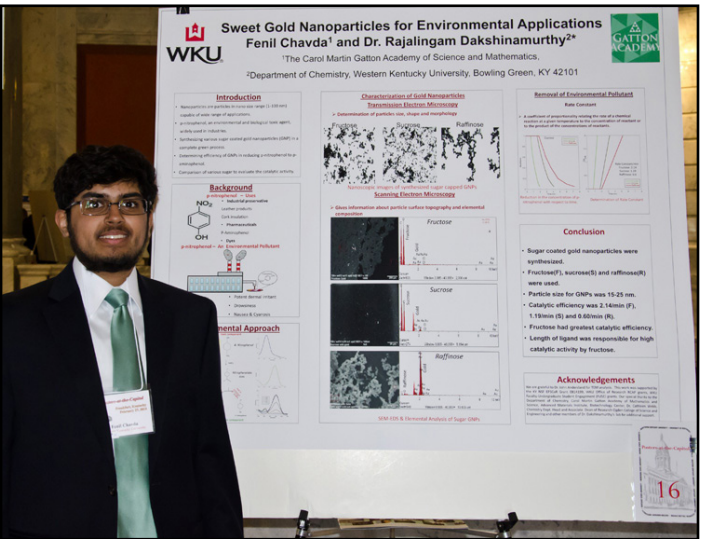
In order to determine the status of the availability of dental care to citizens of Kentucky and beyond and determine barriers to meeting the needs, a review of several data sets was initiated. Based on this review of data it was determined for example that approximately 1.7 million adults in Kentucky lack access to dental care. More than 100 million Americans don't go to the dentist because they can't afford it. Because of the severity of Americans' need for more access to oral health care, both locally and nationally, several potential solutions will be presented to alleviate some of the perceived barriers, such as volunteer events that could be held in order to provide dental care to anyone who is willing to come, mobile dental units and University facilities could provide free or reduced cost



care to individuals and Public Health Registered Dental Hygienists and Advanced Dental Hygiene Practitioners could perform services without a dentist's supervision, thus providing services in remote or underserved areas.

**Fenil Chavda**  
**Western Kentucky University**  
**Mentor: Rajalingam Dakshinamurthy**  
**Green Synthesis, Characterization of Sugar Coated.**  
**Gold Nanoparticles for Catalytic Applications**

Gold nanoparticles (GNPs) are of interest because of their wide applications in the biomedical and pharmaceutical fields, which is due to their unique physico-chemical properties when they are reduced to their nanoscale size range. We developed a novel single step biofriendly process for synthesis of fructose (monosaccharide), sucrose (disaccharide) and raffinose (trisaccharide) capped GNPs, wherein sugar was directly capped onto gold without the use of any secondary capping/stabilizing agent. Our study was mainly focused on the effect of various lengths of sugars in formation and catalytic reduction activity of sugar capped GNPs. Characterization of synthesized GNPs was done using various analytical techniques like transmission electron microscopy (TEM), SEM-EDS, FTIR, UV-Vis spectroscopy. P-nitrophenol assay was used to evaluate the catalytic reduction activity of various sugar capped GNPs at different temperatures using UV-Vis spectrometer. Using the spectroscopic data, the rate constant for three sugar



capped GNPs was determined followed by its activation energy using different equations. From the kinetic data, the catalytic reduction activity for three sugars was in the descending order of fructose, sucrose and raffinose GNPs respectively. This difference in the catalytic activity is believed to be due to the size of ligand on gold surface that greatly influences the surface/volume ratio.

**Ashlan Clark**  
**Western Kentucky University**  
**Mentor: Gregory Goodrich**  
**Risks of Nocturnal Tornadoes in the Mid-South**

Nocturnal tornadoes are those that occur between the hours of sunset and sunrise. Nocturnal tornadoes have been shown to have an increased fatality rate since nocturnal tornadoes are difficult to spot and often occur when the victims are sleeping. The vulnerability to nocturnal tornadoes was found to be greatest in the Mid-South region of the United States. Tennessee and Kentucky ranked 1st and 3rd in the United States in the percentage of all tornadoes that are nocturnal.





**John Cliburn**  
**Western Kentucky University**  
**Mentor: Lan Nguyen**  
**Applications of the Banach Fixed Point Theorem**

We investigated the application of the Banach fixed-point theorem, especially as it applied to initial value problems in differential equations. Many partial differential equations (POE's) model biological growth and could be reduced to ordinary differential equations (ODE's) with time delay on a real Banach space. Other POE's are abstract and non-homogeneous. For any contraction operator on a Banach space, the Banach fixed-point theorem could be used to prove the existence and uniqueness of a solution to these equations .

**Amy Correll**  
**Western Kentucky University**  
**Mentor: Dana Burr Bradley**  
**International Health and Aging: Observation and Analysis of Elderly Care in Migori Kenya**

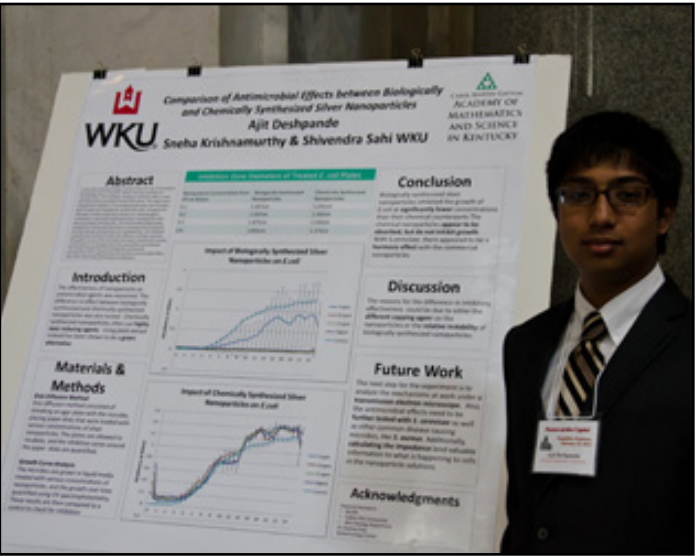
While generally respected in Kenya, Elders are not primary recipients of health care services in later life. This research documented the need for geriatric specific care and the availability of resources for seniors in Migori, Kenya. Lastly, a set of 5 recommendations was developed to guide the delivery of health services provided to older residents in this small village of 6000. After a literature review and analysis of existing demographic data, a needs assessment instrument was developed to guide gathering of relevant data from Migori. Using a research protocol approved through the WKU IRB Committee, the Primary Investigator interviewed 25 elders and 3 key informants in August 2013 in Migori Kenya. She performed referencing vital statistics checks (weight, blood pressure and nutritional assessment) and in depth interviews with the assistance of a translator. Descriptive statistics were used to analyze the vital and nutrition profiles and narrative analysis was used to determine primary and secondary themes in respondent's health lives. Because of the high prevalence of HIV Aids, many elders have lost their



own children and are the primary caregivers for their grandchildren. Older Kenyan's are chronically underweight, malnourished and at risk for many chronic diseases. This group of elders was no exception to norms. Issues of food availability and the constant caregiving strain meant that many elders face stark choices: feed their grandchildren or themselves. Personal health concerns were secondary and interviewees reported widespread discouragement from using what little formal health services existed .

**Ajit Deshpande**  
**Western Kentucky University**  
**Mentors: Shivendra Sahi & Sueha Krishnamurthy**  
**Comparison of Antimicrobial Effects between Biologically and Chemically Synthesized Silver Nanoparticles**

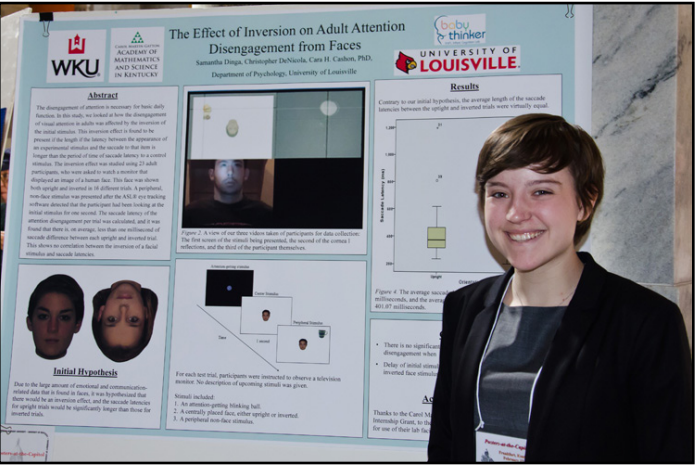
In the field of biotechnology, nanoparticles are one of the fastest developing areas of research. While chemical synthesis of nanoparticles is the standard, biological synthesis offers a safer and more environmentally friendly alternative. This experiment analyzed the inhibition of microbial growth when the microbes were treated with biologically-synthesized silver nanoparticles that were created using yucca extract as a reducing agent compared to chemically-synthesized silver nanoparticles that were purchased commercially. The antimicrobial effects were analyzed by treating Saccharomyces cerevisiae and Escherichia coli with varying concentrations of nanoparticles. The inhibition of growth was tested first with disk diffusion method, and then the growth curves of the microbes



that were treated with varying concentrations of nanoparticles were quantified and analyzed. The results showed that the biologically synthesized nanoparticles had a significantly more potent antimicrobial effect than their chemically synthesized counterparts.

**Samantha Dinga**  
**Western Kentucky University**  
**Mentor: Cara H. Cashon**  
**The Effect of Inversion on Adult Attention Disengagement from Faces**

The disengagement of attention is necessary for basic daily function. In this study, we looked at how the disengagement of visual attention in adults was affected by the inversion of the initial stimulus. This inversion effect is found to be present if the length of the latency between the appearance of an experimental stimulus and the saccade to that item is longer than the period of time of saccade latency to a control stimulus. The inversion effect was studied using 23 adult participants, who were asked to watch a monitor that displayed an image of a human face. This face was shown both upright and inverted in 16 different trials. A peripheral, non-face stimulus was presented after the ASL® eye-tracking software detected that the participant had been looking at

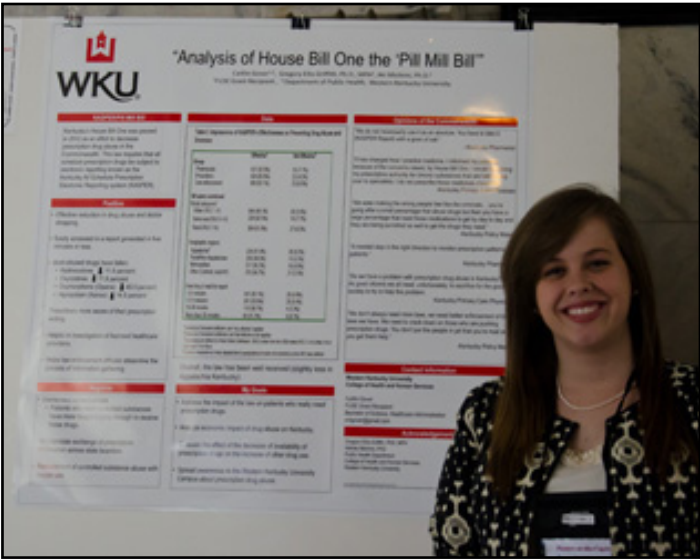


the initial stimulus for one second. The saccade latency of the attention disengagement per trial was calculated, and it was found that there was, on average, less than one millisecond of saccade difference between each upright and inverted trial. This shows no correlation between the inversion of a facial stimulus and saccade latencies.



**Caitlin Gover**  
**Western Kentucky University**  
**Mentors: Gregory Ellis-Griffith & Aki Micbimi**  
**Analysis of House Bill One the "Pill Mill Bill"**

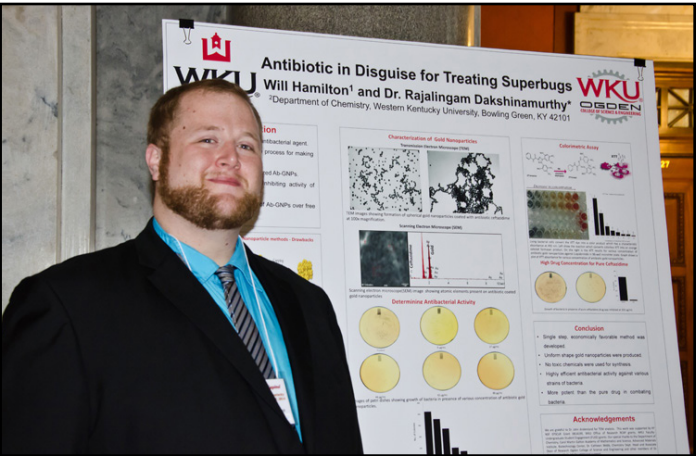
Kentucky's House Bill One was passed last year as an effort to decrease prescription drug abuse in the Commonwealth. This law requires that all schedule prescription drugs be subject to electronic reporting known as the Kentucky All Schedule Prescription Electronic Reporting system. I sought to identify if the passage of the bill had affected the prescription drug problem in our Commonwealth. My overall approach to analyzing the Pill Mill Bill was to conduct a pretest-posttest study design. In order to humanize these numbers, I conducted interviews with members of law enforcement and the judicial branch, health care providers, and politicians in different regions of Kentucky. The impact of the law on patients who really need prescription drugs was addressed. Since most students were not aware of the dangers of prescription



drugs and the impact of the "Pill Mill Bill," awareness of prescription drug abuse on Western Kentucky University's campus needs to be addressed.

**William R. Hamilton**  
**Western Kentucky University**  
**Mentor: Rajalingam Dakshinamurthy**  
**Designing a Unique Therapeutic Agent Involving Gold Nanoparticles Capped with Ceftazidime for Potent Antibacterial Applications**

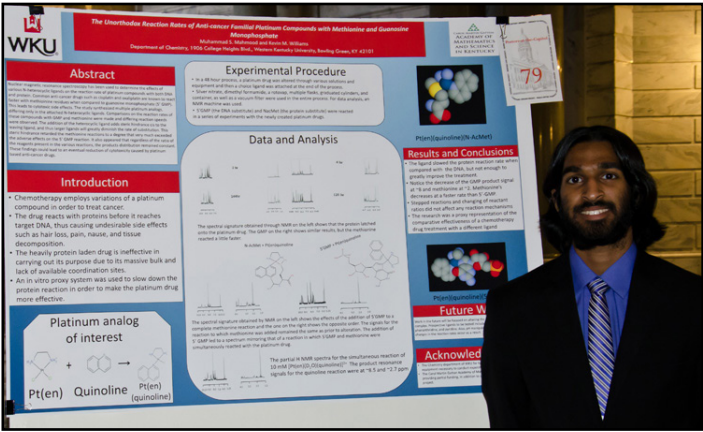
There is a desperate need for creating new antibiotics or modifying existing antibiotics in response to the soaring increase in cases of multi-drug resistant (MDR) bacteria that are commonly known as "Superbugs" all across the world. We have tried to design an effective antibacterial agent involving gold nanoparticles (AuNPs) capped with an antibiotic (ceftazidime). Keeping the 12 principles of 'green chemistry' in mind a unique, single step process that is unlike conventional methods was conceived for making AuNPs using the combined reducing and capping ability of ceftazidime to yield ceftazidime capped gold nanoparticles (C-AuNPs). The C-AuNPs were then characterized using various analytical techniques that utilized such tools as the transmission electron microscope (TEM), scanning electron microscope (SEM) and UV-Vis spectroscopy to determine the morphology of the AuNPs. The



efficiency of the antibacterial activity of C-AuNPs was assessed using several antibacterial assays such as turbidimetry, spread plate method, and XTT assay. A variety of bacterial strains including both Gram-positive and Gram-negative were used for the above assays. The minimum inhibition concentration (MIC) of C-AuNPs, obtained from the assays was compared with the MIC of ceftazidime pure drug in order to evaluate the efficacy of C-AuNPs compared to pure ceftazidime drug.

**Suhaib Mahmood**  
**Western Kentucky University**  
**Mentor: Kevin Williams**  
**The Unorthodox Reaction Rates of Anti-cancer Familial Platinum Compounds with Methionine and Guanosine Monophosphate**

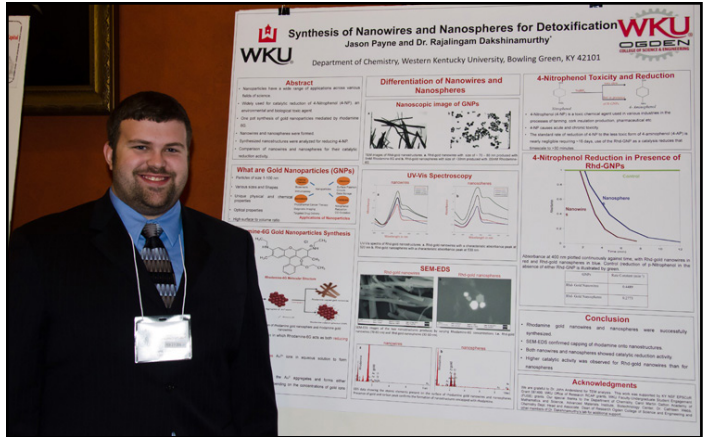
Nuclear magnetic resonance spectroscopy has been used to determine the effects of various Nheterocyclic ligands on the reaction rate of platinum compounds with both DNA and protein. Common anti-cancer drugs such as cisplatin and oxaliplatin are known to react faster with methioinine residues when compared to guanosine monophosphate ( 5' GMP). This leads to cytotoxic side effects. The study synthesized multiple platinum analogs, differing only in the attached N-heterocyclic ligands. Comparisons on the reaction rates of these compounds with GMP and methionine were made and differing reaction speeds were observed. The addition of the heterocyclic ligand adds steric hindrance cis to the leaving ligand, and thus larger ligands will greatly diminish the rate of substitution. This steric hindrance retarded the methionine reactions to a degree that very much



exceeded the adverse effects on the 5' GMP reaction. Also, it was found that once 5' GMP had reacted, methionine was unable to displace it but the reverse did not hold true as 5' GMP displaced a complete methionine reaction. It also appeared that regardless of the ratio of the reagents present in the various reactions, the products distribution remained constant. These findings could lead to an eventual reduction of cytotoxicity caused by platinum based anti-cancer drugs .

**Jason Payne**  
**Western Kentucky University**  
**Mentor: Rajalingam Dakshinamurthy**  
**A Single Step Synthesis and Characterization of Nanowires & Nanospheres for Catalytic Applications**

Nanoparticles are of immense interest due to their potency for a wide range of applications. Inorganic metals such as gold have been extensively used for catalytic reduction of p-nitrophenol in presence of NaBH4. p-Nitrophenol is an environmental and biological toxic agent which is widely used in industries for a variety of purposes. Here, we report a single step, biofriendly synthesis of gold nanoparticles (AuNPs) with the help of a fluorescent dye called rhodamine-6G. We were successfully able to form AuNPs of different morphology i.e. gold nanowires and nanospheres by varying the concentration of rhodamine-6G. The synthesized gold nanostructures were characterized using transmission electron microscope (TEM), scanning electron microscope (SEM) and UV-Vis spectroscopy that proved the formation of rhodamine-6G containing

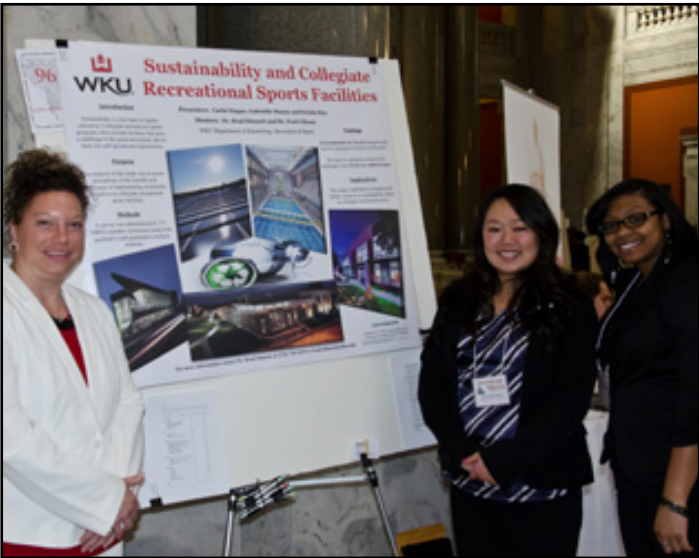


gold nanostructures. Catalytic activity in reducing p-nitrophenol to p-aminophenol was assessed and compared for similar concentration of rhodamine-6G gold nanowires and nanospheres using UVVis spectroscopy. Finally, using the spectroscopic data, rate constant (k) was calculated and compared for individual nanostructures to determine the effect of rhodamine AuNPs morphology on catalytic reduction activity.



**Keisha Ray, Carlet Hagan, & Gabrielle Manny**  
**Western Kentucky University**  
**Mentors: Brad Stinnett & Fred Gibson**  
**Sustainability and Collegiate Recreational Sports Facilities**

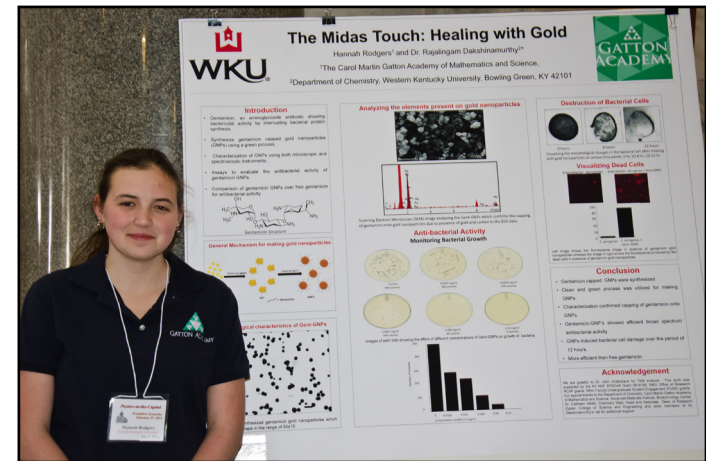
Sustainability is a hot topic in higher education. Green and renewable are buzzwords that have helped brand modern environmentalism. A greater emphasis on facility planning, development, and management is contributing to sustainability efforts. Collegiate recreational sports programs often include facilities that pose a challenge to the green movement, due to their size and operational requirements. The purpose of this study was to assess levels of personnel knowledge and institutional commitment related to sustainable initiatives at collegiate recreational sports facilities. This foundational study attempted to create some benchmark data for the collegiate recreation industry within the National Intramural-Recreational Sports Association (NIRSA). The Collegiate Recreational Sports Sustainability Survey was developed to assess the variables in the study and was sent to directors of NIRSA member institutions. This research produced a number of key findings: the LEED Accredited Professional (AP) certification is virtually nonexistent among collegiate recreational sports professionals; institutions that led in commitment levels per their respective category type were two-year public institutions, large enrollment institutions, institutions from NIRSA Region VI, and



institutions that contain large collegiate recreational sports facilities; statistically significant differences in commitment levels existed between four-year public and four-year private institutions, between large and small enrollment institutions, and between institutions that had large and small facilities. Implications from this study included providing benchmark data, LEED-AP credential considerations, creating advisory committees, and modeling NIRSA Region VI institutions. This study established a foundation for further research on sustainability efforts in collegiate recreational sports.

**Hannah Rodgers**  
**Western Kentucky University**  
**Mentors: Rajalingam Dakshinamurthy & Rammohan Paripelly**  
**Single Step, Antibiotic Mediated Synthesis of Gold Nanoparticles with Potent Antimicrobial Activity**

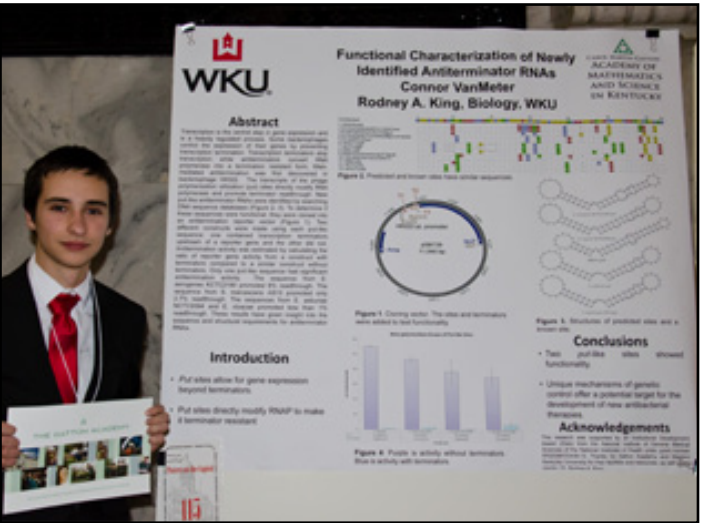
Gentamicin is an aminoglycoside antibiotic with bactericidal activity that works through binding the 30S subunit of the bacterial ribosome, interrupting protein synthesis. In this study we synthesized Gentamicin capped gold nanoparticles (GNP's) through a single step process in an aqueous buffer. The GNPs were identified and size was determined with transmission electron microscopy. The average diameter of the particles is 50+/- 10 nm. Further characterization was carried out with UV /vis spectrophotometer, Electron dispersion spectroscopy (EDS) and FTIR analysis. Elemental composition of GNP's was determined with EDS. Different antibacterial tests such as Turbidimetry, Spread plate assay, Tetrazolium salt based colorimetric assay and Micro-dilution Alamar blue assays were carried out on both Gram-negative and Gram-positive bacteria to determine the minimum



inhibitory concentration of GNP's. Bacterial cross sectioning was performed, to document the morphological changes on bacteria caused by GNP's treatment. GNP's activity was further confirmed with propidium iodide assay. Compared with the concentration of the Gentamicin alone, the Gentamicin gold nanoparticles have yielded a lower minimum inhibitory concentration, indicative of their success.

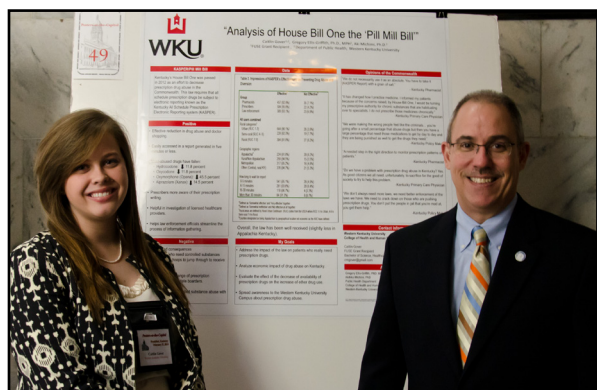
**Connor VanMeter**  
**Western Kentucky University**  
**Mentor: Rodney A. King**  
**Functional Characterization of Newly Identified Antiterminator RNAs**

Transcription is the central step in gene expression and is a heavily regulated process. Some bacteriophages control the expression of their genes by preventing transcription termination. Transcription terminators stop transcription while antiterminators convert RNA polymerase into a termination resistant form. RNA-mediated antitermination was first discovered in bacteriophage HK022. The transcripts of the phage polymerization utilization (put) sites directly modify RNA polymerase and promote terminator readthrough. New, put-like antiterminator RNAs were identified by searching DNA sequence databases. To determine if these sequences were functional, they were cloned into an antitermination reporter vector. Two different constructs were made using each put-like sequence: one contained transcription terminators upstream of a reporter gene and the other did not. Antitermination activity was estimated by calculating the ratio of reporter gene activity from a construct



with terminators compared to a similar construct without terminators. Only one put-like sequence had significant antitermination activity. The sequence from E. aerogenes KCTC2190 promoted 8% readthrough. The sequence from S. marcescens AS13 promoted only 2.7% readthrough. The sequences from E. asburiae NCTC9394 and E. cloacae promoted less than 1% readthrough. These results have given insight into the sequence and structural requirements for antiterminator RNAs.

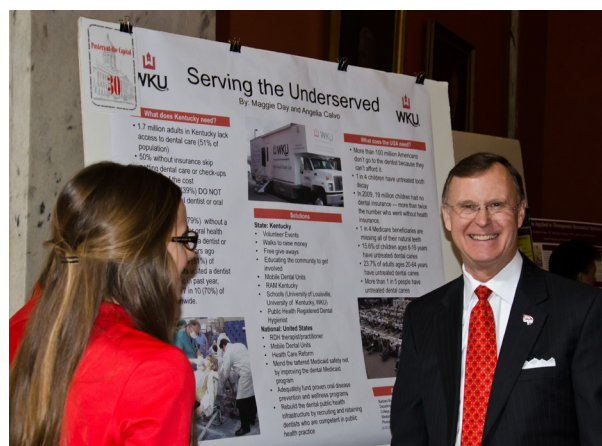




Caitlin Gover with Representative Jim Decesare



Tori Buckley with Representative David Givens



Maggie Day with WKU President Gary Ransdell



Group Photo of all Posters at the Capital participants