Poster Presentation Abstracts

Monday, November 5, 2018

Category A: Newly emerging research/education projects or communities that seek to extend involvement

1. Synthesis and Functionalization of Fe3O4 magnetic nanoparticles in one-step and their potential for medical applications

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Monodispersed superparamagnetic Fe3O4 nanoparticles were synthesized and functionalized successfully by coating them with Poly ethylene glycol in one-step experiment using supercritical conditions of fluids. The synthesis materials used were chosen as they do not confer significant toxicity and thus could be used for in vivo studies. Fe3O4 nanoparticles have been found to be useful in the medical field due to their magnetic properties under applied magnetic field. Based on their large magnetization, Fe3O4 magnetic nanoparticles (MNPs) can agglomerate and behave as one large cluster, which is not required for the biomedical applications. Therefore, the functionalization of MNPs is required to have dispersed particles in the solution and enhance their potential to be used for medical applications such as magnetically induced hyperthermia, magnetic resonance imaging (MRI) and in magnetic targeted drug delivery. Herby, we have synthesized functionalized Fe3O4 MNPs by using PEG as surfactant. The magnetic as well as the hyperthermia measurements reveal high magnetic superparamagnetic behavior as well as sufficient specific absorption rate (SAR) in the therapeutic range. The outstanding findings open new root of synthesis functionalized monodispersed Fe3O4 MNPs and their potential for magnetic hyperthermia for cancer treatment.

2. Two-photon flow cytometry using 2D Airy beam sheet

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Two-photon flow cytometry is a technology that was developed a decade ago. It is quite challenging due to Rayleigh range of the focused Gaussian beam that leads to narrow sampling volume. This volume cannot occupy the dimension of the size of blood vessels. 2D Airy beam sheet has the more penetrating depth which can propagate a long distance without diffracting. The Beam size as well as effective spot size of Airy is comparable to that of Gaussian. 2D airy beam light sheets were developed by our lab team members with effective larger sampling volume. In Two-photon Laser with 2D Airy beam sheet, laser beam strikes the sample which gets either reflected or refracted. The fluorescence emitted by samples (microbeads) through such beams can be analyzed once it is recorded to get an instant result at the real time. This technique could be promising and quite useful for the detection of cancer cell in the blood, as such beams can transverse in-depth of blood vessels. It may also be utilized in other research fields like: protein engineering, cell sorting and biomarker detection in the future.

Category B: Individuals, teams, or communities of practice that seek to disseminate efforts

3. An Interdisciplinary Strategy to Reduce Children's Blood Lead Levels in El Paso, Texas

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Given the growing evidence and broad acceptance that no level of lead exposure is "safe" for children, attention must now turn to developing practical strategies for lowering child blood lead levels that continue to impact millions of children nationwide to undetectable levels. El Paso, Texas is one of over 3000 cities nationwide with un-renovated pre-1978 housing and continuing high risk of child lead exposure from un-remediated lead paint. New cost-effective child-relevant mitigation strategies are needed to provide intervention for clusters of children in high-risk neighborhoods. We propose a strategy that uses a holistic approach and integrates neighborhood- level community-engagement and education on child lead exposure hazards and solutions, with household level lead hazard detection and mitigation. The approach maximizes scarce resources by: 1) spatially mapping real time child BLLs determined by Inductively Coupled Plasma Mass Spectrometry (ICP-MS) in neighborhoods for identification of hotspots of child lead exposure; 2) using a late-generation X-ray fluorescence analyzer for efficient identification of possible home lead sources, and bioaccessibility assays to narrow the focus of mitigation on likeliest child-relevant lead hazards; and 3) assisting home owners with low-cost mitigation of household lead exposure sources. We hypothesize that (H1) as compared to pre-mitigation (baseline) child BLLs, child BLLs measured at 4, 8 and 12 months post-mitigation will be significantly reduced, controlling for sex and age of child; and (H2) as compared to pre-mitigation home dust lead levels with bioaccessibility > 20%, post-mitigation dust lead levels and dust lead bioaccessibility will be significantly lower immediately following mitigation, and at 4, 8 and 12 months post-mitigation. We aim to screen 200 children for lead exposure, and we anticipate approximately N = 70 with lead exposure, representing approximately 25 homes requiring household assessment and mitigation. Our study began this fall and it will take 3 years to complete.

4. The Computing Alliance of Hispanic-Serving Institutions (CAHSI), an NSF INCLUDES Alliance

Ann Gates, Professor, Computer Science[1]; Daniel Barajas, Director of Industry Partnerships[2]; Patricia Morreale, Professor, Computer Science[3]; Ilmi Yoon, Professor, Computer Science[4]
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The Computing Alliance of Hispanic-Serving Institutions (CAHSI) was formed in 2006 to address the low representation of Hispanics in higher education and the workforce. Since that time, CAHSI's graduation rates have surpassed national trends, when comparing CAHSI against other long-standing departments that have existed since 2002 (70% vs 158%, respectively). CAHSI is a grass-top alliance – one that involves both faculty and administrators, as well as industry, government, and industry partners. As a National NSF INCLUDES Alliance, CAHSI has adopted the collective impact framework to support its growth resulting in a nationwide alliance of over 60 HSIs, 2-year colleges, non-profits, and industry partners. CAHSI's bold, shared vision is: By 2030, Hispanics will represent 20% or more of those who earn credentials in computing. CAHSI's mission is to grow and sustain a networked community committed to recruiting, retaining, and accelerating the progress of Hispanics in computing. To accomplish its mission, CAHSI leaders and regional connectors work with individuals and organizations across different disciplines and with various foci to disseminate high-impact practices and activate tailored approaches to regional challenges.

5. Prevalence of Obesity and Risk Factors for Metabolic Syndrome among Uninsured College Hispanic Students in El Paso Texas

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The risk factors of metabolic syndrome (MetS) are associated with cardiovascular and other chronic diseases. The University of Texas at El Paso (UTEP) is located near the U.S.-Mexico border. Studies that research MetS risk factors among universities students are few, especially among those who lack access to health insurance. This study screened 150 Hispanic UTEP students recruited by flyers, email and tabling events from 2015-2017. Participants were evaluated for obesity and MetS risk factors based on NCEP ATP III revised guidelines. Regression analyses investigated associations of age, sex, income, marital status, a recent medical checkup, and perceived health with BMI and MetS risk factors. Mean age (SD) was 24(5.3), mean BMI was 25.9(4.8). There was a low prevalence for MetS(10%), but 60% had at least one metabolic abnormality and 23% had two or more. 40% had low HDL-cholesterol (51%male, 35%female) and 21% high blood pressure (41%male, 12%female). Logistic regression after adjusting for sociodemographics showed age (OR=0.12 p=0.021), being male (OR=1.21 p=0.019),

and fair or poor perceived health (OR=1.16 p=0.036) were associated with being overweight/obese (p=0.005). Fair or poor perceived health (OR=2.21 p=0.001) was associated with large waistline (p=0.006).Being male (OR=2.38 p<0.001) and never being married (OR=2.61 p=0.013) were associated with high blood pressure (p<0.001). And being male (OR=1.87 p=0.003) was associated with high triglycerides (p=0.029). Early detection of metabolic risk factors is crucial to detect and prevent disease progression. In this student population, the majority have at least one risk factor, and males are at higher risk than females. Further research among college students without access to healthcare is critical. Program development is needed to raise awareness in this population.

Category C: Active or completed interdisciplinary research/education projects that seek to disseminate results

6. Nonlinear response of aluminum nitride powders for additive manufacturing

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Over the past decades, Aluminum nitride (AlN) has become a widely studied material due to its wide band gap, high thermal conductivity(320W/(m.k)), high temperature stability and low thermal expansion(4.3 x 〖10〗^(-6)^-6 /K). These properties have made ALN a good candidate for several applications such as thin film bulk acoustic resonators, heat dissipation in micro-rings, and DUV light emitters. Applications also extend to hot engine parts and rocket nozzles due to the high temperature stability. In recent years 3D printing processes include a range of manufacturing techniques such as sintering and hot isostatic pressing in order to aid in of the fabrication of ceramics. During these processes, the properties of the material can be altered significantly due temperature, pressure, and atmosphere of above-mentioned processes. Probing these changes is an integral part in the functionalization of ceramics and their subsequent 3D printed materials. AlN has both second 〖(X〗^2) and third order (¬X^3) optical nonlinearities due to its non-centrosymmetric crystal structure in the stable wurtzite phase which allows optical probing of its second harmonic signal. We investigate the optical response of AlN powders that have undergone sintering and hot isostatic pressing using nondestructive two-photon microscopy.

7. The Middle Rio Grande Land Use/ Land Cover: Diversity, Impact, and Change

Omar S. Belhaj, PhD candidate, Environmental Science and Engineering; Stanley T. Mubako, Assistant Research Professor, CERM; William L. Hargrove, Director, CERM
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The Middle Rio Grande is a Transboundary basin in a water scarce region facing huge changes in land use/ land cover starting from the last decades. Fast growth in the major metropolitan areas in this region has resulted in changes in land use practices. The whole region faces various environmental challenges such as the loss of agricultural and native land, as well as growing competition between human urban demands for water and other uses that include environmental and agricultural. This study uses geographic information systems and remote sensing technologies to identify and measure land use/ land cover change in this region to help better understand the trends. Preliminary results have shown clear urban sprawl and a reduction in the surface water bodies. Agricultural and the native vegetation areas have also decreased, especially around the urban areas. Geographic information systems and remote sensing technologies are useful tools for analyzing land use/ land cover change over time and for monitoring meso-scale regions that are experiencing rapid urban growth and water scarcity.

8. Investigations of boron-doped diamond films - a confocal Raman mapping and SEM study

Emma Sundin, PhD student, Biomedical Engineering[1]; Kevin E. Bennet, Chair of the Division of Engineering, co-Director [2]; Kendall Lee, Professor, Director[2]; William G. Durrer, Physics[1]; Felicia S. Manciu, Professor, Physics; Biomedical Engineering, and Border Biomedical Research Center[1]
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Boron-doped diamond (BDD) thin films are of interest in neurosurgical applications due to the superior stability of BDD-coated electrodes compared to that of carbon-fiber electrodes. BDD film stability is therefore relevant, as delamination and dislocation of films, which can occur during surgical electrode implantation, negatively impact biosensing by fast-scan cyclic voltammetry. This study investigated induced stress in both undoped and BDD-doped diamond thin films using confocal Raman mapping. In addition to dopant quantity, sample chemical composition and substrate effects were also compared. Electrodes were fabricated by chemical vapor deposition in a custom-built reactor, on cylindrical tungsten substrates. Results of the spectroscopic mapping and stress-analysis revealed a correlation between regions of pure diamond and enhanced stress, while greater boron incorporation coincided with

stress release throughout the film. Preferential boron incorporation into the diamond lattice was also observed. Sp2-type carbon impurities may also have contributed to high values of compressive stress.

9. Ultrasensitive Detection of Neurotransmitters by Surface Enhanced Raman Spectroscopy for Biosensing Applications

Katia Ochoa, student, Physics[1]; Kevin E. Bennet, Chair of the Division of Engineering, Assistant Professor of Neurosurgery, co-Director[2] ; John D. Ciubuc, PhD student, Biomedical Engineering[1]; Emma Sundin, PhD student, Biomedical Engineering[1]; William G. Durrer, Physics[1]; Michael Eastman, Professor, Chemistry[1]; Felicia S. Manciu, Professor, Physics, Biomedical Engineering, and Border Biomedical Research Center[1]
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In this study, fabrication of silver nanoparticles (Ag NPs) as surface-enhanced Raman spectroscopy (SERS) active platforms enabled detection of serotonin, adenosine, and dopamine at concentrations as low as 10-11 molar. Besides demonstrating the potential value of this high sensitivity Raman recording of these very important analytes in the diagnosis of numerous neurological diseases, we observed variations in the intensities of characteristic Raman signatures that indicate changes in the molecular orientations of the neurotransmitters in the proximity of the silver surface, as well as potential chemical interactions. We also found that the particular Raman cross sections of neurotransmitter molecules and their densities close to the surface of Ag NPs play a significant role in preferential SERS enhancement. This study not only provides direct evidence that, using Raman spectroscopy, label-free detection of trace amounts of neurotransmitters is achievable, but it further advances knowledge of their interactions at the interface with metal nanoparticles.

10. Human Microvascular Endothelial Cells Induction: In Vitro Characterization of the Expression and Activation of Angiogenic Cytokines and Kinases via Thermal Inkjet Printing

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One biofrabication process that has gained tremendous momentum in the field of tissue engineering and regenerative medicine is cell-printing or most commonly bioprinting. We have discovered that thermal inkjet bioprinted (TIB) human microvascular endothelial cells (HMVECs) were recruited or otherwise involved in the formation of microvasculature to form graft-host anastomoses upon implantation. The aim of the present study is to quantify and characterize the expression and activation of specific cytokines and kinases in vitro. Milliplex magnetic bead panels demonstrated TIB-HMVECs expression of VEGF-A, FGF-1, Ang 2, HSP70, IL-1, and IL-8 at 2.6, 4.0, 0.3, 3.9, 5.5, and 2.2, respectively, in fold change as compared to the control. In addition, human phospho-kinase array displayed an increased phosphorylation of Fgr, HSP27, HSP60, p53, p27, and eNOS at 1.9, 1.7, 2.3, 1.4, 1.7, and 1.2, respectively, in fold change as compared to the control. Moreover, TIB-apoptotic rate was measured through Annexin V-FITC and propidium iodide on a flow cytometer (results pending). Collectively, it is suggested that the massive appearance of capillary blood vessels upon implantation may be due to the HSP-NF-kB pathway to produce VEGF. TIB cell activation may be used as a new strategy for vascularization of tissue engineered constructs which are in high demand in regenerative medicine applications.

11. Kidney Stones – From an Ancient Tea to Modern Research

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Although a considerable number of investigations have already been undertaken and many causes such as life habits, metabolic disorders, and genetic factors have been noted as sources that accelerate calculi deposition and aggregation, there are still plenty of unanswered questions regarding efficient inhibition and treatment mechanisms. Thus, in an attempt to acquire more insights, we present here detailed multi-technique spectroscopic investigations of kidney stone formation and growth inhibition based on a traditional medicine approach with Rotula Aquatica Lour and Larrea Tridentata herbal extracts. Raman, infrared absorption, X-ray photoelectron spectroscopy, and photoluminescence were used to analyze the effects of herbal inhibitors on the synthetic growth of calculi by a simplified single diffusion gel technique. A visible decrease in calculi sizes with increasing amounts of herbal infusion was observed in photomicrographs, as well as a color change from white-transparent for pure crystals to

black for crystals with Rotula Aquatica Lour inhibitor and to light orange-brown for crystals with Larrea Tridentata inhibitor. The resulting spectroscopic data support the possibility of the magnesium of the inhibitor binding with phosphate or carbonyl oxygen associated with different types of kidney stones. Morphological changes from a monohydrate structure for the crystals grown alone to a dihydrate morphology with the addition of inhibitor were also observed for calcium oxalate samples. The main focus of this work is to demonstrate the usefulness of optical spectroscopy, which provides an important source of information in the study of this tantalizing and complex problem, which is far from being completely understood.

12. Label-Free Raman Imaging to Monitor Breast Tumor Signatures

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Methods built on Raman spectroscopy have shown major potential in describing and discriminating between malignant and benign specimens. Accurate, real-time medical diagnosis benefits from substantial improvements through this vibrational optical method. Not only is acquisition of data possible in milliseconds and analysis possible in minutes, but Raman allows concurrent detection and monitoring of all biological components. Besides validating a significant Raman signature distinction between non-tumorigenic (MCF-10A) and tumorigenic (MCF-7) breast epithelial cells, this study reveals a label-free method of assessing overexpression of epidermal growth factor receptors (EGFR) in tumor cells. EGFR overexpression gives rise to Raman features associated with phosphorylated threonine and serine, and modifications of DNA/RNA characteristics. Investigations by gel electrophoresis reveal EGF induction of phosphorylated Akt, agreeing with the Raman results. The analysis presented is a vital step toward Raman-based evaluation of EGF receptors in breast cancer cells. With the goal of clinically applying Raman-guided methods for diagnosis of breast tumors, the current results lay the basis for proving label-free optical alternatives for prognosis of the disease.

13. Human appropriation of net primary productivity: A critical component of the U.S. food-energy-water system

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Human appropriation of net primary productivity (HANPP) is a measure of human dependence on ecosystems for various ecological resources. This project aims to evaluate empirical methodologies for measuring human appropriation of net primary productivity (HANPP) and eHANPP (HANPP embodied in trade) in order to capture human dependence on ecological resources. The eHANPP project improves on the concept of agro-ecological footprint by measuring HANPP and placing it in a spatial and temporal context by linking it with trade and transfer of provisioning ecosystem services. The research team involves faculty from UTEP's Center for Environmental Resource Management, Utah State University's Environment and Society Department, and Northern Arizona University's School of Informatics Computing and Cyber Systems, and students at Utah State University's Environment and Society Department. The research is part of the project Mesoscale Data Fusion to Map and Model the U.S. Food-Energy-Water System (FEWSION Project), supported by the National Science Foundation's (NSF) INFEWS Program through Northern Arizona University.

14. Analysis of Rutile and Anatase TiO2 Nanoparticles with Two-Photon Microscopy and X-Ray Diffraction

Andres Reyes, Master's student, Physics; Alex Price, PhD student, Physics; Yi Wang, PhD student, Chemistry; Chunqiang Li, Professor and Lecturer Department of Physics
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TiO2 nanoparticles have become a very common material as it is used in cosmetic products and other consumer products. Thus its effect on the environment is something that needs to be studied. However, the first step before studying a material is being able to identify it. To that effect TiO2 nanoparticles were observed under a Two-Photon Microscopy set up and then correlated with X-Ray Diffraction (XRD) data to further categorize two forms of TiO2,

Anatase and Rutile. The Anatase and Rutile structures of the TiO2 nanoparticles were also studied to see how the crystal structure impacts the fluorescent properties of each sample.

15. Building a Foundation for Addressing "Wicked" Water Resources Challenges through Participatory Modeling: Stakeholder Identification and Engagement

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Our objective was to develop a systematic approach to identifying and classifying water stakeholders and engaging them in a discussion of water futures as a foundation for a participatory modeling project to address the "wicked" water resource problems of the Middle Rio Grande basin. The label "wicked" has been used in the literature to describe problems that are difficult to explain; unique; impossible to plainly define, often because they are the result of other indefinable problems; and have no one true solution. The term "wicked" is relevant to the challenges of climate change and competing demands for water in the region. We identified the major sectors of water users to include: 1) agricultural, 2) municipal, 3) self-supplied industrial users, 4) environmental, and 5) a sector we labeled "social justice", comprised of individuals who lack access to potable water or who represent such individuals. We included stakeholders from both the U.S. and Mexico, and hosted a total of ten stakeholder meetings by sector. Results from stakeholder meetings included: 1) their vision for the future of water; 2) challenges to be overcome; and 3) important research questions that could be addressed using participatory modeling. Four broad themes emerged: 1) quantity, drought, and scarcity; 2) quality/salinization; 3) urbanization; and 4) conservation and sustainability. Each sector also expressed distinctive views regarding the future of water. Agricultural stakeholders had strong feelings of ownership of water rights as part of land ownership and a concomitant sense of threat to those water rights emanating from dwindling supplies and competing demands. The unique contribution of this work is a methodology for identifying, classifying, and engaging all types of stakeholders, enabling us to compare and contrast views of different types of stakeholders. Heretofore, this has been accomplished in "bits and pieces" but never comprehensively and holistically.

16. Drosophila Melanogaster as a Model for Nanoparticle Drug Delivery

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The blood-brain barrier (BBB) plays a vital role in regulating the passage of substances into the brain and in maintaining homeostasis within the central nervous system. In humans, the BBB is composed of tight junctions in the endothelial cell layer of the brain's capillaries and the thick basal lamina that surrounds the feet of the astrocytes, forming a highly selective barrier against potentially pathogenic materials. Utilizing a Drosophila melanogaster model creates an interesting opportunity to both discover the effectiveness of nanoparticles in permeating through the BBB, and in seeing how these same nanoparticles, when used in conjunction with other drugs and compounds, can act as treatment modalities for neural diseases. The septate junctions of the sub-perineural glial layer combined with the perineurial glia and neural lamella, mimic the structure and function of the human BBB similarly enough to use the Drosophila model as a screen for size and general selectivity. The proposed study will test our hypothesis that surface modified nanoparticles can serve as vehicles for targeted drug delivery in a Drosophila model. Albumin was prepared and conjugated with Atto 565 for fluorescent imaging, with the Marty desolvation technique being utilized to create nanoparticles pH 7.0 and 9.0. Five, 6-8 day old male flies were exposed to both albumin and PEGylated albumin nanoparticles over periods of 1, 3, 6, and 24 hours at concentrations of 10 mg/ml and fixed for confocal imaging. Albumin-Atto 565 nanoparticles fabricated at pH 9.0 appeared to enter areas of the brain, such as the cell bodies and near the calyx, more readily than the particles prepared at pH 7.0, suggesting the presence of a size selective mechanism for nanoparticle transport. Additionally, PEGylated particles did not appear to enter cell bodies; however, these particles were seen to enter the perineurial glia.

17. Protein-Based Nanoparticle Formulations for Treatment of Cutaneous Leishmaniasis

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Leishmania major is a zoonotic flagellate protozoan transmitted to humans and other mammals through phlebotomine female sand flies. L. major is responsible for causing cutaneous leishmaniasis (CL) in endemic areas of the Old World with about 1 million new cases each year. Present anti-leishmanial drugs are highly toxic leading to an urgent need for new compounds. The applications of organic chemistry have allowed for novel compounds with effective anti-parasitic properties to be synthesized, however these lack in solubility, making their delivery difficult using standard methods. Developments in biomedical engineering offer an alternative through use of protein-based nanoparticles as vehicles for the transport of these compounds. For this study, gelatin (GNP) and albumin nanoparticles (ANP) were chosen as carriers to enhance compound delivery while reducing toxicity and cost. The primary objective of this project was to profile the loading and release process for these anti-leishmanial compounds to optimize their effectiveness in delivery. The size (nm), polydispersity index (PDI), and zeta potential (mV) were identified in addition to the corresponding concentrations of entrapped compound for each GNP and ANP formulation. Through methodologies in biology, loaded and unloaded GNPs were found to be non-toxic to murine intraperitoneal macrophages (IPM) and achieved <5% survival for L. major promastigotes. Evidence in this experimentation supports the application of GNPs and ANPs as hydrophobic compound carriers and further establishes their role as an effective delivery vehicle.

18. 3-D Bioprinted cancer cells, a novel approach for developing breast tumors in vitro tested in vivo

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Biomedical tissue printing technology has been around for over three decades now and it is still an underdeveloped technology with very promising opportunities e.g., skin allographs. Bioprinting of cancer cells done via a modified inkjet printer to test individualized treatment regimens is being explored. Our experiment includes modeling and bioprinting MCF7 cancer cells that could be used for drug testing in vitro (outside of the body). Preliminary results from our research indicate that 3D printed cancer cells not only grow at a slightly faster rate but also create different clusters of tumors when compared to standard cultured cancer cells in two dimensions (2D). Additionally, these bioprinted cancer cells were implanted in Severe Combined Immune Deficient (SCID) mice to further identify differences between these and non-printed breast cancer cells. This experiment was conducted in conjunction with the Biomaterial Implantation Class – MME4171, in order to optimize the number of mice used and thus reducing the number of mice required if a separate study was conducted. Furthermore, this experiment gave students hands on experience and exposed them to clinically important processes, from applying anesthesia, to surgery, to conducting biopsies and tissue processing in animals. Biopsy and tissue processing are routine tests that are normally done when breast cancer patients are first diagnosed with breast cancer. Tissue processing helps identify the characteristics of the tumors, which are used by a committee of oncology experts to determine the type of treatment regimen each patient will receive. The overarching goal of the project is twofold, to develop bioprinted cancer cells that will grow into tumors for a safe and more efficient drug testing of breast carcinomas and to provide undergraduate students hands on experience with engineered tissues, surgical procedures and histological methods, which will prepare them for future in vivo studies that they will be doing throughout their careers.

19. Chitosan Nanoparticles Formulated for the Enhancement of Furosemide-Silver Complex Antibacterial Activity

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For decades, silver and its complexes have proven to be sufficient means of being antibacterial treatment methods. However, the rise of antibacterial resistant bacterial strains has become a leading threat to current treatments. Recently synthesized silver-furosemide (Ag-FSE) complex has shown promising antibacterial activity but has poor solubility. Therefore, the goal was to formulate chitosan nanoparticles (CSNPs) of Ag-FSE complex in order to enhance its solubility and antibacterial efficacy. Investigations to enhance CSNP characterization of size, polydispersity index (PDI) and zeta potential (ZP) to maintain CSNP size < 300 nm using various times of sonication to unloaded CSNPs and drug loaded CSNPs via dynamic light scattering (DLS). Once established optimal sonication times for CSNP characterization we performed encapsulation efficiency (EE%) studies using an ultracentrifugation technique analyzed via UV-spectrophotometry. Drug release studies were also performed using dialysis membrane permeation technique and analyzed via UV-spectrophotometry. Antibacterial activity was also investigated for enhanced effects of Ag-FSE CSNPs versus unencapsulated Ag-FSE against E. coli, S. aureus, and P. aeruginosa using a Mueller-Hinton Broth technique. Stability studies for the formulation in 4 °C and 25 °C conditions over a period of 120 days was performed to ensure that the Ag-FSE CSNP formulation remained stable with consistent size, PDI and ZP. We also looked at crystallinity characterization of the Ag-FSE CSNP formulation to ensure that entrapment of the drug was successful with the CSNPs via x-ray diffraction (XRD) and differential scanning calorimetry (DSC). Morphology of the Ag-FSE CSNPs was also investigated using transmission electron microscopy (TEM) to see the exact shape of the drug nanoparticles.