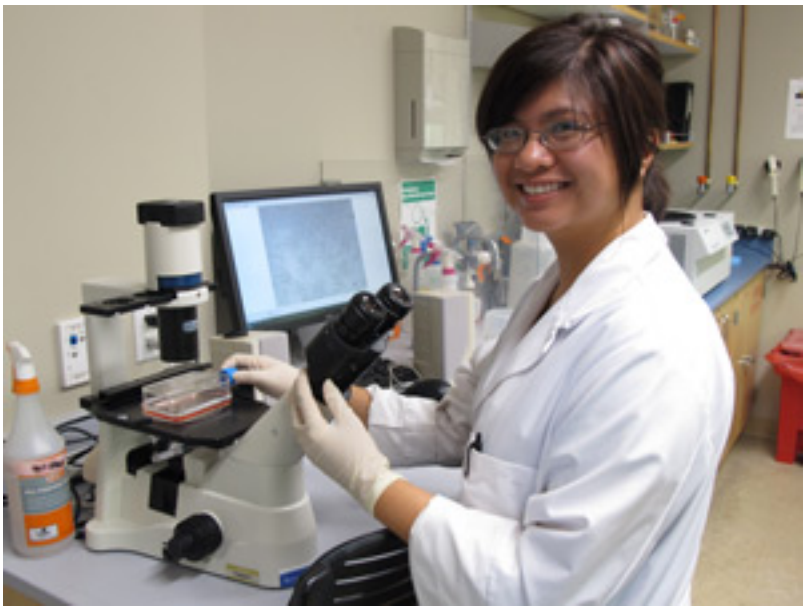
UC Merced Center for Excellence on Health Disparities Undergraduate Student Project Abstracts

Year 2 Cohort



Differentiation of Insulin-Producing Cell Clusters from Mouse Embryonic Stem Cells

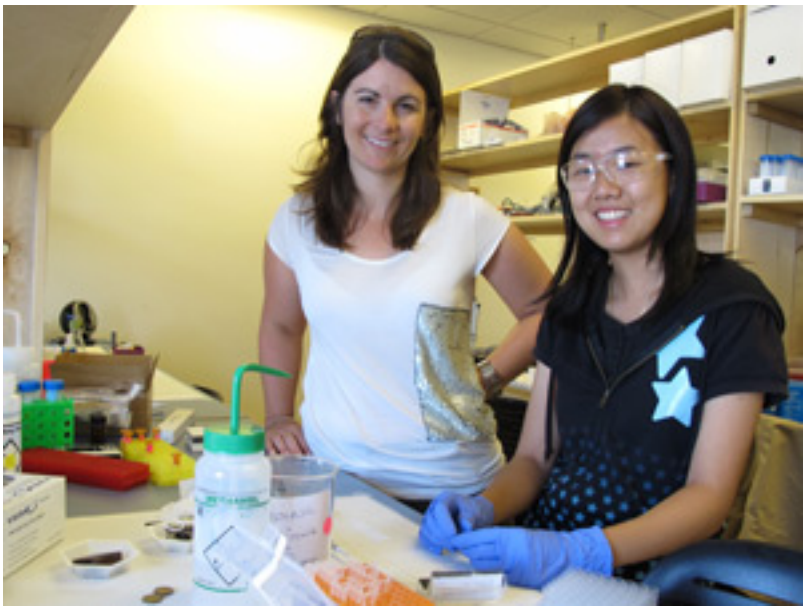
Christa D. Caneda and Jennifer O. Manilay

In Type 1 diabetes, insulin-producing pancreatic cells, or beta cells, are destroyed by an autoimmune response. Current clinical treatments are limited to indefinite insulin replacement therapy, pancreas transplantation, and beta islet transplantation. To restore glucose regulation in a less invasive way, the replacement of beta cells by inducing embryonic stem cell (ES cell) differentiation to insulin-producing cell clusters (IPCCs) has been proposed.

We hypothesize that cell culture and differentiation of embryonic stem cells to IPCCs will reproduce the insulin-producing capacity of healthy beta cells in an adult mouse. Over the course of 6 weeks, three mouse-derived cell cultures were grown and maintained: the insulinoma cell lines, 832/3 and 832/13; the embryonic fibroblast cell line, STO; and the clonal ES cell line, ES-D3. These cell lines were cultured through the practice of routine subculture, thawing, and freezing protocols. Insulinoma cell stocks were successfully expanded, and will be utilized as a positive control for comparison with IPCCs. ES cells and STO cells (which are feeder cells for ES cells) continue to be cultured.

To direct differentiation to IPCC, ES cells will be resuspended by trypsinization and then transferred to differentiation media. Analysis of differentiation will be conducted through enzyme-linked immunosorbent assay (ELISA) to detect levels of c-peptide, a byproduct of insulin production, to distinguish between de novo insulin synthesis and adsorption of insulin-rich culture media. These protocols will contribute to the overall goals of achieving islet cell development by embryonic stem cell differentiation.

Christa is a third-year Regents Scholar from Sacramento, California. She is a Biological Sciences major, with her studies emphasizing on Microbiology and Immunology. She is actively engaging in career exploration for a suitable lifelong environment for her passion towards biology, with current considerations in pharmacy and research. When she is not sporting her lab coat to perform cell culture, she enjoys the creative pastimes of drawing, painting, and theater. She also currently participates in the UC Merced Intervarsity Christian Fellowship and the UC Merced Pre-Pharmacy Club.



Omega-3 fatty acids and their role in biological membranes: Possible reasons for beneficial health outcomes

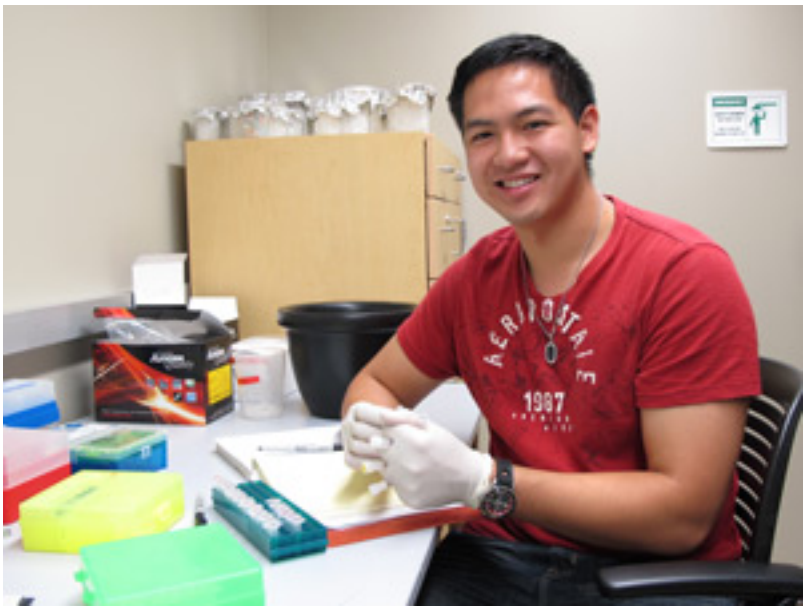
Stephanie Chen and Linda S. Hirst

Docosahexaenoic acid (DHA), an Ï‰-3 fatty acid, is known for being an essential dietary nutrient for nerve tissue growth and function. Numerous clinical studies have also shown that DHA deficiencies are associated with disorders such as attention deficit hyperactivity disorder, cystic fibrosis, unipolar depression and aggressive hostility. Consequently it is important to understand how Ï‰-3 fatty acids contribute to the development of the central nervous system, but not much is known about how polyunsaturated fatty acids are transported to the cells of the nervous system and incorporate into the membrane. We are particularly interested in studying the link between ingestion of Ï‰-3 lipids and their observed dietary benefits.

This study uses fluorescence microscopy and atomic force microscopy to observe phase separation phenomena (such as lipid rafts/domains) in membranes containing DHA and other lipids. Membranes are prepared by the electro-formation method to generate giant unilamellar vesicles, synthetic models for the cell membrane. Previous work has shown that saturated lipids in the membrane pack preferentially with cholesterol to form nano-scale domains with a variety of proposed important roles in trans-membrane protein function. We expect that an increase in polyunsaturated lipids in the membrane, such as DHA, will modify the structure and/or distribution of the membrane domains. This molecular level study may provide key information about how ingestion of Ï‰-3 lipids can produce health benefits.

Stephanie Chen is currently a third year undergraduate student at the University of California, Merced. She is pursuing a bachelors degree in psychology with a minor in art. She plans on

pursuing graduate school upon completing her degree. Some career interests, that Stephanie is exploring, are: academic advising, research, teaching, and forensic testimony. She is now a part of the Center of Excellence on Heath Disparities. Undergraduate Research Training Program. She works in a biophysics lab in order to explore her interests in biology and physics.



Studying Patterns of Mitochondrial DNA and Major Histocompatibility Complex Variation in the Red Hills Roach (Cyprinidae: Lavinia symmetricus ssp) Populations

Morrell Chhay and Andy Aguilar

The recently discovered small population of the Red Hills roach (Cyprinidae: Lavinia symmetricus ssp) has had previous morphological and phylogenic studies done to determine the degree of isolation for this subspecies. However, studies to determine genetic diversity in the major histocompatibility complex (MHC) in these small populations has yet to be done and can provide insight into the future persistence of these populations.

We hypothesized that the small populations of the Red Hills roach will have a low amount mitochondrial DNA and MHC diversity due to their small population sizes and their isolations. DNA was extracted with fin clips and the Qiagen DN-easy kit. Portions of the cytochrome B and the three MHC genes: DAB1, UAA, and OL93-139/OL93-23 were targeted with polymerase chain reaction (PCR) using established primers.

Data for MHCs were inconclusive for because all three MHC primers had failed to produce consistent results. The OL93-139/OL93-23 primers produced multiple bands when amplified and the UAA primer fail to produce any bands. The DAB1 primer only worked in some individual samples and the trends that correlate to the success of the primer in certain samples is unclear. The cytochrome B primer produced useable results showing variation in the mitochondrial DNA in the Red Hill roach populations. Our data suggests that the Red Hills Roach is a distinct subspecies in the California roach species complex.

Morrell Chhay is a continuing third year student at UC Merced and is majoring in Biology with an emphasis in development. For his career goals he is keeping an open mind and for now is pursuing a career involving general health and medicine. Aside from academics he takes part in the UC Merced Sports Shooting Club and volunteers in emergency room at Catholic Healthcare

Wests Mercy Medical Center. On the recreational side, Morrell enjoys staying active with running, hiking and biking.

Underrepresented Students Success in STEM Majors

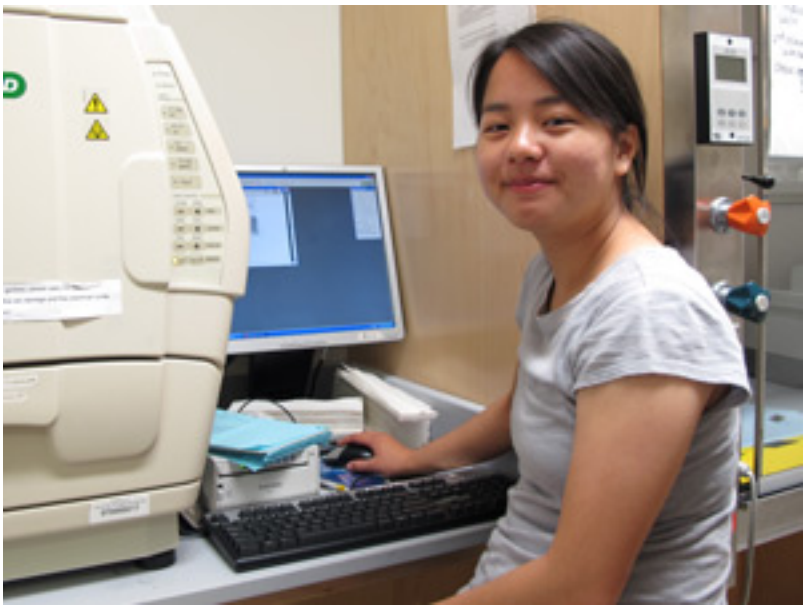
Rubinpreet Kaur and Irenee Beattie

Science, Technology, Engineering, and Mathematic (STEM) fields are amongst the most popular choices of major for underrepresented students (e.g. women, first generation, and minorities). A common characteristic for successful students in STEM fields is communication. In this study, we are looking for a relation between communications during high school with parents and college with faculty amongst underrepresented STEM students. Increased times of communication per semester between faculty and students can be a result from communicating openly with parents during high school about career planning and higher education. We conducted an online survey to a stratified random sample at a university.

Currently, the results show that women minorities communicated more with their parents during high school than first generation men and non-first generation men and women did. Further analysis could possibly show higher Grade Point Averages amongst these women when looking at a factor of academic success. Some underrepresented students, such as first-generation, that had working parents during high school probably communicate less to faculty than others do. A mentoring program at universities can help students that did not openly converse with parents during high school learn to communicate with professors.

Rubinpreet Kaur is a fifth year student at the University of California, Merced. She has obtained a Bachelor of Arts in Sociology and will be completing final courses for her minor this upcoming academic year. Rubinpreet plans to attend law school and study criminal law. Her interests include cooking, dancing, and mentoring students into higher education.

Rubinpreet is currently working with Dr. Irenee Beattie, through the Center of Excellence on Health Disparities, as a research intern. She is looking at trends in underrepresented students in fields of Sciences, Technology, Engineering, and Mathematics.



Akt/Protein Kinase B Expression Increases with High Glucose Supplementation in Insulin Resistant OLETF Rats

Lia Lee, Irina Popovich[1], Ruben Rodriguez[1], Jose Viscarra[1], Daisuke Nakano[2], Akira Nishiyama[2], Rudy M. Ortiz[1] 1. School of Natural Sciences, Univ. California, Merced 2. Department of Pharmacology, Kagawa Medical University, Japan

Akt/protein kinase B plays a significant role in the insulin signaling pathway of peripheral tissues. Disruption of Akt/protein kinase B in skeletal muscle is associated with a decrease in glucose uptake. Inefficient glucose uptake can lead to insulin resistance, contributing to the development and progression of cardiovascular disease.

Angiotensin receptor blocker (ARB) treatments can improve insulin sensitivity and decrease the augmentation of cardiovascular conditions. However, the contribution of angiotensin receptor activation to insulin sensitivity in the heart remains unclear.

In addition, cardiac insulin signaling with respect to Akt phosphorylation is yet to be investigated. Using an insulin resistant model, we hypothesized that the action of Akt is increased with high glucose. After six weeks, hearts were collected from 5 groups of rats (14 wks old): 1) LETO control, 2) OLETF, 3) OLETF+ARB (10 mg olmesartan/kg/d), 4) OLETF+high glucose (HG; 5% in water) and 5) OLETF+ARB+HG. Protein content of cardiac Akt was analyzed by Western blotting. Blood and plasma insulin levels were measured to calculate IR index. Ratio of phosphorylated Akt to total Akt content increased with high glucose suggesting glucose increases the activation of Akt. However, treatment with ARB did not change the activation in rats on either normal or high glucose-supplemented diets. This suggests that the activation of angiotensin receptor does not contribute to the activation of Akt in the heart during an insulin resistance.

Lia Lee is a fourth year student from Fresno, Ca. She is majoring in molecular and cell biology and hopes to pursue nursing after she leaves UC Merced. She enjoys reading books and seeing new places!

Hmong cultural practices, traditions, and beliefs to prevent morbidity and mortality: A critical review

Bouapanh Lor and Stergios Roussos[1]Â MPH, PhD 1. Alliance for Community Research & Development, Merced

After the Hmong migrated from Southeast Asia to the United States in the early 1970s, adaptation and assimilation into the Western culture has been a continuous struggle, especially towards Western medicine. This study aims to determine Hmong cultural practices or traditions that are used to prevent diseases and maintain overall good health. If these practices could be identified, they could be applied towards building trust in Western medicine.

Interviews were conducted with 12 key informants about cultural practices used to prevent diseases and maintain good health. Each interview was assessed individually to examine key concepts about health practices in the Hmong culture. Eighty three percent of the interviews identified herbs, herbal teas, and nutrition such as growing their own foods, as ways that the Hmong stay healthy and try to prevent diseases. Seventy-five percent of the interviews said that if someone were dying from an illness, most Hmong people would take that person to a shaman or try home herbal remedies; Western medicine would be the last resort. Ninety-two percent of those interviewed agreed that individuals who are considered trustworthy (preferably Hmong) and educated about vaccines or drugs, or visual proof would be the only way to convince or change behaviors of the Hmong public.

This study suggests there is a need for cultural liaisons that are trusted and educated about vaccines and drugs to reach out to the Hmong public about health issues that specifically target them. More research is needed on the effectiveness of Hmong cultural health practices.

Bouapanh Lor first moved to Merced at the beginning of her sophomore year in high school from Fresno. She attended Golden Valley High School and graduated in 2007. That following fall semester, she attended Merced College as an undeclared major. After a year, she discovered her enthusiasm for the sciences and declared biology as her major. In the spring of 2011, she transferred to UC Merced as a biology major with an emphasis in human biology where she still currently attends. Her future plans include continuing her education in an institution where she can pursue becoming a physicians assistant.

Impacts of Foreclosure on Efficacy and Perceptions of Barriers to Community Success in South Merced and Planada.

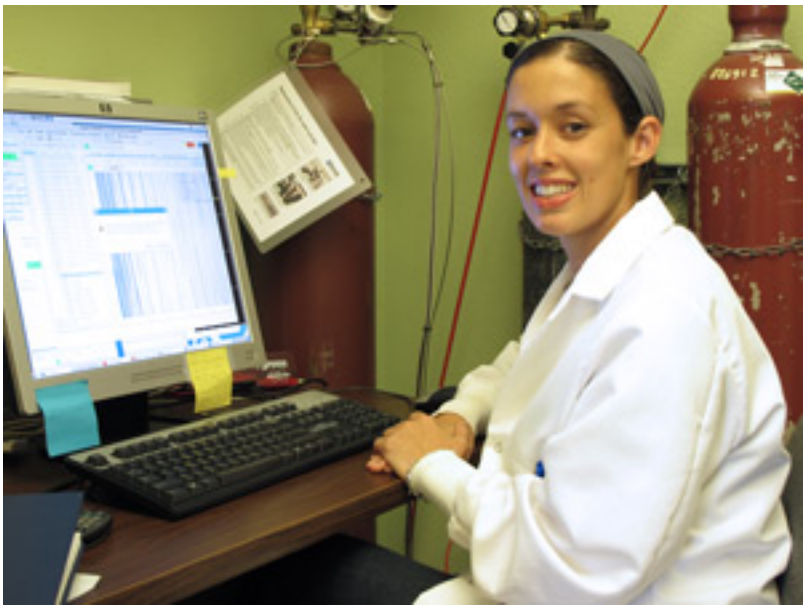
Alex Parnell and Simn E. Weffer

Neighborhood collective efficacy, which is defined as a common intent to reduce the existing problems within a neighborhood, is dependent on social cohesion and social control. It can be disrupted by instability within the neighborhood. Previous studies by Sampson et al (1997) have found a relationship between increased collective efficacy and a decrease in violence as well as the negative effects of residential instability. One of the most impactful factors on neighborhood stability in the last 5 years has been the increase in foreclosures.

Foreclosures clearly cause a shift in neighborhood stability. The literature has not examined in depth the link between foreclosures and neighborhood efficacy. If people have negative ideas of foreclosure, these views should be reflected in decreased efficacy. Using surveys of 127 participants from South Merced and Planada from 2007 to 2010, we examine foreclosures, neighborhood efficacy, and perceptions of barriers to community success.

We examine what the average efficacy score is for individuals based on their responses on the impacts of foreclosure in their community. The most common response in relation to the questions: 1) what are the barriers to improving the community; 2) what empty houses (as a result of foreclosure) do to the neighborhood were crime and safety. However, only 2 of the 127 people surveyed mentioned foreclosure as a barrier to community success. Therefore, people are concerned with crime and safety within their neighborhoods, but may not be directly aware of foreclosure as a factor.

Alex Parnell is currently a senior at the University of California, Merced. Alex entered the university as a psychology major, but during her junior year decided to broaden her education by adding cognitive science as a second major, with a minor in sociology. Her future goals include attending graduate school in the fall of 2012 and then to pursue a career as a clinical psychologist.



2H and 13C NMR Analysis of Ethanol: Isotopic Markers of Biological and Process Origins of Single-Malt Scotches

Dusty Ventura, M P Meyer and A LiWang

Isotopic analysis via NMR is rapidly becoming a powerful tool in the analysis of the biological and process origins of foods. The principal hypothesis behind this analysis is that food and drink production processes fractionate isotopes in a distinct manner which can be traced to physical origins. Here, we propose to utilize the analysis of four isotopic quantities to gain insight into the differences among single-malt scotch whiskeys. The geographical origins of the raw barley used to manufacture malt will partially determine the ratio of 13C in the methylene and methyl groups of the product of fermentation, ethanol. Processes, such as distillation, are likely to have some additional effect upon total heavy isotope inclusion. The regional geographical source of water used during the milling process in the production of scotch whiskey is likely to determine the intramolecular 2H ratios at the methylene and methyl groups in ethanol. Total deuterium content is likely to reflect the geographical origin and distillation process of raw barley.

We propose to leverage NMR analysis of the 13C and 2H content at the methyl and methylene groups in ethanol for scotch whiskeys originating from each of the geographically distinct whisky production regions in Scotland. Principle component analysis will be used to generate isotopic markers capable of distinguishing the geographical origin of single-malt scotch whiskys. This research has the prospect of increasing our knowledge of how geochemical signatures are transferred into food systems, as well as increasing the effectiveness and accuracy of food provenance determination techniques.

Dusty Ventura began her academic career by studding biotechnology at Merced Community College, which was completed in 2009. She is now a senior at the University of California, Merced, currently doing research in enology and NMR analysis in the lab of Dr. Matthew P. Meyer and Dr. Andy LiWang. Dusty is particularly interested in nanobiotechnology, and plans on pursuing a Ph.D. in that field while at UC Merced.