

Advanced Biomedical Engineering and Instrumentation Summit

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Exhibitor



Venue

Crowne Plaza San Francisco Airport Hotel

1177 Airport Blvd, Burlingame
CA

Keynote Presentations

The Rise of Modern Genetic Engineering Tools: And our Responsibility to Introduce the Ethical and Societal Implications to our Students and the Public

Temple F. Smith

Department of Biomedical Engineering, Boston University, MA

Abstract

It is clear that tools such as CRISPR/cas 9, have immense potential, in medicine, agriculture and biotechnology. Along with this are the associated ethical and societal challenges. Therefore, not only do those of us who are developing and using such tools have an obligation to understand those challenges, but to help the general public and our students understand them. One of the initial steps is to be sure that we expose our students to these issues and challenges and do that in the full historical context. Here I outline just such a university course recently developed and taught within Boston University. That experience exposed the unanticipated need to discuss religious beliefs, current legal systems and the distinction between communal ethics and personal moral sensitivities, in some detail. In particular, we must not be insensitive to the real concerns these tools present. All of this requires the expanded education of our selves, the biomedical research community, and preparation to become more involved in the wider public discussions.

Biography

Prof. Temple F. Smith is an Emeritus Professor in biomedical engineering, who helped to develop the Smith-Waterman algorithm with Michael Waterman in 1981. The Smith-Waterman algorithm serves as the basis for multi sequence comparisons, identifying the segment with the maximum local sequence similarity, see sequence alignment. This algorithm is used for identifying similar DNA, RNA and protein segments. He was director of the Biomolecular Engineering Research Center at Boston University for twenty years and is now professor emeritus.

Synaptic Mitochondria are More Susceptible to Traumatic Brain Injury-Induced Oxidative Damage and Respiratory Dysfunction than Non-Synaptic Mitochondria: Neuroprotective Effects of Cyclosporine A

Edward D. Hall¹, Jacqueline R. Kulbe, Juan A. Wang, Rachel L. Hill and Jimmi R. Hatton

University of Kentucky College of Medicine Spinal Cord & Brain Injury Research Center, Lexington, KY

Abstract

Currently, there are no FDA-approved pharmacotherapies for the treatment of traumatic brain injury (TBI). As central mediators of the secondary injury cascade, mitochondria are promising therapeutic targets for prevention of cellular death and dysfunction following TBI. One of the most promising and extensively studied mitochondrial targeted TBI therapies is inhibition of the mitochondrial permeability transition pore (mPTP) by the FDA-approved drug, cyclosporine A (CsA). A number of studies have evaluated the effects of CsA on total brain mitochondria following TBI; however, none have investigated the effects of CsA on isolated synaptic and non-synaptic mitochondria. Synaptic mitochondria are considered essential for proper neurotransmission and synaptic plasticity and their dysfunction has been implicated in neurodegeneration. Synaptic and non-synaptic mitochondria have heterogeneous characteristics, but their heterogeneity can be masked in total mitochondrial (synaptic and non-synaptic) preparations. Therefore, it is essential that mitochondria targeted pharmacotherapies, such as CsA, be evaluated in both populations. This is the first study to examine the effects of CsA on isolated synaptic and non-synaptic mitochondria following experimental TBI. We conclude that synaptic mitochondria sustain more damage than non-synaptic mitochondria 24h following severe controlled cortical injury (CCI). However, administration of CsA (20mg/kg, i.p.) 15min following injury preserves mitochondrial respiratory function with a significant improvement in the more severely impaired synaptic population. Thus, CsA remains a promising candidate for the acute treatment of TBI. Indeed, CsA even when delayed for 8 hours post-TBI, increases brain tissue sparing in CCI rats and in a human phase 2a trial, improves neurological recovery and survival.

Biography

Prof. Edward D. Hall is a Professor of Neuroscience at the University of Kentucky holds the W.R. Markesbery, MD Chair in Neurotrauma Research. After completion of his Ph.D. in Pharmacology at the Cornell University, he joined the Northeastern Ohio Universities College of Medicine where he rose to the rank of Associate Professor of Pharmacology with tenure. In 1982, he moved to The Upjohn Company where he initiated and led an effort for the next 15 years to discover drugs for the treatment of acute neurotrauma, stroke and neurodegenerative diseases. He has authored over 185 journal articles, is an inventor on 4 pharmaceutical patents, and is a founder of the National Neurotrauma Society, the International Neurotrauma Society and the Journal of Neurotrauma.

Virtual Biopsies of Tissues and Carcinomas using Vibrational Optical Coherence Tomography

Frederick H. Silver¹, Michael Richard² and Dominick Benedetto³

¹RWJMS, Rutgers, The State University of New Jersey, Piscataway, NJ

²Neigel Center for Cosmetic and Laser Surgery, Florham Park, NJ

³Center for Advanced Eye Care, Vero Beach, FL

Abstract

Vibrational optical coherence tomography (VOCT) is a new technique that combines the imaging power of optical coherence tomography with the ability of sound to characterize the physical properties of tissues. This technique has been developed to perform “virtual” biopsies and biomechanical measurements on normal and malignant tissues non-invasively and non-destructively. It has been previously reported in the literature that cutaneous wound healing and the development of malignant skin lesions are associated with changes in tissue stiffness. In this talk we present the images and the resonant frequency of different skin lesions and carcinomas which together can help plan surgical interventions and monitor the healing process of skin lesions.

We have imaged and studied several types of skin lesions using VOCT to evaluate the morphology, stiffness, depth and margins of these structures. While cellular components present in skin and carcinomas have resonant frequencies in the range of 30 to 60 Hz, normal collagen has a resonant frequency in the range greater than 90 Hz. In comparison, fibrotic collagen is shown to have higher resonant frequencies above 150 Hz as does collagen from skin lesions.

It is concluded that the ratio of the resonant frequency squared to the tissue thickness obtained from VOCT can be used to grade the type of tissue response seen. Further studies are underway to establish the relationship between tissue stiffness and lesion morphology for cellular and fibrotic lesions based on the characteristic ratios of resonant frequency and tissue thickness.

Biography

Prof. Frederick H. Silver is a Professor of Pathology and Laboratory Medicine at RWJMS, Rutgers University. He did his Ph.D. in Polymer Science and Engineering at M.I.T. with Dr. Ioannis Yannas, the inventor of the MIT artificial skin, followed by a postdoctoral fellowship in Developmental Medicine at Mass General Hospital with Dr. Robert L. Trelstad, a connective tissue pathologist. He has published over 200 research papers and book chapters and is co-inventor on over 20 patents. He's currently developing methods to make Virtual Biopsies using Vibrational Optical Coherence Tomography to plan surgical procedures and evaluate skin lesions.

Advances in Integrated Multimodality Intravascular Imaging for Assessing and Characterizing Atherosclerotic Plaques

Zhongping Chen

Department of Biomedical Engineering, University of California, Irvine, CA

Abstract

Atherosclerosis is one of the major causes of morbidity and mortality in developed countries. This presentation reports on the development of integrated multiple modality intravascular imaging techniques for the identification and evaluation of vulnerable plaques. The integrated imaging technology combines the high-resolution capabilities of optical coherence tomography (OCT), deep penetration depth of intravascular ultrasound (IVUS), molecular sensitivity of fluorescence and photoacoustic (PA) imaging, and mechanical contrast of phase-resolved acoustic radiation force optical coherence elastography (ARF-OCE) to characterize plaques. *In vitro* images of pathologic human coronary arteries, as well as *in vivo* images of normal rabbit abdominal aorta, were obtained using the integrated probe, which demonstrated the feasibility of

the integrated system in intravascular imaging and its potential in the detection of vulnerable atherosclerotic plaques. The presentation will discuss advances made thus far, as well as the challenges that remain to translate this technology from the bench to clinical bedside.

Biography

Prof. Zhongping Chen is a Professor of Biomedical Engineering and Director of the OCT Laboratory at the University of California, Irvine. He is a Co-founder and Chairman of OCT Medical Imaging Inc. Dr. Chen received his Ph.D. degree in Applied Physics from Cornell University in 1993. Dr. Chen's research group has pioneered the development of functional optical coherence tomography (OCT), including Doppler OCT, phase resolved OCT, and optical coherence elastography. He is a Fellow of the American Institute of Medical and Biological Engineering (AIMBE), a Fellow of SPIE, and a Fellow of the Optical Society of America.

Innovation in Skin Pharmacology

Howard Maibach

University of California San Francisco, CA

Biography

Prof. Howard Maibach was graduated from Tulane University School of Medicine in 1955, and completed his internship from William Beaumont Army Hospital, El Paso, TX in 1956. He later completed his Fellowship from Hospital of the University of Pennsylvania in 1961. He also practiced neuropsychiatry for few months in 1956. He is a specialist in contact and occupational dermatitis, including the toxicological and pharmacological aspects. He is also known for his work in neonatal skin, dose response of topical drugs and per-cutaneous penetration. He has written over 2700 research articles, which according to an estimate could be a world record. He was awarded an honorary Ph.D. by Universite de Paris-Sud in 1985 and Université Claude Bernard, Lyon in 2008. In 2013, he was awarded the "Master Dermatologist Award" by the American Academy of Dermatology.

Featured Presentations

Ultrasound-switchable Fluorescence Imaging in Living Tissues

Baohong Yuan, Tingfeng Yao, Shuai Yu and Yang Liu

University of Texas at Arlington, TX

Abstract

Ultrasound-switchable fluorescence (USF) imaging is a recently developed imaging modality for deep-tissue high-resolution imaging. It uses a focused ultrasound beam to stimulate fluorophore emission only in its focal volume. Thus, USF can achieve fluorescence contrast and acoustic resolution in deep tissue. USF can be used for many biomedical applications, such as functional and molecular imaging. We developed several USF imaging systems, including continuous-wave, frequency-domain and time-domain systems. Each system has a different photon collection setup, including fiber bundle based and camera-based collection systems, which have different photon-collection efficiencies. These systems and the images acquired from them will be discussed. Especially, thanks to the spatial information provided by the camera, a new scan method named Z-scan has been developed and the imaging speed has been improved four times compared with that from a fiber-based system in which a raster scan is usually adopted. USF imaging via this Z-scan in tissue samples was realized. The results were validated by a commercial micro-CT system.

Biography

Prof. Baohong Yuan is a Professor of biomedical engineering at the University of Texas at Arlington, TX and the director of the Ultrasound and Optical Imaging Laboratory. His research interest is to explore and develop new imaging technology, including contrast agents and instruments, for understanding cancer mechanisms, early detecting and diagnosing cancers, and monitoring cancer treatment efficiency.

Imaging of Ophthalmic Surgical Dynamics using Intraoperative Spectrally Encoded Coherence Tomography and Reflectometry (iSECTR)

Yuankai K. Tao

Department of Biomedical Engineering, Vanderbilt University, TN

Abstract

Limited visualization of semi-transparent structures in the eye remains a critical barrier to improving clinical outcomes and developing novel surgical techniques. While increases in imaging speed has enabled intraoperative optical coherence tomography (iOCT) imaging of surgical dynamics, several critical barriers to clinical adoption remain. Specifically, these include (1) static field-of-views (FOVs) requiring manual instrument-tracking; (2) high frame-rates require sparse sampling, which limits FOV; and (3) small iOCT FOV also limits the ability to co-register data with surgical microscopy. We previously addressed these limitations in image guided ophthalmic microsurgery by developing microscope-integrated multimodal intraoperative swept-source spectrally encoded scanning laser ophthalmoscopy and optical coherence tomography. Complementary end face images enabled orientation and co-registration with the widefield surgical microscope view while OCT imaging enabled depth-resolved visualization of surgical instrument positions relative to anatomic structures-of-interest. In addition, we demonstrated novel integrated segmentation overlays for augmented-reality surgical guidance. Unfortunately, our previous system lacked the resolution and optical throughput for *in vivo* retinal imaging and necessitated removal of cornea and lens. These limitations were predominately a result of optical aberrations from imaging through a shared surgical microscope objective lens, which was modeled as a paraxial surface. Here, we present an optimized intraoperative spectrally encoded coherence tomography and reflectometry (iSECTR) system. We use a novel lens characterization method to develop an accurate model of surgical microscope objective performance and balance out inherent aberrations using iSECTR relay optics.

Biography

Dr. Yuankai K. Tao received his BSE in Biomedical Engineering and Electrical Engineering in 2006, MS and PhD in 2010 from Duke University. From 2010–2013, he was an NIH NRSA postdoctoral fellow in the Research Laboratory of Electronics at MIT. From 2013–2016, he was Assistant Professor of Ophthalmology and Biomedical Engineering at Cleveland Clinic, and Assistant Professor of Biomedical Engineering at Case Western Reserve University. He is currently an Assistant Professor of Biomedical Engineering at Vanderbilt University.

Hyperspectral Imaging in Short Wave Infrared

Mikhail Y. Berezin

Washington University in St. Louis, MO

Abstract

Stain-free imaging has long been a challenge in biomedical imaging due to low contrast between different biological tissues in the conventional visible spectrum. Compare to the visible range, tissue-forming components such as water, lipids, and proteins show distinct spectra in the shortwave infrared (SWIR) region. Taking advantage of tissue-specific spectral features, we derived a stain-free imaging strategy using a hyperspectral imaging technique. In the last five years, our lab has developed hyperspectral SWIR imagers and advanced algorithms to process three-dimensional datasets. Our hyperspectral imaging software ID Cube is capable of automatic processing of hyperspectral datasets, leading to differentiating tissues, discovering new signatures of the disease, and distinguishing the lesions from the normal tissue. We are currently utilizing hyperspectral SWIR in several diverse life-science applications such as the quantification of skin inflammation in humans, the detection of fatty liver in animal models, and analysis of the nerve tissue.

Biography

Dr. Mikhail Y. Berezin is an Associate Professor in Radiology at Washington University School of Medicine in St. Louis. He has a background in chemistry and optical instrumentation with specific training and expertise in medicinal chemistry, optical spectroscopy and image analysis. His lab pioneered hyperspectral imaging in SWIR for biomedical applications. He joined the faculty of Washington University in 2005. He is a primary investigator on a number of NIH, and NSF-funded grants. His work is documented in more than 70 peer-review papers, several book chapters, edited books and patents in this field.

Blood Flow Velocimetry using Divergence-compensatory Optical Flow Method and its Accuracy Analysis

Zifeng Yang¹, Hontao Yu¹, Mark Johnson¹, George Huang¹ and Bryan Ludwig²

¹Wright State University, CA

²Wright State University / Premier Health – Clinical Neuroscience Institute, CA

Abstract

Blood velocity distribution in the vascular system is the key information for diagnosis of many vascular diseases, such as stenosis and aneurysms. Based on digital subtracted catheter angiographic images, detailed blood flow map can be obtained through optical flow method. A divergence compensatory optical flow method (DCOFM) is introduced to process the digital subtraction angiographic (DSA) images of blood flow in human cerebral arteries. To examine the accuracy of the proposed method, DSA image pairs of blood flow with simulated flow field, and transmittance-based dye visualization (mimicking X-ray angiography) of pulsatile tubing flow *in vitro* experiment are utilized for validation. First, for the DSA image validation, the first image is the *in vivo* DSA image of blood flow with contrast agent in cerebral arteries, and the second image is generated by superimposing a given flow field based on computational fluid mechanics simulation results. The recovered velocity map through DCOFM agrees well with the given flow velocity distribution with an averaged error of 6-8%. Second, for the dye visualization image validation, with the same experimental setup, both particle image velocimetry and transmittance-based visualization imaging are employed to make direct comparison of the results. The averaged velocity distribution based on dye visualization underestimates the velocity magnitude by 16-24% in the central region and by 29-43% in the outer region across the tube for a pulsatile flow in comparison with the PIV results.

Biography

Dr. Zifeng Yang is an Associate Professor in the department of Mechanical and Materials Engineering at Wright State University. He earned his PhD degree in Aerospace Engineering at Iowa State University in 2009. His research interests include development of advanced fluid diagnostic techniques, biological fluid measurements, hemodynamics, wind turbines and gas turbines. He has published 25 journal papers and 45 conference papers in various fluids-related field. He is a member of American Physics Society, American Institute of Aeronautics and Astronautics, and American Heart Association.

A Novel Gallstone Gene, *Lith18*, enhances the Formation of Estrogen-induced Cholesterol Gallstones in Female Mice

David Wang¹ and Helen H. Wang

Department of Medicine, Division of Gastroenterology and Liver Diseases, Marion Bessin Liver Research Center, Albert Einstein College of Medicine, 1300 Morris Park Avenue, Bronx, NY

Abstract

Estrogen is an important risk factor for cholesterol gallstone disease because women are twice as likely as men to form gallstones. The classical estrogen receptor α (ER α), but not ER β , in the liver plays a critical role in estrogen-induced gallstones. Our genetic analyses show that the G protein-coupled receptor 30 (*GPR30*), a novel estrogen receptor, is *Lith18*. Thus, the mechanisms underlying the lithogenic effect of estrogen on gallstone formation have become more complicated. We studied whether *GPR30* promotes estrogen-induced gallstones in female mice through a lithogenic action that is independent from that of ER α . We investigated the biliary and gallstone phenotypes in ovariectomized *GPR30* (-/-), ER α (-/-), and wild-type mice injected intramuscularly with the potent *GPR30*-selective agonist G-1 at 0 or 1 $\mu\text{g}/\text{day}$ and fed a lithogenic diet for 8 weeks. The activation of *GPR30* by G-1 enhanced cholelithogenesis by suppressing expression of cholesterol 7 α -hydroxylase, the rate-limiting enzyme for the classical pathway of bile salt synthesis. These metabolic abnormalities led to biliary cholesterol hypersecretion in company with a low secretion rate of biliary bile salts, thereby inducing cholesterol-supersaturated gallbladder bile and accelerating cholesterol crystallization. The prevalence rates of gallstones were 80% in wild-type and ER α (-/-) mice treated with G-1 compared to 10% in wild-type mice receiving no G-1. However, G-1 did not influence gallstone formation in *GPR30* (-/-) mice. *GPR30* produces additional lithogenic actions, working independently of ER α , to increase susceptible to gallstones in female mice. Both *GPR30* and ER α are potential therapeutic targets for cholesterol gallstones in women.

Biography

Dr. David Wang is Professor of Medicine and Director of the Molecular Biology and Next Generation Technology Core of Marion Bessin Liver Research Center at Albert Einstein College of Medicine in New York. His research has been focused on the pathogenesis of cholesterol gallstone disease, nonalcoholic fatty liver disease and nonalcoholic steatohepatitis,

as well as the molecular regulation of hepatic cholesterol, bile salt and triglyceride metabolism. His group has discovered numerous gallstone (*Lith*) genes in inbred mice. He has published 200 research articles, review articles and book chapters and his research has been supported by NIH, foundations and industry grants.

Reactive Oxygen Species Upregulate Expression of Muscle Atrophy-associated Ubiquitin Ligase Cbl-b in Rat L6 Skeletal Muscle Cells

Takayuki Uchida¹, Takeshi Nikawa¹, Yoshihiro Sakashita¹, Katsuya Hirasaka^{1,2}, Ayako Ohno¹, Reiko Nakao¹, Akira Higashibata³, Takeshi Kobayashi⁴ and Masahiro Sokabe⁴

¹Department of Nutritional Physiology, Institute of Medical Nutrition, Tokushima University Graduate School, Tokushima, Japan

²Graduate School of Fisheries Science and Environmental Studies, Nagasaki University, Nagasaki, Japan

³Institute of Space and Astronautical Science, Japan Aerospace Exploration Agency (JAXA), Tsukuba, Ibaraki, Japan

⁴Department of Physiology, Nagoya University, School of Medicine, Nagoya, Japan

Abstract

Unloading-mediated muscle atrophy is associated with increased reactive oxygen species (ROS) production. We previously demonstrated that elevated ubiquitin ligase casitas B-lineage lymphoma-b (Cbl-b) resulted in the loss of muscle volume. However, the pathological role of ROS production associated with unloading-mediated muscle atrophy still remains unknown. Here, we showed that the ROS-mediated signal transduction caused by microgravity or its simulation contributes to Cbl-b expression. In L6 myotubes, the assessment of redox status revealed that oxidized glutathione was increased under microgravity conditions, and simulated microgravity caused a burst of ROS, implicating ROS as a critical upstream mediator linking to downstream atrophic signaling. ROS generation activated the ERK1/2 early-growth response protein (Egr)1/2-Cbl-b signaling pathway, an established contributing pathway to muscle volume loss. Interestingly, antioxidant treatments such as N-acetylcysteine and TEMPOL, but not catalase, blocked the clinorotation-mediated activation of ERK1/2. The increased ROS induced transcriptional activity of Egr1 and/or Egr2 to stimulate Cbl-b expression through the ERK1/2 pathway in L6 myoblasts, since treatment with Egr1/2 siRNA and an ERK1/2 inhibitor significantly suppressed clinorotation-induced Cbl-b and Egr expression, respectively. Promoter and gel mobility shift assays revealed that Cbl-b was upregulated via an Egr consensus oxidative responsive element at -110 to -60 bp of the Cbl-b promoter. Together, this indicates that under microgravity conditions, elevated ROS may be a crucial mechano transducer in skeletal muscle cells, regulating muscle mass through Cbl-b expression activated by the ERK-Egr signaling pathway.

Biography

Dr. Takayuki Uchida entered into doctoral course at Institute of Medical Nutrition, Tokushima University Graduate School on April 2015. Graduated from Institute of Medical Nutrition, Tokushima University Graduate School and got Ph. D (Nutritional science) on March 2018. Served as assistant professor in Department of Nutritional Physiology, Institute of Medical Nutrition, Tokushima University Graduate School on April 2018.

Development of a Computer Aided System for the Early Detection of Breast Cancer using Thermogram Images

Dayakshini

St. Joseph Engineering College Mangaluru, Karnataka, India

Abstract

The change in life style, rapid growth of industries and urbanization resulted in an increase in the rate of breast cancer in younger women. Mammography is commonly used imaging method for detecting breast abnormalities. But mammograms are less effective in women with dense breast, especially in younger women, which may increase the false positive or false negative rate in such patients. Breast thermography is a non-invasive and effective medical imaging tool used for early detection of breast cancer. Computer aided breast cancer detection systems play a vital role in providing accurate evaluation in an objective manner. This research focuses on automation of detection of breast cancer using thermograms, by developing novel approaches for normalization of the temperature matrix obtained from the thermal camera, segmentation of region of interest of the breast, extraction and selection of relevant features and design of an efficient classifier. Temperature matrix normalization algorithm is developed to bring the different range of temperatures to a common scale. A novel, efficient and robust automatic segmentation technique is developed by making use of shape features of breast and polynomial curve fitting. Further, various spatial and spectral texture features are extracted, statistically analyzed and the best subset of features is identified. From the results, it is found that SVM Gaussian classifier attained high accuracy of classification for

spectral features extracted from local energies of wavelet sub-bands. Using these novel approaches, an efficient computer aided system for detection of breast cancer using thermogram images is developed.

Biography

Dr. Dayakshini obtained her Doctoral Degree from Manipal Academy of Higher Education (MAHE) Manipal in the year 2018. She is currently working as an Associate Professor and Head of the Electronics and Communication Engineering Department, St. Joseph Engineering College Mangaluru India. She has nearly 20 years of teaching/research experience in the field of Electronics and Communication Engineering. Her areas of interest include Medical Image and Signal processing. She has published research papers in reputed Web of Science and Scopus indexed international journals and presented papers in international conferences held at Singapore and Malaysia. She is a reviewer of springer and Elsevier journals.

Keynote Presentation

Bioengineered Micro physiological Systems for Drug Safety and Efficacy Testing

Danilo A. Tagle

National Center for Advancing Translational Sciences, National Institutes of Health, MA

Abstract

Approximately 30% of drugs have failed in human clinical trials due to adverse reactions despite promising pre-clinical studies, and another 60% fail due to lack of efficacy. One of the major causes in the high attrition rate is the poor predictive value of current preclinical models used in drug development despite promising pre-clinical studies in 2-D cell culture and animal models. The NIH Micro physiological Systems (Tissue Chips) program led by NCATS is developing alternative approaches and tools for more reliable readouts of toxicity and efficacy during drug development. Tissue chips are bioengineered micro physiological systems utilizing human primary or stem cells seeded on biomaterials manufactured with chip technology and microfluidics that mimic tissue cytoarchitecture and functional units of human organs. These platforms can be a useful tool for predictive toxicology and efficacy assessments of candidate therapeutics. Tissue chips can also contribute to studies in precision medicine, environment exposures, reproduction and development, infectious diseases, microbiome and countermeasures agents.

Examples of the utility of individual tissue chips and multi-organ integrated platforms in drug development will be presented. Presentation will also include examples of effective partnerships with stakeholders, such as regulatory agencies, pharmaceutical companies, patient groups, and other government agencies. In collaboration with International Space Station – National Laboratory, tissue chips are being used to model aging-related diseases and testing of potential new drugs for earth-based use. The unique environment of the ISS-NL allows researchers to study cells in ways not possible on the ground and are helping to advance the field of regenerative medicine.

Biography

Dr. Danilo Tagle is Associate Director for special initiatives at NCATS. He also recently served as acting deputy director of NCATS. He has served on numerous committees and advisory boards, including the editorial boards of the journals *Gene* and the *International Journal of Biotechnology*. He obtained his Ph.D. in molecular biology and genetics from Wayne State University School of Medicine in 1990. He has authored more than 150 scientific publications and has garnered numerous awards and patents.

Featured Presentations

Granulocyte Colony Stimulating Factor (GCSF) Gene Therapy in Stroke and Alzheimer's Disease Model

Jang-Yen Wu*, Jigar Modi, Janet Menzie, Hong Yuan Chou, Rui Tao, Ashleigh Morrell, Paola Trujillo, Kristen Medley, Ahmed Altamimi, Jasica Shen J and Prentice H

Department of Biomedical Science, Charles E. Schmidt College of Medicine, Florida Atlantic University, Boca Raton, FL

Abstract

Granulocyte colony - stimulating factor (GCSF) is an FDA-approved drug that stimulates growth and differentiation of stem cells. Previously we have demonstrated that GCSF is effective as a therapeutic agent for stroke, Parkinson's disease and Alzheimer's disease (AD). Here we report that GCSF gene therapy could provide a new and novel therapeutics for stroke and AD as well. We have designed and constructed AAV-GCSF gene therapy vectors consisting of various promoters e.g., CMV, synapsin 1, or a hypoxia regulated domain (HRE). In PC 12 cell cultures, we found that AAV-GCSF gene therapy significantly increased cell viability from 50% to 80% compared to the control group under three experimental conditions including glutamate -, hypoxia - and A β - induced toxicity. In global ischemic stroke model, we also found that AAV-GCSF

gene therapy greatly increased the survival rate, decreased the infarct size, reduced the stress markers for mitochondria, e.g., DRP1, endoplasmic reticulum, e.g., GRP78, pIRE1, autophagy, e.g., Beclin1 and increased mitochondrial enhancing protein, OPA1 and anti-apoptotic proteins e.g., Bcl-2 as well as improving the behavioral outcome. Similar results were obtained in AD transgenic mouse model including decrease of cellular stress markers, increase of cell survival markers and improvement in behavioral outcome. These results suggest that GCSF gene therapy could provide a new and novel approach for therapeutic intervention in stroke and Alzheimer's disease. (Supported by grant from James and Esther King Biomedical Program, Grant # 6JK08 and AD-Moore Alzheimer's Disease Research Program, grant # AWD-001440 State of Florida; Grant from Aeura Company).

Biography

Dr. Jang-Yen Wu is a Senior Schmidt Fellow and Distinguished Professor at Florida Atlantic University. His research interest is in both basic sciences including neurotransmitter systems such as GABA and glutamate and translational research including developing novel therapeutic intervention for Stroke, Parkinson's, Alzheimer's and Epilepsy. He has also received patents for his inventions. He has published over 300 papers and was recognized as one of the most cited scientists according to Institute for Scientific Information in 2002.

Dynamic Brain Functional Connectivity Informed by Brain Anatomy

Suprateek Kundu¹, Jin Ming¹, Jennifer Stevens² and Ying Guo¹

¹Department of Biostatistics and Bioinformatics, Emory University, Atlanta, GA

²Department of Psychiatry and Behavioral Science, Emory University, Atlanta, GA

Abstract

There has been an increasing recognition that the brain organization is prone to variations across the scanning session, fueling the need for dynamic connectivity approaches. One of the main challenges in developing such approaches is that the frequency and change points for the brain organization are unknown, with these changes potentially occurring frequently during the scanning session. These issues present significant challenges in identifying changes in the brain networks based on fMRI data for single subjects. In one of the first such studies, we propose a novel dynamic brain functional connectivity approach that automatically detects change points in the brain network, guided by brain structural connectivity knowledge obtained from DTI data. Incorporating SC knowledge is designed to yield better power to detect change points and lead to more accurate estimation of dynamic brain networks, particularly when the brain connectivity changes are frequent. We provide rigorous simulation studies to validate the proposed approach compared to existing methods that do not account for the dynamics of the network and/or do not account for brain anatomical knowledge. We apply the method to infer dynamic functional brain networks for task fMRI data in PTSD studies guided by SC knowledge, with the method being able to accurately detect the change points that are close to changes in the block-task design and identify important regions and connections in the brain that drives the PTSD task.

Biography

Dr. Suprateek Kundu is Assistant Professor in Department of Biostatistics at Emory University, who specializes in developing network-based approaches for high-dimensional multimodal data. Dr. Kundu's research is motivated by high-dimensional neuroimaging, genomics, epidemiological, and biomedical data, and he works at the interface of statistics, machine learning, and computer science to address complex systems-wide problems. He often develops novel Bayesian methods informed by prior expert knowledge or existing databases to gain greater power and accuracy for studies with small n and large p . His research is providing new directions in connectome-based science to address challenging biomedical problems in neuroscience and beyond.

Encapsulation of Surfactant Protein A in Biopolymers as a Potential Therapeutic Agent in Sinusitis

George T. Noutsios¹, Aleksandra Grozić¹, Julie G. Ledford², Eugene H. Chang³ and Anastasia A. Pantazaki⁴

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²Department of Medicine & Immunobiology University of Arizona College of Medicine, AZ

³Department of Otolaryngology – Head & Neck Surgery, University of Arizona College of Medicine, Tucson, AZ

⁴Department of Chemistry, Laboratory of Biochemistry, Aristotle University, Thessaloniki, Greece

Abstract

Chronic rhinosinusitis (CRS) is a heterogeneous inflammatory disease of the sinus mucosa affecting patients of all ages with staggering health costs. The sinonasal epithelium (SNE) is the physical barrier between the environmental insults

and the respiratory system and has immunological functions. Therefore, it is the frontline defense mechanism of the whole respiratory system. Surfactant protein A (SP-A) is a critical innate immune molecule secreted by the airway epithelia and can directly eliminate bacteria. Our data show that SP-A is expressed in the SNE and its levels are significantly changed in bacterial infections, suggesting a role in sinus innate immunity [1]. We hypothesize that SP-A plays a role in susceptibility to CRS and its exogenous administration positively affects CRS. We are employing experimental plans that include definition of SP-A role in CRS, identification of endogenous and exogenous factors which come together in a different extent and determine CRS. We are expecting to determine the effects of exogenous SP-A in CRS and whether it helps resolve sinusitis. We have 598 tissues from healthy and CRS patients, SP-A humanized transgenic mice [2] and recombinant SP-A to conduct *in vitro* and *in vivo* studies. To improve the pharmacokinetics and antimicrobial properties of SP-A we are considering encapsulating SP-A recombinant molecules in biodegradable biopolymers [3-5]. The use of nanoparticles for SP-A administration in airway epithelium to ameliorate the innate immune responses in CRS is a new concept and is likely to lead to new horizons in CRS therapeutic regimens.

Funding: Arizona Biomedical Research Grant ADHS18-198882.

Biography

Dr. George T. Noutsios was born and raised in Thessaloniki, Greece, where he studied Biochemistry and Molecular Biology. His dissertation focused on immobilization of antigenic biomolecules in bio-polymeric substrates for detection and diagnosis of endemic *Brucella melitensis* biotypes. In 2011 he came to the USA to pursue his career in lung diseases research. During his postdoc at Penn State Hershey Medical Center (2011-2016), he studied the role of cis-acting elements and trans-acting factors on splicing and translation of the pulmonary surfactant protein A and identified 14-3-3 isoforms and microRNAs as potential therapeutic regulatory molecules in lung diseases.

Laparoscopic Extraperitoneal Uterine Suspension with Suture Line Instead of Mesh

Jing Liang^{*} and Bin Ling

China-Japan Friendship Hospital, China

Abstract

Over the past dozen years, many mesh-based uterine- sparing operative techniques have been created to treat pelvic organ prolapsed (POP) and restore the anatomy of pelvic organs. Because of more and more serious mesh complications, treatment based less on mesh is under much debate and remains a challenge to gynecologists.

Even laparoscopic sacrohysteropexy / sacrocolpopexy is the most commonly performed procedure and considered a highly effective and durable treatment, it is also associated with greater perioperative morbidity and serious mesh-related complications. We have queried those techniques before FDA Alert in 2011, then the first describe was reported in 2010 and improved in 2012. Further exploration substitute suture line for mesh, Laparoscopic extraperitoneal linear uterine suspension, was published in 2017. According to DeLancey Theory, the cervical ring (level I support) is deliberately suspended to the anterior abdominal fascia with non-absorbable suture line. We create a permanent and non-elastic ligament to elevate the uterus to a more physiological axis of the vagina with a tiny thread, which has equivalent effect, much less morbidity and more economical compare with mesh.

Laparoscopic extraperitoneal linear uterine suspension is easy to perform and is associated with fewer mesh-related complications. It is more secure, especially in elderly women and in those with physical complications.

Biography

Dr. Jing Liang completed his MD in the major of gynecology pelvic floor dysfunction and tumor therapy, and she is the Vice director of obstetrics and gynecology department of China-Japan friendship hospital.

Dr. Bin Ling is a Professor and the vice-chairman of the International Society for Minimally invasive and Noninvasive Medicine and the chairman of the committee of noninvasive and minimally invasive medicine of Chinese medical doctor association. Major in gynecology pelvic floor dysfunction and tumor therapy for more 30 years. He was the vice President of Anhui provincial hospital and is now the director of obstetrics and gynecology department of China-Japan friendship hospital.

Image-Guided Surgery using near Infrared Turn-ON Nanoprobes for Precise Detection of Tumor Margins

Rachel Blau¹, Yana Epshtein¹, Evgeni Pisarevsky¹, Galia Tiram¹, Sahar Israeli Dangoor¹, Eilam Yeini¹, Adva Krivitsky¹, Anat Eldar-Boock¹, Dikla Ben-Shushan¹, Hadas Gibori¹, Ori Green², Yael Ben-Nun³, Emmanuelle Merquiol³, Hila Schwartz⁴, Galia Blum³, Neta Erez⁴, Rachel Grossman⁵, Zvi Ram⁵, Doron Shabat² and Ronit Satchi-Fainaro¹

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Abstract

Complete tumor removal during surgery has a great impact on patient survival rate. In order to remove the tumor tissue completely with minimal collateral damage to healthy tissue, there is a need for diagnostic tools that will differentiate between the tumor and its normal surroundings.

We present here the design, synthesis and characterization of a novel polymeric Turn-ON probe that is enzymatically degraded by cysteine cathepsins to generate a fluorescence signal. This polymeric Turn-ON probe was recently reported by us and composed of *N*-(2-hydroxypropyl) methacrylamide (HPMA) copolymer bearing self-quenched Cy5 fluorescent dyes. We studied the kinetics of the polymeric nano-probe on orthotopic breast and melanoma cancer models in mice and showed an improved tumor-to-background ratio. The signal obtained from the tumor was stable and delineated the tumor boundaries during the whole surgical procedure, enabling a more accurate resection. The control groups which underwent standard surgery under white light only, or under the fluorescence guidance of the commercially-available probes ProSense[®] 680 or 5-Aminolevulinic acid (5-ALA) survived less time and suffered from tumor recurrence earlier than the group that underwent image-guided surgery using our Turn-ON probes.

Our “smart” polymeric Turn-ON probe can potentially assist surgeons to decide in real time during surgery regarding the tumor margins needed to be removed, leading to improved patient outcome.

Biography

Ms. Rachel Blau is Ph.D. student in the laboratory of Prof. Ronit Satchi-Fainaro, the chair of the Department of Physiology & Pharmacology, Sackler Faculty of Medicine, Tel Aviv University. Rachel Blau holds a B.Sc. in Medicinal Chemistry, a B.Sc. Pharm. in Pharmacy from The Hebrew University of Jerusalem and a M.Sc. in Medicinal sciences from Tel Aviv University. Rachel joined to Prof. Ronit Satchi-Fainaro laboratory as a M.Sc. student and to continue Ph.D. studies in that lab. Her projects include the synthesis and characterization of novel nanoparticles for therapeutics and diagnostics applications such as real-time monitoring of drug release and image-guided surgery.

Mechanical Properties and *In vitro* Biodegradation of Porous Zn Alloy Scaffolds for Biomedical Applications

Chunxiang Cui¹, Lichen Zhao, Xin Wang, Tiebao Wang and Yuhang Xia

Key Lab. for New Type of Functional Material in Hebei Province, School of Materials Science and Engineering, Hebei University of Technology, Tainjin, China

Abstract

Biodegradable ZnO nano-rods/porous Zn scaffolds were successfully fabricated by treating the porous Zn scaffolds in NaCl solution at 80 °C. X-ray diffraction (XRD) analysis show that the nano-rods *in situ* fabricated on the porous Zn scaffolds in NaCl solution are hexagonal ZnO phase. This result is also confirmed by the observation and calibration of high-resolution transmission electron microscope (HRTEM) with selected area electron diffraction (SAED) and the analysis of X-ray photoelectron spectroscopy (XPS). Compressive tests suggest that the compressive mechanical properties of the ZnO nano-rods/porous zinc scaffolds do not decrease significantly compared with that of the porous Zn scaffolds without treating in NaCl solution. Immersion tests in simulated body fluid (SBF) show that the ZnO nano-rods/porous zinc scaffolds slightly gain in weight after 16 days of immersion. Moreover, these ZnO nano-rods/porous zinc scaffolds can efficiently induce Ca-P precipitation during immersion tests and show a good bioactivity. In addition, antibacterial tests imply that the ZnO nano-rods/porous zinc scaffolds have an excellent antibacterial ability against *Escherichia coli* and *Staphylococcus aureus*.

Biography

Prof. Chunxiang Cui is a Professor in School of Materials Science and Engineering Hebei University of Technology, Director of Key Lab. for new type of functional materials in Hebei Province, an editorial member of Functional Materials, and invited reviewer of many famous Journals. His current academic research embraces the fabrication of *in situ* Metal Matrix composites, biomaterials, low-dimensional composite nanowires and their application in many areas of industry. Prof. Chunxiang Cui has organized and chaired many National Nature Science foundations of China. He owns 41 patents and has published over 400 papers in academic journals.

A Bioreactor System for the Cultivation of a Tissue-Engineered Vascular Graft

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¹Institute of Technical Chemistry, Leibniz University Hannover, Germany

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Abstract

Due to a high atherosclerotic comorbidity in an aging society, bypass operations are frequent. Since synthetic grafts are correlated with medical complications such as infection and thrombosis and autologous veins are rare especially in older patients, tissue-engineered vascular grafts are urgently needed. For the successful *in vitro* cultivation of a tissue-engineered vascular graft, we developed a rotating pulsatile bioreactor system providing all physiologic conditions necessary. Pulsatile flow is induced by a voice coil actuator under constant pressure control using sensors placed on both sides of the vascular graft. Tissue growth is monitored using a high-resolution ultrasound device enabling 3-D image reconstruction. Shear stress as an important tissue forming factor for endothelial cells is estimated using suitable software (COMSOL Multiphysics, CFD-modul). Monitoring systems for pH, pO₂, temperature, glucose and lactate are implemented in the reactor using a flow injection analyzer (FIA).

The tubular scaffold consists of a biodegradable polymer and is 3-D printed using a Cellink Bioprinter. Coated with human fibrin, the microstructured scaffold is seeded with a 5:1 mixture of immature endothelial cells or endothelial progenitor cells and mesenchymal stem cells to form the bioartificial vascular graft in stem-cell conditioned minimal medium. Hypoxic and glucose-deprived culture conditions are monitored with regard to pH, pO₂, temperature, glucose and lactate using a flow injection analyzer (FIA) as well as the dynamic stress, exerted by the pressure-regulated reactor pump system.

Based on this multidisciplinary approach, we envision an automated generation process for a biohybrid vascular graft for the future.

Biography

Mr. Sebastian Heene, born in 1989, studied Life Science at the Leibniz University in Hannover and completed his master's degree in 2017. Currently, he is doing his research at the Institute of Technical Chemistry in Hannover, Germany, under the guidance of Prof. Dr. Med. Cornelia Blume on the subject of developing a bioartificial vascular graft to earn his doctoral degree.

Rational Design of *In situ* Tissue Engineered Vascular Grafts in Aged Hosts

Piyusha S. Gade^{*}, Keewon Lee, Yadong Wang and Anne M. Robertson

University of Pittsburg, PA

Abstract

In situ engineered vascular grafts offer a much-needed alternative to Dacron, and often unavailable autologous grafts for treating atherosclerosis. State-of-the-art technology like small diameter (800µm) poly (glycerol sebacate) (PGS) grafts developed by Wang *et al.* have demonstrated functional new artery (neoartery) formation with mature elastin and collagen. However, the fundamental mechanisms guiding growth and remodeling (G&R) of these grafts remain unknown, impeding efforts to translate their success across age and species. In this work, we translated, for the first time, neoartery formation to an aged murine model and aimed to tailor our constrained mixture theory-based G&R tool with this experimental data. We performed carotid artery interposition grafting of PGS grafts in young (n=35) and aged (n=15) rats (Fig. 1A, B). Our G&R tool described using the following strain energy equation

$$W(s) = \Sigma W^\alpha(s) = \frac{\rho^\alpha}{\rho(s)} Q^\alpha(s) \widehat{W}^\alpha(\mathbf{C}_{n(0)}^\alpha(s)) + \int_0^s \frac{m^\alpha(\tau)}{\rho(s)} q^\alpha(s - \tau) \widehat{W}^\alpha(\mathbf{C}_{n(\tau)}^\alpha(s)) d\tau$$

was tailored using (a) simultaneous biaxial inflation testing with multiphoton imaging, (b) histological, and (c) biochemical data. Older neoarteries (ONs) exhibited an altered mechanical state at 180 days as compared with young neoarteries (YNs) (Fig. 1C). ONs exhibited higher circumferential stiffness with collagen microstructure exhibiting a preferential axial direction as opposed to YNs which demonstrated biaxial collagen fiber orientation. Our tailored G&R tool was validated by comparing against experimentally measured collagen deposition (Fig. 1D). In the future, this validated tool can be used to predict long-term G&R and understand salient mechanisms guiding G&R. Such an approach can be instrumental in rational design of vascular grafts across age and species.

Biography

Ms. Piyusha Gade is a graduate student in Bioengineering at the University of Pittsburgh. She has been conducting research to understand the process of growth and remodeling of soft tissues, in particular, *in situ* engineered vascular grafts; a state-of-the-art technology that harnesses host remodeling ability to develop new tissue upon polymer degradation. She combines the techniques from soft-tissue biomechanics, continuum mechanics, mechanical testing and advanced imaging to develop tools and techniques for understanding the role of biomechanics in new tissue regeneration.

Expression of HIF 1 α , TERT, XIAP, p53, Caspase3 in 24 *denovo* Glioblastoma Patients

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²Department of Radiation Oncology, Apollo Specialty Cancer Hospital, Chennai, India

Abstract

Aim: Glioblastoma expresses varied levels of different gene transcripts or proteins. Studying the immune-histochemical expression of hypoxia inducible factor 1 α (HIF1), Telomerase reverse transcriptase (TERT), X-linked inhibitor of apoptosis protein (XIAP), tumor protein 53 (p53) and Caspase3 may help in prognosis and predicting radio-chemo resistance.

Methods: We studied Immunohistochemistry (IHC) expression for five biomarkers on 24 FFPE blocks of GBM patients treated between January 2014 and October 2015. The minimum follow up period was 14 months. All patients underwent the standard treatment of maximal surgical resection followed by concurrent chemo radiation and adjuvant Temozolomide. Monoclonal antibodies were used for P53 and TERT. Polyclonal antibodies were used for caspase 3, HIF1 and XIAP. Immuno reactive score (IRS) was used to assess protein expression based on intensity of staining and percentage of positive tumor cells. The protein was considered “overexpressed” for IRS “median and “under expressed” for IRS < median. Kaplan; Meir analysis was used to calculate the overall survival and log; rank test was used to assess the statistical significance of any differences in survival associated with protein expression.

Results: The median overall survival was 13 months in the entire group. 66.7% patients showed nuclear overexpression of HIF1 particularly in the areas of endovascular proliferation and 26.3% patients showed cytoplasmic overexpression of XIAP. 54.2% patients showed cytoplasmic Caspase3 overexpression. Only 37.5% patients showed nuclear overexpression of p53. There was no statistically significant difference in survival between under expressed and overexpressed groups of HIF1 (P = 0.69), Caspase3 (P = 0.77), XIAP (P = 0.16) and p53 (P = 0.81). 58.3% patients showed nuclear overexpression of TERT. The median survival in under expressed and overexpressed TERT group was 11 and 17 months respectively which was statistically significant (P < 0.04).

Conclusions: Our study shows only TERT overexpression as a marker for better survival in GBM patients. Further analysis with next; generation sequencing will help us to identify TERT as one of the prognostic biomarker.

Biography

Prof. Rama Shanker Verma has expertise, leadership, training, expertise and motivation necessary to successfully carry out the proposed/academic responsibility, research and healthcare management project. His research includes live tissue regeneration for Tissue Engineering, Stem construction of Scaffolds for cardiac tissue regeneration, Cancer stem cell, Biomarker and pathways studies in Fanconi anemia. Construction and production of Bacterial and Humanized Immunotoxin for cancer therapeutics and Monoclonal antibody production are my other research priorities, he is also involving several academic and industrial activities related to institute, state and several government departments.

Poster Presentations

Stability of Hyaluronic Acid Nanoparticles under the Simulated Conditions Associated with their Bio-Applicability

Zuzana Bilkova¹, Jitka Kasparova¹, Anna Lierova², Jiri Palarcik³, Lucie Korecka¹, Zuzana Sinkorova² and Lenka Ceslova⁴

¹Department of Biological and Biochemical Sciences

²Department of Radiobiology, Faculty of Military Health Sciences, University of Defence in Brno, Czech Republic

³Institute of Environmental and Chemical Engineering,

⁴Department of Analytical Chemistry, Faculty of Chemical Technology, University of Pardubice, Czech Republic

Abstract

There is no one doubt that the medicine of the 21st century will more and more exploit the benefits arising from the use of nanotechnologies and nanomaterials (NM). Nanomaterials of various compositions and structures have been already today applied in clinical practice for therapeutic or diagnostic purposes, e.g. drug delivery systems (DDS), systems for immunotherapy, orthopaedic implants with improved biocompatibility, imaging probes for diagnostics [Buzea C. 2007]. As many clinical trials suggested, the medical applicability of NM is strongly dependent on their biocompatibility and controlled biodegradability. Therefore, the biopolymers characterized by minimal or no toxicity such as hyaluronic acid, chitosan, poly(lactic acid), poly(lactic-co-glycolic acid) or poly(caprolactone) have come to the forefront of scientist's interest. Hyaluronic acid is mostly noted as a biocompatible and biodegradable material suitable as a transporting phase and backbone for DDS. In this study, structural stability of hyaluronic acid nanoparticles (HA-NPs) as a biocompatible material suitable for DDS application has been elucidated. HA-NPs prepared by two different protocols (cross-linked by conventional adipic acid dihydrazide or newly by bis(3-aminopropyl)amine) were exposed to conditions simulating the environment related to their potential bio-applicability, e.g. extreme temperature, drying and re-swelling, enzymatic degradation and gastric juice treatment. Results have been discussed with respect to their feasible bio-applicability.

This work was supported by OP RDE project NanoBio Strengthening interdisciplinary cooperation in research of nanomaterials and their effects on living organisms^a, reg. n. CZ.02.1.01/0.0/0.0/17_048/0007421.

Biography

Prof. Zuzana Bilkova is graduated in Molecular Biology and Genetics at Charles University (Prague, CZ) and currently she is a Professor of immunology and immunochemistry at the University of Pardubice (CZ). During her twenty-year academic career, she has been named as a head of Department of Biological and Biochemical Sciences. Her scientific expertise can be summarized: surface modification and biofunctionalization of nanomaterials and their application in immunochemistry, bioaffinity chromatography and biosensing. Up to the present days, she has published more than 110 papers and gave more than 45 oral presentations at seminars, workshops, conferences.

Gene Therapy of Nonalcoholic Fatty Liver Disease (NAFLD) in Mice

David Wang* and Helen H. Wang

Department of Medicine, Division of Gastroenterology and Liver Diseases, Marion Bessin Liver Research Center, Albert Einstein College of Medicine, 1300 Morris Park Avenue, Bronx, NY

Abstract

ApoA-V is a new member of the apolipoprotein family and is synthesized exclusively by the liver. Lack of apoA-V leads to hypertriglyceridemia in humans and mice. We have found that chow-fed apoA-V KO mice spontaneously develop NAFLD. Herein, we performed gene transfer experiments to study the mechanisms underlying apoA-V specific effects on NAFLD pathogenesis and explore whether KO mice transduced with AAV2/8 carrying human *APOA-V*, but not *LacZ* (as control), are protected against NAFLD. Male apoA-V KO and WT mice were transduced with AAV2/8-*APOA-V* or AAV2/8-*LacZ* (1×10^{12} vg/mouse), and maintained on chow diet for two months. We found that compared to WT mice, apoA-V deficiency reduced hepatic VLDL secretion by impairing its lipidation and maturation. Hepatic carnitine palmitoyltransferase-1 mRNA and protein levels were reduced by ~60% ($P < 0.01$) in KO mice. Moreover, there was a decrease in fatty acid β -oxidation and energy expenditure. These alterations resulted in the accumulation of excess triglycerides in the form of enlarged lipid droplets that manifested as NAFLD. All abnormalities in hepatic triglyceride metabolism in KO mice were prevented by gene transfer of AAV2/8-*APOA-V*, but not AAV2/8-*LacZ*. As a result, NAFLD in KO mice was

prevented upon transduction with AAV2/8-*APOA-V*. We conclude that apoA-V deficiency severely disrupts hepatic fatty acid β -oxidation and VLDL secretion, leading to spontaneous development of NAFLD. Overexpression of the human *APOA-V* in the liver prevented NAFLD in mice. These studies provide insight into the role of apoA-V in the pathogenesis of NAFLD and identify potential novel targets for pharmacological intervention in NAFLD.

Biography

Dr. David Wang is Professor of Medicine and Director of the Molecular Biology and Next Generation Technology Core of Marion Bessin Liver Research Center at Albert Einstein College of Medicine in New York. His research has been focused on the pathogenesis of cholesterol gallstone disease, nonalcoholic fatty liver disease and nonalcoholic steatohepatitis, as well as the molecular regulation of hepatic cholesterol, bile salt and triglyceride metabolism. His group has discovered numerous gallstone (*Lith*) genes in inbred mice. He has published 200 research articles, review articles and book chapters and his research has been supported by NIH, foundations and industry grants.

UV-NBS Photocross Linking of Antibodies Utilizing Various Light Intensities

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²Department of Emergency Medicine, Indiana University School of Medicine, IN

Abstract

The nucleotide binding site (NBS), found in the Fab variable domain of all antibody isotypes, can be utilized for site-specific functionalization of antibodies. UV exposure (254nm) to a small molecule, indole-3-butyric acid (IBA), that has high affinity to the NBS can be used to photocrosslink ligands to antibodies. Here, we demonstrate a method to modify antibodies by photo crosslinking with various intensity UV light sources: UV crosslinker XLE-1000 (40-watt), handheld EF-160C (6-watt), and Minimax UV-5NF (5-watt). The different sources possess different power levels and by modulating both time of UV exposure and distance from the source crosslinking at the NBS for affinity tags (IBA-Biotin) and fluorescent molecules (IBA-FITC) was optimized. Application of the UV-NBS photocrosslinking technique is possible by first incubating the antibodies, Rituximab [chimeric anti-CD20] and Tocilizumab [chimeric anti-IL6R] (12-15 μ M), with IBA-FITC (300 μ M) followed by defined exposure times and distances from the UV sources in triplicate experiments. Conjugation efficiency was determined via absorbance/fluorescent measurements to quantity conjugated IBA-FITC/Antibody. Through modulating time and distance from the UV source, conditions were optimized to allow for efficient crosslinking at the NBS with all 254nm sources while maintaining antibody antigen binding activity and Fc recognition. This study demonstrates that the UV-NBS site-specific antibody modification technique can be accomplished using UV light sources with differing light intensities expanding its implementation potential by making the crosslinking technique more widely accessible. Ultimately, the UV-NBS method is a reproducible, efficient, and site-specific technique for functionalizing antibodies with significant potential to advance biomedical technologies in diagnostic and therapeutic settings.

Biography

Ms. Celia Ochoa is a graduate student at Indiana University-Purdue University Indianapolis (IUPUI) pursuing a Bachelor of Science in Biomedical Engineering with emphasis in instrumentation. She is a member of the Alves Lab which focuses on the development of translational technologies, treatments, and techniques for clinical applications. Her project involves further developing a novel site-specific antibody conjugation method to be utilized for the development of next generation pharmaceutical antibodies and enhanced medical diagnostics. She has presented her work at numerous conferences, including the Emerging Researchers National Conference in DC, where she tied for 1st place poster in the Biological Sciences division.

Cylindrical Reactor for Treatment of Biomedical Surfaces by Plasma Electrolytic Oxidation

Karenina Paiva¹, Paulo Guerra¹, Ângelo Guerra¹, Andréa Pinheiro¹, Karilany Coutinho¹, João Lacerda², João Santos², Ricardo Valentim¹, Janaina Silva¹ and Custódio Guerra Neto¹

¹Federal University of Rio Grande do Norte, Brazil

²Federal Institute of Education, Science and Technology of Rio Grande do Norte, Brazil

Abstract

Until nowadays, many studies have been performed in search of biocompatible materials for the manufacture and treatment of implants, mainly in the orthopedic and dental area. There is a wide spectrum of surface modification techniques available. Among these techniques, Plasma Electrolytic Oxidation presents itself as an attractive technique for biomedical

applications due to its characteristics that favor osseointegration. A limitation of existing reactors, in terms of geometry, is the difficulty of obtaining a uniform treatment in multi-faceted parts. Within this circumstance, a new reactor geometry was designed, developed and manufactured for surface treatments in scale and with better uniformity. The validation of the fabricated prototype was performed through treatments of a set of titanium cylindrical samples immersed in an electrolytic bath for 8 minutes. The voltage used was 290 V with direct current. To characterize the coating thickness of the samples the techniques of Optical Microscopy and Scanning Electron Microscopy (SEM) were used. To obtain the chemical composition and phase of the coating, the technique of Energy Dispersive X-Ray Spectroscopy (EDS) was used. In the study of wettability, the sessile drop technique was used. The newly designed reactor geometry presented promising results as it was able to produce homogeneous, porous, hydrophilic coatings. The new reactor demonstrated production scalability, maintaining suitable properties for biomedical surfaces. Finally, it is believed that by using the same solution for a set of samples, there is a reduction in production costs.

Biography

Ms. Karenina Paiva has completed her Bachelor's in Science & Technology and Materials Engineer from the Federal University of Rio Grande do Norte (UFRN), Brazil and Master's degree in Science, Technology and Innovation (MPInova/UFRN), Brazil. She is a Researcher of Laboratory of Technological Innovation in Health (LAIS/UFRN) in the field of Bioengineering.

PVP-based Scaffolds for Neural Tissue Engineering

Manar A. El-Naggar^{*}, Hassan El-Fawal and Nageh K. Allam

The American University in Cairo, Egypt

Abstract

Spinal Cord Injury (SCI) is a devastating condition, leading to permanent loss of motor and/or sensory functions. Full recovery after SCI is usually hindered by the pathological microenvironment in the site of injury. Recently, surgical procedures involving insertion of scaffold or conduit in the site of injury is done to enhance neural regeneration and functional recovery. The rational of using implanted scaffolds is to support growing neurons physically and to stimulate growth cones to help in axonal elongation and regeneration. Electrospun nanofibers scaffolds gained special interest in this context as electrospinner produces a mesh closely compared to the extracellular matrix in tissue. Also, nano-features of the fibers provide high surface area to volume ratio and porosity. The aim of this research is to fabricate novel nanofibers composed of polyvinylpyrrolidone (PVP) and containing growth factors through electrospinner to be used as a substrate for neural regeneration after spinal cord injury. Nanofiber scaffold has been produced, scanning electron microscope revealed uniform diameter distribution ranging from 200 – 300 nm. Surface and bulk properties of the material to be characterized, including FTIR, biodegradation rate, pore size distribution. Biocompatibility and cellular growth will be tested using PC12 cell line.

Biography

Ms. Manar El-Nagar is a Master student in Nanotechnology program at the American University in Cairo. She has a B.Sc. degree in Pharmaceutical Sciences from faculty of Pharmacy, Alexandria University in July 2017. During her undergraduate studies, she has joined "Cancer Nanotechnology Research Laboratory" where the focus was to fabricate novel drug delivery systems for chemotherapeutics. In September 2018, she had participated in SensUS competition, Netherlands, and won "Public Inspiration Award". In February 2019, Manar's team and herself proposed a novel solution for sustainable cities and it was recognized in the United Nations "Innovate Green Competition" as one of the top three ideas.

Keynote Presentation

Sensors for Biological Fluids: From Solid Electrodes to Paper-based Devices

Sadagopan Krishnan*, Vini Singh, Charuksha Walgama, Gayan Premaratne, Rajasekhara Nerimetla, Jinesh Niroula, and Zainab Al Mubarak

Department of Chemistry, Oklahoma State University, Stillwater, OK

Abstract

New in vitro diagnostic approaches are crucial to accomplish minimally and non-invasive detection of health abnormalities. In this regard, robust and reliable sensor designs for selective detection of desired ultra-low levels of molecules are significant for improving human health and longevity of life. We present here a series of first electrochemical approaches combined with surface plasmon imaging for measuring insulin, and autoantibodies present in human serum. Quantitative insights into biosensor assemblies and surface chemistry designs by electrochemical, micro-gravimetric, and spectroscopic methods will be presented. Among others, we present our pyrenyl-nanocarbon and graphenyl surface with enriched chemical functionalities for highly sensitive biosensing of large serum biomolecules as well as small molecules (e.g., formaldehyde present in urine). Both solid and paper-based electrodes have been successfully designed for our sensor development.

Biography

Dr. Sadagopan Krishnan is currently an Associate Professor at Oklahoma State University. He obtained a PhD in Bioanalytical Chemistry under the supervision of Prof. Jim Rusling, University of Connecticut, Storrs, USA. He pursued his postdoctoral research with Prof. Fraser Armstrong at Oxford University, UK. His research interests are in Point-of-care methods, Clinical Biosensors, Biocatalysis, Biomarker validation, and Small-molecule screening. He is a contributing author of 56 peer-reviewed publications, including three book chapters, two cover articles, and two review articles. He has been a peer-reviewed for 37 journals from ACS, RSC, Wiley, Springer, and Elsevier publishers. He has served in the grant review panels of several federal agencies.

Electrochemical Phosphate Sensors using Silver Nanowires Treated Screen Printed Electrodes

Qiquan Qiao*, Md Faisal Kabir, Md Tawabur Rahman and Ashim Gurung

Department of Electrical Engineering and Computer Science, Jerome J. Loehr College of Engineering, South Dakota State University, Brookings, SD 57007

Abstract

Essential biomolecules of the human body and plant growth depend upon the proper amount of phosphate ions. Phosphorus has critical values in both agricultural and biomedical applications. There is a need for inexpensive, portable, repeatable, highly sensitive and field deployable sensors with wide detection range to monitor the health of water system and field soil. This work aims to develop an electrochemical phosphate sensor using novel ammonium molybdate tetrahydrate/silver nanowires (AMT/AgNWs) modified screen printed electrode (SPE) for phosphate detection to achieve simplicity, high sensitivity, wide detection range, and high repeatability and portability. The cyclic voltammetry measurements exhibited the sensitivities of AMT modified SPE without and with AgNWs are $0.1 \mu\text{A}/\mu\text{M}$ and $0.71 \mu\text{A}/\mu\text{M}$, respectively. The use of highly conductive AgNWs significantly increased the sensitivities of the AMT/SPE. Besides, AgNWs and AMT modified SPE (AMT/AgNWs/SPE) showed a very wide detection range of $5 \mu\text{M} - 1 \text{mM}$. The maximum relative standard deviation (RSD) of around 5% confirms the repeatability of the proposed sensor. Our work suggests that AMT/AgNWs/SPE is promising for simple, low-cost, and portable phosphate ion detection.

Biography

Dr. Qiquan Qiao is Harold C Hohbach Professor and graduate coordinator in Electrical Engineering at South Dakota State University (SDSU). Current research focuses on biomedical sensors, agriculture sensors, polymer photovoltaics, dye-sensitized solar cells, Perovskite solar cells and lithium ion batteries. He has published more than 150 peer reviewed papers in leading journals including Energy and Environmental Science, Journal of the American Chemical Society, Advanced Materials, Advanced Functional Materials, Advanced Energy Materials, Joule, and Nano Energy, etc. He has received 2016 Faculty Award for Global Engagement: Excellence in International Research, 2014 F O Butler Award for Excellence in Research at SDSU, 2010 US NSF CAREER, and 2009 Bergmann Memorial Award from the US-Israel Bi-national Science Foundation.

A Simple and Low Cost Biosensor for Point-of-care Detection in Health Care and Environmental Monitoring

Jayne Wu¹, David Mansom, John Smith and Fred Cox

The University of Tennessee, Knoxville, TN

Abstract

The past decades have witnessed rapidly growing demands for portable, low-cost bioassays with minimal complexity in manufacturing, operation and instrumentation and provide reliable real-time information for clinical diagnosis and environmental monitoring. To address this need, an “AC electrokinetics based capacitive (ABC) sensing” method is developed that is capable of rapid, low cost and simple-to-operate specific assay for use with practical samples. The major innovation with this sensing technology is its ability to simultaneously induce microfluidic enrichment of analytes and to interrogate directly the sensor’s interfacial capacitance. The deposition of macromolecules on the electrode surface can be sensitively detected by monitoring the interfacial capacitance of electrode. “ABC sensing” method is extremely sensitive and specific and is capable of sample-in-result-out within seconds, while also satisfies the requirements of being rapid, low cost, robust, and simple-to-use in a resource-limited setting. A series of proof-of-concept experiments have been conducted detecting specific antibodies, virus particles, and small molecules from practical samples. Preliminary experiments with practical samples have highly encouraging results, with limits of detection around 100 copies/μL for nuclei acids, 4.5 fg/mL for specific antibody, 15 pg/mL for virus particles, and 100 aM for small molecules/chemicals, which is on par with the best laboratory assay available and ours is a rapid on-site technology. This talk will present the mechanisms, assay development and testing results of field samples for detection of antibody, virus and small molecules.

Biography

Prof. Jayne Wu is a Professor with the Department of Electrical Engineering and Computer Science, The University of Tennessee, Knoxville (UTK). She also directs a UTK Organized Research Unit—Initiative for Point-detection and Nano-bio-sensing. She received her Ph.D. in Applied Physics from the Chinese Academy of Sciences in 1999, and the Ph.D. in Electrical Engineering from University of Notre Dame (UND), Notre Dame, IN, in 2004. From 2003 to 2004, Dr. Wu was a Postdoctoral Research Fellow with the Center for Microfluidics and Medical Diagnostics, UND. Her research interests are bio-micro-electromechanical systems, sensors, microfluidics, and lab-on-a-chip.

Integrated Multi-Analyte Sensor and Instrumentation for Real-Time Chemical Imaging

Tom Chen

Dept. of Electrical & Computer Engineering, School of Biomedical Engineering, Colorado State University, Fort Collins, CO

Abstract

Monitoring and analyzing multiple analytes can give unique insight into biological process. Miniature electrochemical sensors integrated with instrumentation circuits provide high-performance and high-temporal resolution, allowing real-time monitoring of biological processes of interest. Furthermore, modern silicon CMOS technology makes it possible to pack thousands of miniature electrochemical sensors in an area suitable for small biological samples, providing high-spatial resolution at the cellular scale to monitor changes in target analytes in real-time.

Real-time chemical imaging with high spatial and/or temporal resolutions are highly desired for better understanding of molecular and cellular dynamics. For instance, analysis of glucose metabolism, extra-cellular acidification rate (ECAR), and mitochondrial respiration for small biological samples, such as single cells and tumor biopsies, allows more meaningful analyses of cell metabolism than previously possible. In addition, real-time chemical imaging with high spatial resolution can further enhance traditional fluorescent microscopy to unveil mechanisms of cell-to-cell communication, important signaling pathways, and efficacy of therapeutics.

We present some preliminary work on integrated multi-analyte sensor systems to produce real-time chemical images with high spatial and temporal resolutions. We highlight an integrated multi-analyte monitoring system capable of real-time measurements of oxygen and glucose consumption rates (OCR and GCR) and lactate production rate (LPR) from the same biological sample during the same time to provide better insight understanding of bioenergetics in conditions of health and disease. Furthermore, we demonstrate a microelectrode array system with 16K electrodes integrated with bioinstrumentation to achieve real-time 2D chemical imaging to monitor catecholamine from tissue slices.

Biography

Prof. Tom Chen is a Professor at the Department of ECE and School of Biomedical Engineering. He received his B.S.

from Shanghai Jiaotong University and Ph.D. from the University of Edinburgh. His research interests include biosensors and bioelectronics. Dr. Chen has over 160 refereed journal and conference publications in VLSI circuits and biosensor circuits and systems. Dr. Chen provided expert opinions for the FTC, and guest edited several IEEE and Elsevier journal on CMOS circuit designs. Dr. Chen is a member of the Steering Committee for IEEE MWSCAS. He currently holds Business Challenge Endowment Professorship at Colorado State University.

Measuring Cell Sickling using A Portable Electrical Impedance-Based Sensor

Sarah Du¹, Jia Liu and Darry Diejustice

Florida Atlantic University, FL

Abstract

Sickle cell disease (SCD) is a common inherited hematological disorder, caused by a single mutation on the hemoglobin gene that results in abnormal hemoglobin S. Patients of SCD suffer from chronic and acute pain episodes as a result of vaso-occlusion by rigid sickle cells. The reported life expectancy of SCD patients in the US is below 50 years. Currently there is no field sensor for monitoring the hematological activity in SCD patients. To overcome this obstacle, we developed a portable sensor that integrates microfluidics, impedance sensing with smart phone technology. The developed sensor system provides a measurement of kinetics of cell sickling events, a primary hematological parameter that is linked to disease severity, therapeutic treatment, and risk of vasoocclusion in SCD. The impedance measurement of cell sickling events were verified by the hypoxia-induced morphological change in sickle cells using microscopic imaging.

Biography

Dr. Sarah Du is an Assistant Professor in the College of Engineering and Computer Science, Florida Atlantic University. She earned a Ph.D. degree of Mechanical Engineering from Stevens Institute of Technology in 2011. Her area of research includes cell biomechanics and biophysics, biosensors, as well as *in vitro* disease models of blood vasoocclusion and placental malaria.

An Artificial Intelligent Smart Brace System for the Treatment of Adolescent Idiopathic Scoliosis

Edmond Lou

University of Alberta, Canada

Abstract

Scoliosis is a lateral curvature of spine with vertebral rotation. Brace treatment is the only proven non-surgical treatment for adolescent idiopathic scoliosis to stop the curve progression. Most researchers believe that to be effective, the spinal brace must be worn as prescribed in both compliance and tightness. Compliance is the time that the brace is worn relative to the prescribed time and the tightness is the force measures at the major brace pad relative to the prescribed value. In term of the biomechanical theory, brace actions depend on either the brace provide mechanical support to the body (passive) or the patient pulling away from the pressure sites (active). The active component seems to be more important for curve correction. Our team developed a wearable microcomputer system to monitor and maintain loads exerted by braces. This system not only recorded how well and how much time the brace had been used, but also helped patients to ensure that the brace was being worn as the prescribed tightness. Preliminary clinical results showed patients can stop curve progression. To correct the spinal curve, the firmware of the system was upgraded by adding a machine learned algorithm so that the major pad force was gradually increased. Laboratory experiments were conducted and validated that the system was functioned as expected. The system was able to communicate with an iPad via Bluetooth for system set up and data download. Clinical trial is the next step to evaluate the effectiveness of this AI smart brace system.

Biography

Dr. Edmond Lou received his Ph.D. degree in Electrical and Computer Engineering from the University of Alberta in 1998. Currently, he is an Associate Professor in the Department of Electrical and Computer Engineering and an Adjunct Associate Professor in the Departments of Surgery, Radiology and Diagnostic Imaging, Pediatric and Biomedical Engineering at the University of Alberta. He is also the research leader of the Edmonton Scoliosis Interdisciplinary Research Group. Dr. Lou has published over 100 peer refereed manuscripts and held 6 US patents. His research interests including low power embedded systems, wireless communications, image and signal processing, and biomedical instrumentation.

Prediction of Organ-at-Risk Vulnerability to Excessive Radiation Dosage: Application of Deep Neural Network in Radiation Treatment Planning for Prostate Cancer Patients

Maryam Tavakoli¹, Boshu Ru, and Yaorong Ge

University of North Carolina at Charlotte, NC

Abstract

Purpose: The study is to assess patients' vulnerability to receive excessive dosage of radiation in each organ-at-risk (OAR) based on geometric information in CT images.

Data: The dataset is a collection of matrices containing distance values extracted from 216 prostate cancer patients who received radiation treatment.

Methods and Material: The distance matrices can be perceived as 2D and 3D depth of each point in CT slices from target volume (prostate cancerous region) perspective. Thus, we took advantage of transfer learning from image processing domain (beginning blocks of VGG16), while we were training a convolutional neural network classifier. The vulnerability labels were extracted through a balanced binary definition from OAR's dose-volume-histogram (DVH). Four levels of abstractions in transferring features were evaluated for bladder and rectum using 5-fold cross-validation strategy. The results were compared according to various metrics including accuracy.

Result: The results demonstrated higher performance in vulnerability prediction of bladder (accuracy ~ 90%) than rectum (accuracy ~ 55%) as well as more sensitivity to transferred-feature abstraction. The experiments' results will be explained with respect to the organs' anatomy and how they lead us to a better architecture design.

Conclusion: Despite potential advantages of using deep learning over traditional machine learning, the limitation of high-quality labeled data-source in radiation treatment planning presents a challenge in this domain. This study was a preliminary step in combining the previous knowledge of the domain (ex. distance matrices) with the learned features from other domains (ex. image processing) to compensate this shortage of the data.

Biography

Ms. Maryam Tavakoli received her master in Artificial Intelligence from Isfahan University of Technology and is pursuing PhD at UNC Charlotte. Her area of research is theory and applications of machine learning with the current concentration on radiation treatment planning. Additionally, she has experience of research and/or internship at Rakuten – Intelligence, AOL – Verizon, and Institute of Social Capital – UNCC during her PhD study.

Light Focusing Inside Scattering Media via Digital Optical Phase Conjugation Technology

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Abstract

Focusing light inside a scattering medium has attracted the attention of biomedical scientists due to its potential applications. In recent years, wavefront shaping techniques have been intensively studied to compensate for the wave disturbance caused by the inherent microscopic refractive index inhomogeneity in scattering media, enabling refocusing light through or inside scattering media. Accordingly, several methods have been proposed, including feedback-based wavefront shaping, transmission matrix measurement, and optical phase conjugation (OPC). Specifically, digital OPC (DOPC) emerges as a compelling method, featuring a large peak-to-background ratio (PBR) and high speed. DOPC directly measures the wavefront of the tagged photons for optimal phase conjugation, enabling fast focusing inside a scattering medium within 10 ms.

To explain the impact of the various factors on the focusing performance inside a dynamic scattering medium, we establish an angular-spectrum model to trace the field propagation during the whole process of optical phase conjugation in the presence of scattering media. By incorporating fast decorrelation components, the model enables us to investigate the competition between the guide star and fast tissue motions for photon tagging. To further improve the PBR of the light focusing inside scattering media, we proposed polarization modulation based generalized DOPC considering that polarization modulation based SLMs are commercialized for electronic displays and have increasingly large pixel counts with the prevalence of 4K displays.

Biography

Dr. Jiamiao Yang works as a postdoctoral scholar in Andrew and Peggy Cherng Department of Medical Engineering, California Institute of Technology. He got his PhD degree in Beijing Institute of Technology, China. His main research interests focus on optical wavefront shaping, photoacoustic microscopy, optical measurement, and optical instrument researching. He has published more than 10 peer-reviewed articles in journals as the first author, including Nature Communications, Optica, Applied Physics Letters, and Optical Letters.

Predictive Medication using Cloud Computing

Avijit Goswami

Amazon Web Services, CA

Abstract

In today's digital age, availability of health-related information is not only limited to traditional sources like Clinical data, Claims Data, NIS (National Inpatient Sample) and EMRs but they are also being made available from digital sources like Smart Watch, Health Trackers, Glucose Meters, Blood Pressure Monitors and many other newer personal electronics devices. Patients are also often sharing their medical treatment related information and reaction to certain medicines in Social Media pages like Twitter or Facebook which in turn making the medical data available in the social media pages of renowned pharmaceutical companies. As a result, these digital sources are continuously generating huge amount of health-related information and effective use of all this valuable information can help create statistical models that can predict certain medical condition for a patient or provide recommended lifestyle changes or prescription medicines for certain individuals.

This presentation is intended to explain how to effectively use Amazon Web Services to build a scalable platform to analyze the medical data coming from diversified sources and make early recommendations to patients. The solution architecture for this problem will be comprising of AWS IoT Core, Amazon S3, Amazon Comprehend Medical, Amazon SageMaker, Amazon QuickSight and others. The presentation will provide insights about all the above AWS Components and how those components works together to build an end to end solution.

Biography

Mr. Avijit Goswami is a seasoned Software Architect with more than 20 years of industry experience. He has worked on multiple research initiatives in the areas of Bio Technology, Big Data, Databases and Performance engineering which got published in internationally recognized journals like IEEE and CMG Measure IT. Currently, Avijit is working as a Sr. Solutions Architect in Amazon Web Services and helping his Strategic and Start-up customers to build their Infrastructure and Application on Cloud conforming to AWS Well Architected methodologies including Operational Excellence, Security, Reliability, Performance, and Cost Optimizations. His areas of interest are in application of Data Analytics and Machine Learning to improve human life.



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