UC Merced Center for Excellence on Health Disparities Undergraduate Student Project Abstracts

Inaugural Cohort

Prior Use of Telemedicine and Challenges among California Specialty Physicians.

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Telemedicine is defined as the delivery of health services via remote telecommunications. This includes interactive consultative and diagnostic services. One goal of telemedicine is to provide specialty care to underserved populations from a distant point. UC Merced in partnership with Valley Telehealth has established six telemedicine sites across the San Joaquin Valley. In order to understand the barriers that specialists confront using telemedicine, surveys were sent to 11,887 California licensed specialists in 27 medical specialties across California via email addresses available on a public database. Thirteen questions were used to address prior knowledge of telemedicine, use of telemedicine, opinion on telemedicine, and concerns with telemedicine. We tested the hypothesis that specialty physicians with previous experience using telemedicine increases the likelihood of using telemedicine again in the future. 292 complete surveys were returned via email. 202 respondents reported using telemedicine previously and 90 reported never using telemedicine previously. 10 out of the 202 respondents reported using telemedicine previously but were unlikely or very unlikely to use telemedicine again. 192 out of the 202 respondents reported being very likely or likely to use telemedicine again. 95% of specialty physicians with previous experience using telemedicine were very likely or likely to use telemedicine again in the future. Previous experience using telemedicine increases the likelihood of telemedicine continuation in the future.

Evaluation of California Physician Specialists Concerns About Telemedicine Based on Their View of Telemedicine.

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Telemedicine allows practitioners to consult and review the records of distantly located patients. These interactions can be used for diagnosis, case management, patient screening, consultation and store and forward imaging, which also include video conferencing.Â One of the major contributors to increasing health disparities in California is the lack of access to physicians, particularly physician specialists in rural and underserved regions. While telemedicine is and can be deployed in these regions, it is important to identify strategies to increase the number of physician specialists that use telemedicine. We hypothesized that physician specialist opinions positively correlate with the likelihood they would incorporate telemedicine into their daily practice. Data were collected using a thirteen-question survey, which was distributed electronically to California physician specialists identified through California Licensing board. Approximately 11,887 physician specialists were targeted via email to complete the survey. The questions focused on overall opinion, experience, and concerns that may apply to the specialists understanding of telemedicine. There were a total of 292 physician respondents, representing 27 medical specialties. The data suggest that physician specialists with a negative opinion about telemedicine are unlikely to use it in the future.Â Furthermore the primary concerns about use of telemedicine of physicians with a negative opinion were similar to those who viewed it positively and use it in their practice. Primary concerns include compromising quality of care and technical challenges.Â These data will be useful to develop strategies to overcome the barriers to using telemedicine.

Mapping Education in Supervisorial District of Merced County. Phase I: Descriptive Account of GIS Usage in Merced County.

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Using Geographic information system (GIS), this student-led initiative worked with the community to examine the geographical distribution of resources that may contribute to the disparities on community health and development. Community engaged scholarship (CES) is used to actively engage community stakeholders as partners and scholars in conducting the needs assessment for Merced County.

There are three main steps to CES GIS: (1) build an infrastructure for CES GIS campus and in the community, (2) interview key community informants and compile a list of important health and education indicators, and (3) outline procedures for the implementation of a CES GIS mapping.

To create an infrastructure, people and resources within the campus and the community were located. Twenty undergraduate students were recruited to assist the project. The Board of Supervisors (BoS) played a critical role in the development of the CES GIS project. The concerns of the BoS fell into three categories: education, health and economic development. Merced County Office of Education facilitated decision and data collection for schools. Merced County Public Health Department facilitated decisions and data collection for public health indicators. City and County GIS experts facilitated GIS training and provided resources for students to map the selected indicators. Conclusion: From the findings it can deferred that the community input is invaluable in developing the CES GIS project as they offered wisdom and resources that would otherwise be inaccessible. Next steps include: training new student leaders, developing a formal GIS course with credit and continuing to engage community stake holders in the project.

The Relationship Between Residential Stability and Felt Community Efficacy, 2008 - 2009.

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Social cohesion and social control are important to the development of felt community efficacy. Community efficacy can lead to the development and introduction of social programs which may alleviate some of the health disparities which arise in low socio-economic status communities. It is perceived that residential stability increases felt community efficacy. Previous research has focused on communities located within the urban centers of the United States. Our research will focus on low socio-economic status in a more rural setting, Planada and South Merced in California, which has not received much attention from the research community. Data was collected using a semi-structured survey instrument by way of one on one interviews with respondents. The instrument included 11 closed-ended questions using a 5 point Likert scale to quantify responses. Our preliminary findings show that in our rural setting we found that felt community efficacy does not necessarily increase with higher rates of residential stability as it does in communities located in larger urban centers. An extensive literature review was also conducted in order to hypothesize possible findings of our study. We also found that felt community efficacy was greater in the smaller town of Planada, than it was in South Merced which is larger and more populated. In addition our data showed that there was no clear direct relationship between residential stability and efficacy, despite theoretical predictions.

Angiotensin Receptor Blockade Decreases Hepatic Triglyceride Content and Reduces Retroperitoneal Fat Deposition Following Increased Glucose Intake in a Model of Insulin Resistance.

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High glucose intake can result in the progression of diabetes & obesity. Increased lipid concentrations in circulation and in tissues have been shown to impair insulin signaling, which may manifest insulin resistance, and ultimately diabetes. Treatment with an angiotensin receptor blocker (ARB) may improve impaired insulin signaling, and thus decrease the potential for developing diabetes. Because excessive glucose intake can exacerbate the deposition of adipose, and subsequently, plasma lipid levels in insulin resistant conditions, the purpose of this study was to assess the benefits of ARB treatment on lipid metabolism as it relates to fat deposition in a model of insulin resistance on a high glucose supplemented diet. We examined the effects of chronic (6 wks) ARB treatment on Otsuka Long Evans Tokushima Fatty (OLETF) rats, using Long Evans Tokushima Otsuka (LETO) rats as the lean, control strain. To test our hypothesize that angiotensin receptor blockade decreases hepatic triglyceride content following increased glucose intake in a model of insulin resistance we used the following groups of rats: 1) LETO control (14 wks), 2) OLETF at 8 wks, 3) OLETF at 14 wks, 4) OLETF + ARB (10 mg olmesartan/kg/d in the diet x 6 wks), 5) OLETF + high glucose (HG; 5% in water x 6 wks), and 6) OLETF + ARB + HG. After 6 wks of treatment, plasma triglycerides, glycerol, free fatty acids (NEFA), and ÃŸ-hydroxybutyrate levels along with liver triglyceride content were measured. ARB treatment in HG reduced plasma triglyceride, plasma glycerol, NEFA levels and liver triglyceride content suggesting that blockade of angiotensin receptor reduces hepatic triglyceride production. ARB treatment in HG also increased plasma ÃŸ-hydroxybutyrate suggesting that fatty acid oxidation is increased. The data demonstrate a profound benefit from ARB treatment on lipid metabolism and fat deposition suggesting that besides the antihypertensive effects of ARB treatment, ARB can also improve the condition of metabolic syndrome by improving the lipid profile and reducing adiposity.

Mapping the Health Indicators Suggested by the 5 Board of Supervisors in Merced County.

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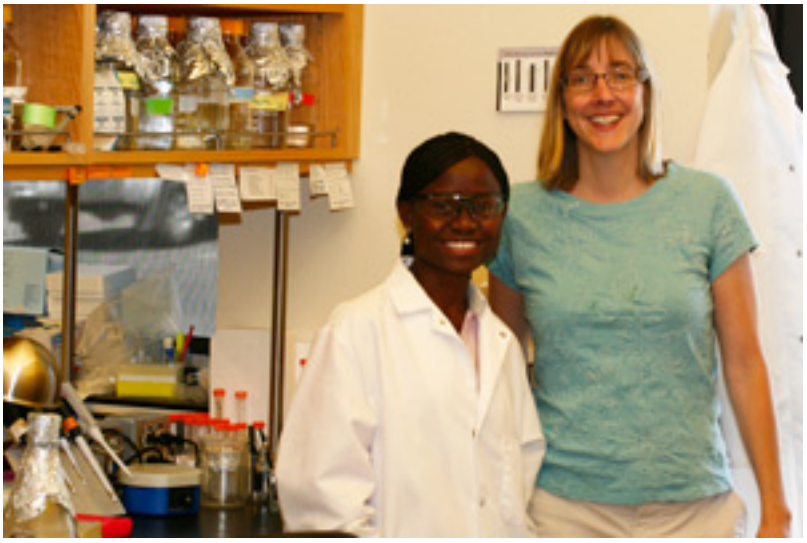
Access to health care services is a strong predictor of life expectancy and a strong indicator of community health. Using geographic information system (GIS), location of potential health indicators within supervisorial districts of Merced County will be easily visualized on an interactive level allowing for relationship, trends and patterns to be monitored. From our understanding, a clear baseline has not been created for Merced County in measuring a change. Our research question is to see how the 5 board of supervisors in Merced County will change the allocation resources such as money and location of health services in their districts to improve population health by using GIS to understand health disparities in Merced County in their districts. From the documentary *Unnatural Causes*, place mater is depicted since where a person lives determines whether one can access health care or not and ultimately influencing how long they will live. Other counties such as Contra Costa County have replicated the construct to improve community health. The majority of the maps collected lack major supervisorial street boundaries dividing the 5 districts in Merced County. Potential health indicators suggested by the board of supervisors in personal interviews included health, economic, gang and crime prevention, early childhood education, agricultural development, and traffic-related mortality. Other health indicators suggested by the Merced County of Public Health was homicide. Merced County was listed as the second worst of 58 counties in California to die from cerebrovascular diseases (CVD) in the MerCo Health Status Profile 2009.



Mutation in C37 Region of Potent HIV Inhibitor Griff37.

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The pandemic of Human immunodeficiency virus (HIV) has led to a global commitment to establishing preventative measures. In a recent study from our group, griffithsin (Griff), a potent HIV inhibitor that binds to HIV protein gp120, was covalently linked with peptide C37, to create a more potent HIV inhibitor chimera (griffithsin-linker-C37 (Griff37)). However, the contribution of this linker peptide (C37) is yet to be examined.

We hypothesized that the linker C37 region of Griff37 contributes to the higher potency of griffithsin by binding to HIV glycoprotein gp41, allowing the overall chimera to bind to two potential targets of HIV entry (gp120 and gp41). Here, we test our hypothesis by mutating the C' terminus of C37 peptide in an attempt to disrupt its binding activity to gp41. Using PCR mutagenesis, we truncated Griff37 by 4 ("No QELL)" and 8 ("Trunked") amino acids. In

addition, we attempt to abolish it's binding to GP41 by mutating the last 8 amino acid to charged amino acids. After cloning and transformation, the proteins were purified using High-performance liquid chromatography (HPLC) through nickel and C4 columns.

Our fusion assay results show that none of the mutants were more than 4 times worse than Griff37 comparer to wild type Griff. We concluded that the linker C37 peptide may not necessary need to bind to gp41 for the high potency of the chimera. It is possible that the linker peptide could be using an alternate strategy to disrupt the binding of HIV to the target cell, such as by providing a larger overall protein to block interactions.

Hepatitis C Virus.

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Hepatitis C virus (HCV) is an etiologic agent of hepatocellular carcinoma in humans. HCV infection has been associated with severe alterations of the host redox status, and oxidative stress has been identified as a key mechanism of HCV-induced pathogenesis. Previously we showed that Nox 4 is an important source of reactive oxidative species during HCV infection and that HCV increases its nuclear localization (Figure 1). Furthermore, HCV increased transforming growth factor (TGF- Î²1) and Nox 4 elevation by HCV could be decreased by neutralizing antibody to TGF- Î²1.Â The transcription growth factor is a cytokine that participates in fibrogenesis and it activates SMAD2/3 pathway. Therefore, we hypothesized that HCV increases the production of Nox 4 through TGF- Î²1 and specially, that TGF- Î²1 would be sufficient to modulate Nox 4, even in the absence of HCV. Huh 7 human hepatoma cells were treated with TGF- Î²1 for 1 and 17 hour.Â Then, immunofluorescence staining was performed to examine Nox 4 expression and its subcellular location. We found that TGF- Î²1 activated SMAD 2/3 at 1hr which subsided at 17hr. Also, TGF- Î²1 increased the protein level of Nox4 and its nuclear localization. Therefore, TGF- Î²1 was sufficient to increase Nox4 and the nuclear localization of Nox 4 in the absence of HCV.Â Â Nuclear location of Nox 4 is likely to play an important role in in the host DNA damage in the development of cancer.

Decreased CD 36 Expression in Insulin Resistant Rats.

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Under normal conditions, the main oxidative energy source comes from the metabolism of free fatty acids; however, insulin resistance (IR) may alter substrate utilization, compromising cardiovascular function. Furthermore, blockade of angiotensin receptors has been shown to improve insulin signaling in peripheral tissues, but its affects in the heart with respect to insulin signaling are not well described. The association between insulin signaling during insulin resistance and CD36 content in the heart in conjunction with treatment with an angiotensin receptor blocker (ARB) has not been examined. In this study we hypothesize that increased blood glucose associated with insulin resistance decreases CD36 expression in the heart. After 6 wks of treatments, hearts were collected from 6 groups of rats: 1) lean-strain controls (LETO), 2) OLETF (8 wks of age), 3) OLETF (14 wks of age), 4) OLETF + ARB (10 mg olmesartan/kg/d), 5 OLETF + high glucose (HG; 5% in water), and 6) OLETF + ARB + HG. Protein content of insulin receptor and CD 36 were quantified by Western blot. Blood glucose and plasma insulin levels were measured to calculate IR index. The results show that increases in glucose levels, and in IR expression are decreases CD 36 expression. Mean CD 36 expression decreased 8% compared to LETO, but ARB treatment did not have any further effect. Additionally, the groups expressing increased insulin receptor expression tended to show decreased CD 36 expression suggesting that increased glucose metabolism is associated with reduced FFA transport in cardiac tissue during IR conditions.

Increasing GLUT4 Expression in Fasting Elephant Seals.

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Type II diabetes is characterized by hyperglycemia caused by insulin resistance. Prolonged fasting is a natural component of the northern elephant sealâ€™s (NES) life history, and is characterized by the maintenance of relative hyperglycemia and hypoinsulinemia. Under normal conditions, the absorption of circulating blood glucose by target tissues (i.e., adipose, skeletal, muscle, etc.) is facilitated by the proto-typical insulin-dependent glucose transporter, Glut4 In terrestrial mammals, extending fasting or starvation is associated with decreasing blood glucose levels and reduced Glut4 levels. We hypothesize that Glut4 expression will decrease in fasting elephant seals. We used western blot to quantify the protein expression of adipose levels of Glut4 between early(2-3 weeks post weaning) and late (<8 weeks post weaning) fasting seal pups. Seals were also given an iv glucose tolerance test (ivGTT) to evaluate their insulin responsiveness (a clinical test typically given to humans to evaluate for the presence of insulin resistance). The suppression of insulin secretion late in fasting with an ivGTT suggests that elephant seals develop insulin resistance during fasting. Despite the suppressed insulin response to the ivGTT, Glut4 expression increased with fasting suggesting that Glut4 may not be the prototypical insulin-dependent glucose transporter in seals. Alternatively, other undetermined factors may regulate the signaling pathway that regulates Glut4.